Expanded Project Notification Form

Submitted Pursuant to Article 80 of the Boston Zoning Code

THE INNOVATION & DESIGN BUILDING

Drydock Avenue
South Boston, Massachusetts

Submitted to:
Boston Redevelopment Authority
One City Hall Square
Boston, Massachusetts 02201

Submitted by:
Jamestown, L.P.
25 Drydock Avenue, 4th Floor
Boston, Massachusetts 02210

Prepared by:
Epsilon Associates, Inc.

May 15, 2014

Epsilon
ASSOCIATES INC.

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Submitted Pursuant to Article 80 of the Boston Zoning Code

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SOUTH BOSTON, MA

Submitted to:

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One City Hall Square
Boston, MA 02201

Submitted by:

JAMESTOWN, L.P.
25 DRYDOCK AVENUE, 4TH FLOOR
Boston, MA 02210

Prepared by:

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In Association with:

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Howard / Stein-Hudson Associates, Inc.
McNamara/Salvia, Inc.
Goulston & Storrs, P.C.
Cosentini Consulting Engineers
Sanborn, Head & Associates, Inc.
CRJA Landscape Architects
Parsons Brinckerhoff

May 15, 2014

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Chapter 1.0

General Information and Project Description

1.0 PROJECT DESCRIPTION AND GENERAL INFORMATION

1.1 Introduction

Jamestown, L.P. (the Proponent) is proposing to redevelop the approximately 826,000 square foot Bronstein Center and the physically connected, approximately 564,000 square foot Boston Design Center (BDC) in the Boston Marine Industrial Park (BMIP) as "The Innovation and Design Building" (the IDB, or the Project), an approximately 1.4 million square foot center of industry, design, and innovation supporting and enhancing the maritime and industrial character of the BMIP and the South Boston waterfront. The Project will maintain the working character of the BMIP, thereby preserving the BMIP as a base of industry and economic activity and preserving the jobs associated with such uses. The Project will also put currently vacant space into productive economic use, thereby enhancing economic opportunities and creating new jobs in the BMIP. The IDB's proximity to the waters of the Boston Harbor and to the existing marine and surface transportation infrastructure serving the Port of Boston make it an ideal location for established and start-up companies to engage in trade, to conduct research and design new products, and to move physical products from production to distribution. The IDB's location and size allow for a full range of economic processes at a single site. In addition, companies engaged in the design and production of digital products are increasingly drawn to the IDB for its large, light-filled floor plates, affordable rents, and creative community. The Project intends to support such economic activity through site and building improvements, as well as through the conversion or reclassification of 206,388 square-feet of interior space from its current industrial or vacant use to commercial use, as contemplated in the 2007 Bronstein Center long-term lease under which the Proponent controls that portion of the IDB. The proposed conversion to commercial use will allow innovative businesses to re-locate to the IDB and support the BMIP in a manner consistent with the 1999 Marine Industrial Park Master Plan (Master Plan) and the 2005 Chapter 91 Master License (Master License). In addition to allowing additional commercial office use in the building, the Project will allow ground-level space to be leased to much-needed accessory retail and food businesses supporting the employees, visitors and customers of the IDB and the BMIP in general.

The existing, interconnected buildings comprising the IDB are in various states of repair and renovation and have a combined vacancy of approximately 550,000 square feet, or 40%. The Project will replace select storefronts while preserving the historic character of the structure, renovate lobby spaces, reconfigure the parking and loading areas, create landscaped pedestrian walkways, identify building entrances through the use of shipping containers organized as building portals with wayfinding signage, and activate the raised promenade with the installation of programmed kiosks and food trucks. These improvements, combined with the proposed use conversion, will do much to reinvigorate both the IDB and the BMIP in a manner consistent with the land use and public access framework outlined in the Master Plan and Master License.

This Expanded Project Notification Form (Expanded PNF) is being submitted to the Boston Redevelopment Authority (BRA) to initiate review of the Project under Article 80B, Large Project Review, of the City of Boston Zoning Code. The Expanded PNF offers a description of the Project and its benefits to the BMIP and the City and Port of Boston. The Expanded PNF reviews the proposed improvements to the interior and exterior environment of the site and analyzes the effects of those improvements on the local environment.

1.2 Project Identification and Team

The Proponent has enlisted a team of professional Boston-based planners, engineers, attorneys, architects and consultants to assist with the development of the proposed Project. The Project and the Project Team are identified below:

Project Name:	The Innovation and Design Building, South Boston
Location:	The Project is located between Drydock Avenue and Black Falcon Avenue in the Boston Marine Industrial Park in South Boston.
Proponent:	**Jamestown, L.P.** 25 Drydock Avenue, 4th Floor South Boston, MA 02210 (212) 652-2142 Katie Scallon, Senior Manager, LEED AP Jake Citrin, Cargo Ventures
Land Owner:	**Economic Development and Industrial Corporation (EDIC)** 22 Drydock Avenue, Suite 201 Boston, MA 02210 (617) 918-6221 Larry Mammoli, Director of Engineering and Facilities Management
Architect:	**Elkus Manfredi Architects** **300 A Street** Boston, MA 02210 (617) 368-3320 Mark Sardegna, AIA, LEED AP, Vice President
Attorney:	**Goulston & Storrs, P.C.** 400 Atlantic Avenue Boston, MA 02110 (617) 574-6597 Matthew Kiefer, Esq.

Permitting Consultant:	**Epsilon Associates, Inc.** 3 Clock Tower Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Andrew D. Magee, Principal
Transportation Consultant:	**Howard / Stein-Hudson Associates, Inc.** 38 Chauncey Street, 9th Floor Boston, MA 02111 (617) 348-3314 Guy Busa, Principal
Civil Engineer:	**Howard / Stein-Hudson Associates, Inc.** 38 Chauncey Street, 9th Floor Boston, MA 02111 (617) 348-3314 Guy Busa, Principal
Structural Engineer	**McNamara/Salvia, Inc.** 160 Federal Street, 5th Floor Boston, MA 02110 (617) 737-0040 John Matuszewski
MEP Engineer	**Cosentini Consulting Engineers** One Kendall Square, Suite B2204 Building 200, 2nd Floor Cambridge, MA 02139 (617) 234-1800 Vladimir Yarmarkovich
Geotechnical Consultant / Hazardous Waste Consultant:	**Sanborn, Head & Associates, Inc.** 1 Technology Park Drive Westford, MA 01886 (978) 392-0900 Stan S. Sadkowski
Landscape Architect	**CRJA Landscape Architects** 115 Broad Street Boston, MA 02110 (617) 896-2500 Chris Jones

Rail Consultant | **Parsons Brinckerhoff**
75 Arlington Street
Boston, MA 02116
(617) 960-4832
Nicholas V. Torello, P.E.

1.3 Project Description

The following sections describe the setting and key development components of the Project.

1.3.1 Project Context – Boston Marine Industrial Park (BMIP)

The IDB consists of Parcels I, F, and F-1 of the BMIP and encompasses five of the six sections of the eight-story, 1.6 million-square-foot BMIP structure occasionally referred to as Building 114. The Proponent controls the IDB and has rights to the surrounding outdoor space under long term leases with the Boston Redevelopment Authority/Economic Development and Industrial Corporation (BRA/EDIC). Although the site is not located on the water, it is located both within filled tidelands and within the state-designated South Boston Designated Port Area (DPA). As such, work within and use of the site is subject to a number of local and state requirements. Of particular note, any such activities must comply with the conditions of the March 16, 2005 BRA/EDIC-held Chapter 91 Master License for the DPA-portion of the BMIP and be consistent with the development of the BMIP as envisioned in above-referenced Master Plan. The status of the Project with respect to the Master Plan and the Master License are reviewed in Section 6.0, Tidelands. As discussed more fully below, the Project complies with and supports the interests identified in the Master License and Master Plan.

As noted above, Building 114 is divided into six interconnected segments. These are identified as buildings 17, 19, 21, 23, 25 and 27 Drydock Avenue. All but 27 Drydock Avenue, which is leased from EDIC by a separate entity not affiliated with the Proponent, are the subject of this Expanded PNF. The Project site includes the existing BDC (referred to herein as buildings 17 and 19) located at 1 Design Center Place and the surrounding BMIP Parcel F; the Bronstein Center (buildings 21, 23 and 25) located at 21, 23, and 25 Drydock Avenue and the surrounding BMIP Parcel I; and the open space at the west end of the IDB, identified as BMIP Parcel F-1, which is used primarily as a visitor parking lot for the design center. A location map of the Project site is presented in Figure 1-1, while Figure 1-2 presents an aerial photograph of the site and surrounding land uses. Figures 1-3 and 1-4 include photographs of the IDB buildings and surrounding lands (all Section 1.0 figures are included at the end of this section).

At eight stories in height, Building 114 is the largest structure in the BMIP. The easternmost segment of Building 114 (i.e., 27 Drydock Avenue) is not included in this Expanded PNF, and therefore marks the eastern border of the Project site with a building of equal height and cross-section. Coastal Cement, a cement import and distribution facility, is located directly beyond the eastern end of Building 114.

To the immediate south the site is bound by Black Falcon Avenue (portions of which, as a private way, are within the area leased to the Proponent by EDIC), the Black Falcon Cruise Terminal and Pier (the Cruiseport), and the waters of the 600-foot wide Reserved Channel. Note that the Cruiseport is not within the BMIP. The Cruise Terminal building is two stories in height and runs immediately parallel to, and the length of, Building 114. The Cruiseport currently hosts more than 100 ocean-going cruise ships and more than 300,000 cruise passengers per year.

To the north the site is bound by Drydock Avenue and a number of smaller structures at the center of the BMIP. Beyond these structures is the fully operational Dry Dock No. 3, one of the largest dry docks on the east coast of the United States. To the northwest of the IDB opposite Drydock Avenue from the BDC is the five-level, approximately 1,700-space parking garage operated by the EDIC.

1.3.2 Proposed Development Program

The Project includes the renovation of two existing, physically connected, eight-story buildings – the Bronstein Center located at 21-23-25 Drydock Avenue (BMIP Parcel I), and the BDC located at 1 Design Center Place (BMIP Parcel F), with its surface parking lot at BMIP Parcel F-1 – which the Proponent has rebranded as one unified complex, now referred to as "The Innovation and Design Building" or IDB.

The IDB constitutes five sixths of the structure occasionally referred to as Building 114, which also includes Drydock Center located at 27 Drydock Avenue, and which was constructed in the early 1900s as a storehouse for the South Boston Army Base. The building's existing tenant base – an eclectic mix of commercial and light industrial uses such as architecture and advertising firms, research and technology companies, and maker spaces – is evidence of Boston's growing innovation economy, which represents a broad range of businesses involved in the production of physical, digital, and engineered products. In addition to creative office and light manufacturing uses, the IDB complex is also home to the BDC, New England's premier resource for design professionals, with approximately 80 showrooms featuring over 1,200 luxury product lines of fabric, furniture, lighting, antiques, fine art, wall and floor coverings, and kitchen and bath design and contract services. With a combined vacancy rate of 40% at the IDB today, the Proponent believes that it will be able to improve the financial health of the Project by leasing up vacant spaces in the building to a complementary mix of businesses in high-growth, innovation industries, akin to those that have called the complex home for years, and including some new, supportive commercial uses such as ground floor amenities to serve the building's workforce.

The Proponent's plan for repositioning the IDB includes both physical improvements to the complex and the conversion or reclassification of uses within the buildings. The Project described herein includes the conversion or reclassification of 206,388 square feet of building floor area at Parcel I from industrial or vacant space to commercial uses and associated improvements to the ground floor spaces, site, and façades of the existing building.

1.3.2.1 Physical Improvements

Physical changes are limited and will include improvements to the IDB pedestrian experience by creating a new "streetscape" on the existing raised loading platform along Drydock Avenue, reconfiguring loading and service functions to distinguish them from this pedestrian zone and to accommodate increased demand following lease up, and rationalizing the approach to the building by creating four new entrance portals and lobbies on the north side of the complex. Parking spaces will be reconfigured to accommodate the remodeled building entryways, loading areas, and Massachusetts Port Authority (Massport) Cruiseport operations on Black Falcon Avenue, but the Project will not result in net new car parking spaces on the IDB parcels. In addition, the Proponent plans to install new glass storefronts along the north side of the ground floor and will curate a mix of ground floor amenities in vacant suites and in new freestanding kiosks to support the economic activity at the IDB and the BMIP in general. Proposed supporting uses on the ground floor include cafés, newsstands, bike storage and repair stations, and other similar amenities to serve building tenants and visitors (see Figures 1-5 through 1-7 for existing and proposed site plans and first floor plans). The Project will add a limited amount of leasable area in the new kiosk structures; however, any new kiosk floor area will be offset by new mechanical areas which do not contribute to the buildings' gross floor area, resulting in no net new floor area. The Proponent also plans to install new façade, canopy, and site signage to assist in wayfinding and to reinforce the new IDB identity. Overall, exterior interventions will be limited and focused on the ground floor, and the Project will retain the historic appearance of the existing structure.

1.3.2.2 Use Changes

The Proponent estimates that commercial uses at the IDB complex currently account for approximately 180,253 square feet, or 13% of the total building area. Upon completion of the proposed Project and at full occupancy, approximately 25% of the IDB's uses (or approximately 347,300 square feet) will be commercial in nature. Of the 206,388 square feet of commercial allocation requested for Parcel I under this Project proposal, it is anticipated that 91,474 square feet will be applied to existing commercial uses in the building, 54,478 square feet will go towards a new commercial office lease currently under negotiation, and 60,436 square feet will be available to assign to future office and/or ground floor retail uses within Parcel I. The ground floor retail uses will include some combination of food and beverage offerings, other support retail to serve the employees working in the

IDB complex, and design showrooms which are open to both the trade and the end consumer. The Proponent may also consider temporary uses such as pop-up events or exhibitions.

At full occupancy, the remaining 75% of the IDB uses (or 1,041,892 square feet) will be occupied by either general industrial or marine industrial uses. Such industrial uses may include light manufacturing, industrial office, research and development, warehousing, and trade-only design showrooms. All of these use types exist within the IDB today and contribute to the character of the BMIP as an economic hub of Boston.

Table 1-1 summarizes the dimensions of the various Project elements.

Table 1-1 Project Program

Use Classifications - General	Area (SF)	% of Total
Marine Industrial	82,552	5.9%
General Industrial	959,340	69.1%
General Commercial	347,300	25.0%
Vacancy		0.0%
Total	**1,389,192**	**100.0%**
Use Classifications - Detailed	**Area (SF)**	**% of Total**
Marine Industrial		
Marine Industrial Office	82,552	5.9%
General Industrial		
Light Manufacturing	173,054	12.5%
Industrial Office	173,054	12.5%
Research & Development	173,054	12.5%
Warehousing	17,500	1.3%
Trade Showroom	422,678	30.4%
General Commercial		
Commercial Office	237,300	17.1%
Retail	90,000	6.5%
Food & Beverage	20,000	1.4%
Vacancy		0.0%
Total	**1,389,192**	**100.0%**

1.4 Summary of Project Benefits

The IDB Project will renovate and restore an important building in the BMIP, a building that is in need of repair and is currently underused (40% vacant). In doing so, the Project will result in numerous benefits to the BMIP and the City and Port of Boston.

1.4.1 Urban Design

The Project improves the urban design of Drydock Avenue and Black Falcon Avenue without compromising any economic functioning of the BMIP. As noted above, the Project combines the existing BDC (referred to herein as buildings 17 and 19) located at 1 Design Center Place, and the Bronstein Center (buildings 21, 23 and 25), located at 21, 23, and 25 Drydock Avenue, into a single complex rebranded as "The Innovation and Design Building." It consists of five physically connected, eight story buildings. The design of the Project embodies several key urban design principles, including:

- *Development that recognizes, respects, and reinforces the scale and character of the surrounding BMIP.* The proposed exterior modifications to the IDB are minimal with respect to new construction and will retain the overall historic appearance; however, the rebranding of the north side of the building will have substantive impact to the image of the building and its response to the urban context. Re-used shipping containers at four new entry plazas along the pedestrian promenade will reinforce the building's physical and visual connection to the surrounding maritime park and harbor operations.

- *Improved pedestrian access into, through and around the site.* Existing loading areas on the north and south sides of the building will be reconfigured and organized to improve loading efficiencies, to accommodate increased loading activity following lease up of the building, and, importantly, to distinguish active loading zones from pedestrian zones. Loading functions will be largely internalized on the Black Falcon Avenue side of the building allowing for better vehicular circulation on the roadway and improving the building's appearance from the Cruiseport to the south. Car and truck parking will be reconfigured along Drydock Avenue to better define the parking and loading areas and enhance the loading efficiencies. Additionally, new landscaped plaza, pedestrian walkways, and bicycle parking areas will be created to better organize the interface between the pedestrian realm and the vehicular activity in the area.

- *Creation of an active, pedestrian-friendly edge.* Vacant ground floor spaces will be programmed with support retail and food and beverage uses and oriented to the exterior, and glass storefronts will replace some of the unused overhead doors along the north side of the building. Additionally, seating areas, free-standing kiosks and food trucks will be distributed along the raised platform creating an inviting, active pedestrian promenade along the length of the building.

- *The creation of new urban open space.* Each of the building's four new north side entries will incorporate new landscaped areas, benches and trees to enhance the experience of visitors and tenants.

Additional details concerning the Project's relationship with the surrounding setting are presented in Section 5.0, Urban Design.

1.4.2 Smart Growth/Transit-Oriented Development

Smart growth tenets encourage minimizing impacts on infrastructure and developing near existing transit routes, and the Project has several smart growth benefits. By reusing and repurposing existing buildings, the Project will have a minimal impact on existing infrastructure. The Project supports the transportation objectives of smart growth because it has access to the MBTA Silver Line, with Silver Line stations located on site. In addition, the Proponent has sponsored two Hubway bike share stations at the Project site and will create bicycle parking and support areas to further maximize non-vehicular access to the IDB.

1.4.3 Building Design

The proposed Project includes improvements to the loading docks, accessways and façades of the existing buildings. The new program will accommodate a range of commercial office and accessory retail uses in addition to the existing industrial, office, and warehouse uses. Alterations and modifications of the existing buildings are described in the following sections.

1.4.3.1 Building Reprogramming and Repositioning

Buildings 17 and 19 currently contain ground level home furnishing showroom spaces oriented around a central, internal corridor that is accessed from an entrance lobby at the western end of the building complex. The Project will provide improved pedestrian access to the internal corridor from the north side of the site via a new building entry near the core of building 19. The new entry resolves existing safety and security concerns associated with visitors from the east side of the IDB complex entering the building via the existing loading door as a "shortcut" to the official BDC entry lobby at the west end of the building. In addition, the Project will re-orient some of the ground floor suites to the exterior promenade through installation of new storefront assemblies with doors. Ultimately, the Proponent would like to enable continuous pedestrian-facing frontage on the ground floor along the north side of the building. Doing so would accommodate the desire of some showroom operators to reach both the trade and the end consumer at a single location. It would also accommodate food and beverage vendors and other support retail uses serving building workers and visitors. The Proponent also plans to include limited commercial use on the second floor of building 17 by creating a café and an antiques market with stalls for small vendors. This proposed café and antiques market would complement the existing showroom uses in the building and would be open to both the design trade and general consumers. Any new food and beverage venues at IDB will be accommodated with required services, grease traps, kitchen exhaust, natural gas, and plumbing. All ground floor spaces will have direct access to a new, continuous ground floor service corridor (secondary egress) connecting leased areas to building core spaces such as loading areas, restrooms, indoor bicycle storage facilities and trash/recycling facilities. It is anticipated that the loading operations for the building will continue to be balanced between the loading doors on Black Falcon Avenue and those on Drydock Avenue. The existing loading functions along Black Falcon Avenue are proposed to be internalized and consolidated into a few distinct areas rather than the sporadic layout which currently exists. Delivery operations, including truck parking berths and loading doors, will be maintained on the Drydock Avenue side of the building and will be reconfigured to separate loading activity from pedestrian zones and passenger vehicle areas, to the extent possible. During cruise events or other times with heavy traffic on Black Falcon Avenue it will be possible to accommodate all loading using the IDB's infrastructure along Drydock Avenue. All loading areas will be managed by a dock manager to ensure smooth and efficient operation.

In addition to the ground floor use changes described above, building levels two through eight will be programmed with some new commercial office uses in the Bronstein Center to complement the existing office, industrial office, research and development, and warehouse uses that exist today throughout in the IDB.

1.4.3.2 Building Façade, Materials and Signage

Exterior changes to the existing building will be minimal. In addition to the new retail storefronts along the northern side, the building's upper floor windows will continue to be replaced over time with more energy efficient systems that will maintain the character and aesthetic of the original windows, which will be subject to specification approval by EDIC under the Proponent's leases via a proposal separate from this Expanded PNF.

New signage reinforcing the building's new identity as "The Innovation and Design Building" will be placed on the existing canopy over the loading platform on the north side of the building and on the pediment at the west end of the building. New signage above the BDC entry will reflect the Boston Design Center's refreshed visual identity and will replace the existing BDC signage that is currently located on the western façade. Perspectives of the building identification and entrance signage are presented in Figures 1-8 and 1-9.

In addition to the new building signage described above, each retail tenant will have signage opportunities along the pedestrian promenade. Such signage will likely be in the form of blade signs and storefront signs, but may also include overhead signs along the existing canopy edge. Perspectives of a potential tenant signage layout and typical storefront are presented in Figures 1-10 and 1-11. The signage design is intended to be unique to each tenant, and each tenant will be encouraged to develop signage which enhances the character of the IDB.

New lighting along the promenade will activate the space and create a more inviting pedestrian path. Each of the four new building entrance plazas will incorporate overhead, catenary lighting that will draw visitors and tenants into the buildings and retail promenade. Renderings of the entry plaza and ground floor promenade are presented in Figures 1-12 and 1-13.

Handrails and freestanding kiosks will provide edge protection along the raised promenade. Seating areas and benches will also be added to this pedestrian zone.

The existing glass solarium at each Bronstein Center entry will be replaced with a new building entry leading to a new entry lobby. New signage will signal building entries along the promenade in conjunction with the placement of new shipping container portals at the four building entrances along Drydock Avenue.

Loading areas will be consolidated and internalized along Black Falcon Avenue, and outdoor equipment will be screened to provide a neater appearance from the Cruiseport to the south of IDB. A rendering of Black Falcon Avenue is presented in Figure 1-14.

1.4.4 Improved Street and Pedestrian Environment

The Project will create significant public benefits in the form of improvements to the pedestrian experience at the Project site. The Project as proposed will create four new building entrances fronting Drydock Avenue. The new entry portals will be constructed out of shipping containers and are intended to better define and celebrate the entrance to each section of the IDB. The gently sloping entry plazas will transition pedestrian and handicap access from the parking areas and Drydock Avenue sidewalk to newly configured stairs and handicap accessible lifts to the raised promenade at the existing loading dock level. The entry plazas will provide areas for bicycle storage, sitting and relaxing during the day. The shipping containers along the promenade will house seating areas, retail kiosks and other programs to help enhance the pedestrian experience.

In addition to the four new entry plazas, the areas in front of the building will be reshaped with new sidewalks, reconfigured vehicular parking, street lights and signage, trees and other plantings to replace the relatively undefined loading and parking which exists today. A rendered landscape plan and precedents that informed this design are presented in Figures 1-15 and 1-16, while site and street sections are presented in Figures 1-17, 1-18 and 1-19. New crosswalks will provide improved access to nearby MBTA stops, Hubway bike share stations, parking lots, and garages. It is anticipated that two MBTA Silver Line stops along Drydock Avenue in front of the IDB that are within 550 feet of each other will be consolidated into a single stop with passenger waiting accommodations. Overall, site improvements are intended to rationalize the approach to the building and to minimize conflicts between pedestrians, bikers, cars, and trucks. The raised promenade along the north side of the building will be established as a primarily pedestrian zone, with north side loading doors consolidated around each building core, and new sidewalks and plazas will provide pedestrians with a safe route from the street to the building.

1.4.5 Sustainable Design/Green Building

The Project has several sustainable design public benefits, perhaps the most notable of which is the reuse and adaptation of an existing building. Energy conservation and other sustainable design measures will also be integral parts of the proposed Project. The Project will employ energy and water efficient features for mechanical, electrical, architectural, and structural systems, assemblies, and materials, where possible. Sustainable design elements relating to building energy management systems, lighting, recycling, conservation measures, local building materials, and clean construction vehicles will be included, as practical.

The Proponent recognizes that the City of Boston promotes sustainable design in large projects, and Article 37 requires that all large projects be designed as certifiable by the US Green Business Council Leadership in Energy and Environmental Design (LEED) program based on the most appropriate LEED building rating system. Details describing the Project's compliance with Article 37 are presented in Section 4.0, Sustainable Design and Climate Change Preparedness.

1.4.6 Public Parking

Existing parking spaces on the site will be reconfigured, but no net new vehicle parking spaces are proposed as part of the Project. The affected parking areas include the area between the northern edge of the raised promenade on the north side of the complex and the southern boundary of Drydock Avenue, and the parking areas on Black Falcon Avenue. The existing parking spaces will be reconfigured to accommodate new pedestrian access points to each of the four new building entrances, reconfigured truck parking and loading zones, and cruise-related traffic on Black Falcon Avenue.

1.4.7 Increased Employment

The IDB is located in the heart of one of Boston's primary economic activity hubs and will have significant job creation benefits. The Project is expected to result in the creation of approximately 58 construction jobs, as well as approximately 550 permanent jobs which are directly attributable to the change in use from industrial to commercial.

1.4.8 *New Property Tax and PILOT Revenue*

The Project will provide increased revenues for the City of Boston. The Proponent controls the BDC subject to a lease that requires property tax payments at the rates applicable to nonresidential buildings citywide, and the Proponent controls the Bronstein Center subject to a lease that requires a payment in lieu of taxes. (PILOT The Proponent anticipates that, following lease up, the Project will generate approximately $436,000 in new property tax and PILOT revenues for the City of Boston.

1.5 Public Participation

The Proponent is committed to a comprehensive, inclusive and effective community outreach process and will continue to engage community leaders, stakeholders and all other interested parties to ensure public input on the Project. The Proponent has already begun the process of meeting with community groups, community representatives and other interested parties, including but not limited to those listed below, to review and discuss the Project. The Proponent is committed to continuing this comprehensive outreach throughout the approval process.

- Massachusetts Port Authority;
- Massachusetts Department of Environmental Protection – Waterways Program;
- City of Boston, Office of the Mayor;
- City of Boston; Boston Redevelopment Authority;
- City of Boston; Economic Development and Industrial Corporation;
- City and State Representatives;
- The Boston Harbor Association; and
- Boston Marine Park Business Association.

1.6 Legal Information

1.6.1 *Legal Judgments Adverse to the Proposed Project*

The Proponent has no knowledge of any legal judgments adverse to the proposed Project.

1.6.2 *History of Tax Arrears on Property*

The Proponent does not have a history of tax arrears on property that it owns in the City of Boston.

1.6.3 Evidence of Site Control/Nature of Public Easements

Affiliates of the Proponent control the IDB as the lessees under separate leases for the BDC and the Bronstein Center. EDIC is the lessor. The Project will be designed so as to not adversely affect existing utility, access, and rail line easement areas, or the Proponent will seek to amend any relevant easement(s) prior to undertaking the portion of the Project that would affect the area subject to the easement(s).

More specifically, physical improvements to the IDB described in this Expanded PNF will require approval of EDIC under these leases. Aspects of the Project may require lease modifications as well. The Proponent has begun discussions with EDIC on these matters and acknowledges that any future BRA approval of an Adequacy Determination for the Proposed Project under Article 80B will not obviate the need for such separate EDIC approvals.

Similarly, aspects of the Project may require exercise of relocation rights or modifications to easement rights held by Massport over portions of the IDB lease parcels in Black Falcon Avenue. The Proponent is in active discussions with Massport concerning these matters. The Proponent acknowledges that, if such EDIC and Massport matters have not been fully resolved by the time of BRA Board approval under Article 80B, such approval may be conditioned on any required EDIC and/or Massport approvals being subsequently finalized.

Although an existing rail line along the north side of the building is not currently used, EDIC has informed the Proponent that rights to use this rail line have been granted to railroads and to other lessees in the BMIP and, as discussed below in Section 5.6, that this rail access may be re-activated at some point in the future. As a consequence, the Project has been designed to avoid any impairment to this rail line consistent with EDIC, CSX Transportation, and U.S. Department of Defense railway access standards.

1.7 Consistency with Zoning

The IDB is located entirely within the I-2 General Industrial District (I-2) and the Restricted Parking Overlay District (RPOD) of the City of Boston Zoning Code (the Code). As discussed below, the IDB is also located in the Piers Zone of the South Boston Parking Freeze Area. The IDB is located entirely outside the Harborpark District, which is bounded by the centerline of Drydock Avenue adjacent to the IDB. The IDB is not located within a Groundwater Conservation Overlay District.

The Project's anticipated uses are all as-of-right in the I-2. The IDB currently has the benefit of a Conditional Use permit, dated January 9, 1987, authorizing 186 accessory of-street parking spaces at the BDC. The Proponent understands that parking at the Bronstein Center is a prior non-conforming use since it precedes the implementation of the conditional use permit requirements for parking. The proposed reconfiguration of accessory off-street parking is not anticipated to result in any net new parking. If required based on the final parking plan, the Proponent will seek a new conditional use permit under the RPOD. The Project otherwise will conform to the Code's minimum parking and loading requirements.

The IDB either complies with the dimensional requirements of the Code or is a lawfully existing non-conforming structure. The City of Boston Inspectional Services Department has treated the IDB as part of one zoning lot together with the separately-owned but contiguous 27 Drydock Avenue and other parcels originally acquired from the Army in 1983, as shown in Figure 1-20. The Proponent is in the process of determining whether Building 114 is in compliance with the Floor Area Ratio requirements of the Code. The IDB complies with the Minimum Rear Yard requirements of the Code, but is not in compliance with the Parapet Setback requirements of the Code. However, the Project is not expected to increase any existing non-conformities. In the I-2, the Code imposes no minimum requirements for Front Yard, Lot Size, Lot Area, Lot Width, Usable Open Space, Side Yard, or Rear Yard Lot Coverage Ratio. Further, the I-2 imposes no maximum Building Height applicable to the IDB.

The Project's signage will undergo comprehensive sign review before the BRA, and, as noted above, the Project will comply with the Article 37 Green Building and the BRA Climate Change Resiliency Checklist requirements.

1.8 Consistency with Planning and District Goals

As noted above, the IDB is subject to the BMIP Master Plan, which comprises a Final Environmental Impact Report approved under the Massachusetts Environmental Policy Act (MEPA). The Project is consistent with goals stated in the Master Plan. The Master Plan identifies an overarching goal for the BMIP as accommodating both "new and existing industries that can provide attractive job opportunities for Boston residents" (Master Plan at page 1-1). The Project will retain and enhance existing general industrial uses, such as warehousing, research and development, and light manufacturing and will also accommodate new industries that will create a range of job opportunities for Boston residents, such as office, service, restaurant and retail uses.

The Master Plan also seeks "to protect [the BMIP's] existing job base and its industrial, manufacturing, and waterfront environment" (Id. at page 1-2). The Project will protect the BMIP job base by retaining existing jobs, converting vacant space to productive use that attracts new job opportunities, and providing support commercial services that encourage employers to come to the BMIP. The multi-story IDB does not have direct waterfront access, but instead plays a supporting role for other water-dependent industrial uses in the BMIP. (The Master Plan, on pages 3-30, describes Building 114 as "completely unsuited to modern maritime industrial use.") Concentrating commercial and general industrial uses in the multi-story, landlocked IDB allows the IDB to make vital economic contributions to the BMIP and will protect and support the existing manufacturing and industrial waterfront environment elsewhere in the BMIP.

The Master Plan also seeks "to provide sites and support for new economic development and job growth and to maintain flexibility to respond to Boston's future economy" (Id. at page 1-2). The Project will provide a site for new innovation-oriented economic development and job growth opportunities in a variety of industries. The Project will include uses that are both incidental to and supportive of water-dependent industrial uses in the BMIP as contemplated by the Master Plan (Id. at 8-1). As mentioned above, new uses include office, service, restaurant, and retail uses.

The Project will not detract from other Master Plan goals, such as maximizing locational advantages for import/export uses.

1.9 Regulatory Controls and Permits

The Project will undergo the reviews and will seek the major discretionary permits addressed below. A detailed discussion of the Master License, that is, the Massachusetts waterways license required under Chapter 91, is provided in Section 6.0, Tidelands, and is not addressed here.

1.9.1 Article 80 Review – Large Project Review

The Project is undergoing Large Project Review pursuant to Article 80 of the Code. Based on a comprehensive approach to addressing potential impacts and mitigation equivalent to the level of information normally presented in a Draft Project Impact Report (DPIR), the Project Team has asked that the BRA, after reviewing public and agency comments on this Expanded PNF and any further responses to comments made by the Project Team, issue a Scoping Determination Waiving Further Review pursuant to the Article 80B process. As part of Large Project Review, the Proponent will make appropriate mitigation commitments.

1.9.2 Boston Civic Design Commission

Review by the Boston Civic Design Commission (BCDC) under the provisions of Article 28 of the Code is required for any substantial rehabilitation of over 100,000 square feet. The Proponent has submitted design documents to the BCDC, and BCDC advisory design review is underway.

1.9.3 Massachusetts Environmental Policy Act (MEPA)

The Project is not expected to be subject to MEPA review because it is not expected to exceed any review thresholds.

1.9.4 Massachusetts Historical Commission

The Project will be subject to State Register Review (950 CMR 71) because it will require a consistency determination regarding a proposed revision to the Master License, which determination is issued pursuant to Chapter 91 by the Massachusetts Department of

Environmental Protection (MassDEP). A Project Notification Form will be filed with the Massachusetts Historical Commission to initiate the State Register Review process. This process is normally coordinated with review by the Boston Landmarks Commission.

1.9.5 Architectural Access Board Requirements

The Project will comply with the requirements of the Massachusetts Architectural Access Board and will be designed to comply with the standards of the Americans with Disabilities Act. The use of accessible lifts at each of the building entries may require special approval from the Massachusetts Architectural Access Board.

1.9.6 Boston Air Pollution Control Commission

The Project is located in the Piers Zone of the South Boston Parking Freeze Area administered by the Boston Air Pollution Control Commission (BAPCC). EDIC currently holds permits from the BAPCC authorizing several thousand commercial spaces in the BMIP. The Proponent will seek any required confirmation of or modification to the existing parking freeze in conjunction with the Project.

1.9.7 Other Anticipated Permits and Approvals

Table 1-2 below lists permits and approvals from governmental agencies which are presently expected to be required for the Project, based on information currently available (some are addressed in the previous sections). It is possible that not all of these permits or actions will be required, or that additional permits or actions may be needed. In addition to the approvals presented in the table, it is assumed that EDIC approval will be required under the Proponent's leases for some changes to the site layout and circulation.

1.10 Schedule

The filing of this Expanded PNF initiates the formal public review process for the Project. The Proponent anticipates completing the permitting of the Project in the third quarter of 2014, with construction following shortly thereafter. It is anticipated that the Project will be completed within twelve months of the initiation of construction.

Table 1-2 Anticipated Permits, Approvals and Reviews

Agency Name	Permit/Approval/Review
Federal	
US Environmental Protection Agency	NPDES General Construction Permit
State	
Massachusetts Department of Environmental Protection	Chapter 91 License Revision; Sewer Connection and Extension Permit; Fossil Fuel Utilization Permit
Massachusetts Office of Coastal Zone Management	CZM Consistency Review
Department of Public Safety	Demolition and Building Permits; Certificate of Occupancy; Plumbing Permits
Massachusetts Department of Transportation	MGL c40, s.54A – Permit for Construction on or appurtenant to (former) Railroad Right-of-Ways
Massachusetts Historical Commission	State Register Review - Determination of No Adverse Impact
Local	
Boston Redevelopment Authority	Article 80B Large Project Review – Certification of Compliance; Cooperation Agreement
Boston Civic Design Commission	Design Review
Boston Transportation Department	Construction Management Plan Agreement; Transportation Access Plan Agreement
Boston Water and Sewer Commission	Site Plan Review; Water, Sewer and Cross Connection Permits
Boston Inspectional Services Department	Building Permit; Other construction-related permits; Certificates of Occupancy
Boston Air Pollution Control Commission	Parking Freeze Permit Confirmation or Modification
Boston Employment Commission	Construction Employment Plan
Office of Jobs and Community Services	Permanent Employment Agreement

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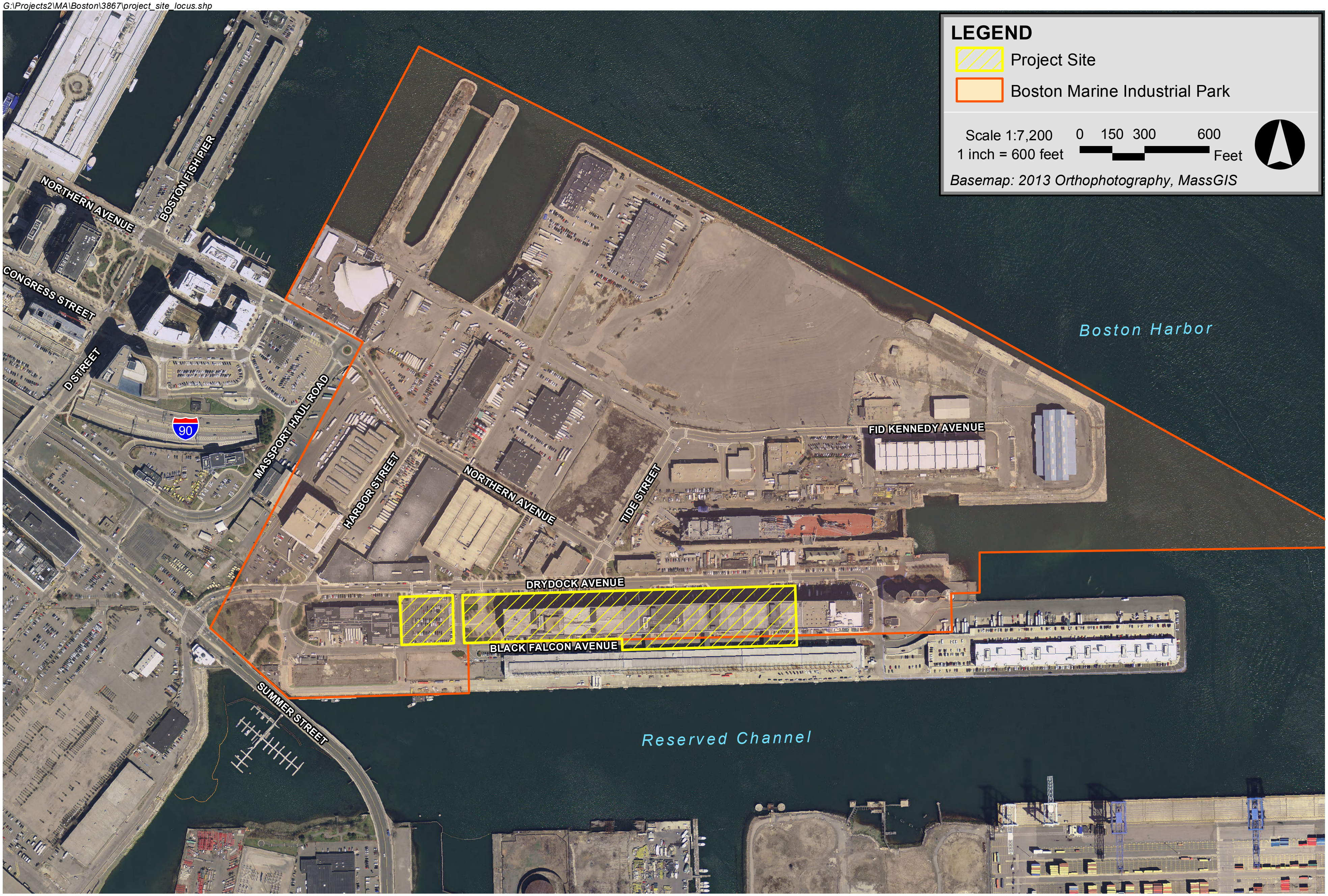

Innovation and Design Building **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 1-1

Project Site Locus - Aerial Photograph

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Innovation and Design Building Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1-2

Site Context - Aerial Photograph

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Figure 1-3
Existing Site Photos

The Innovation and Design Building   Boston, MA

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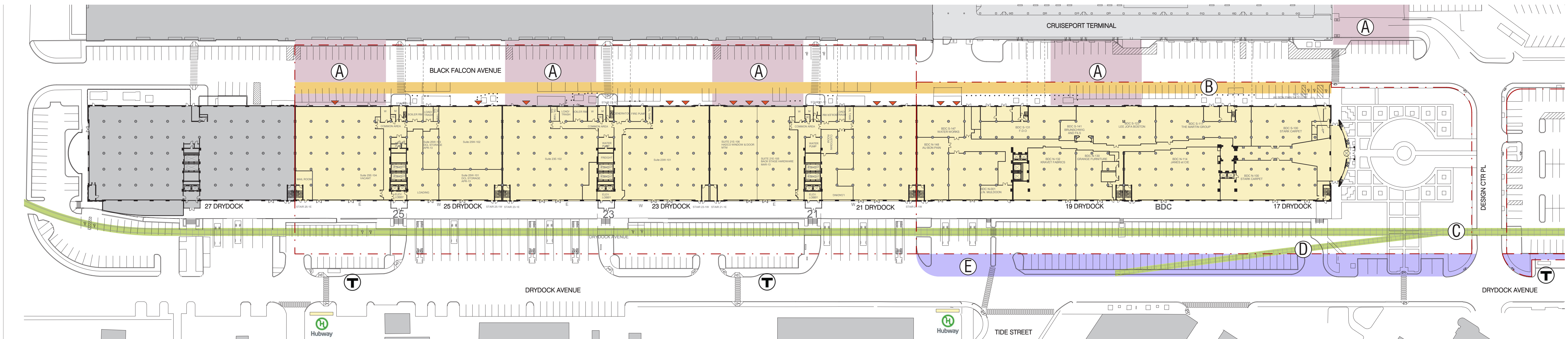
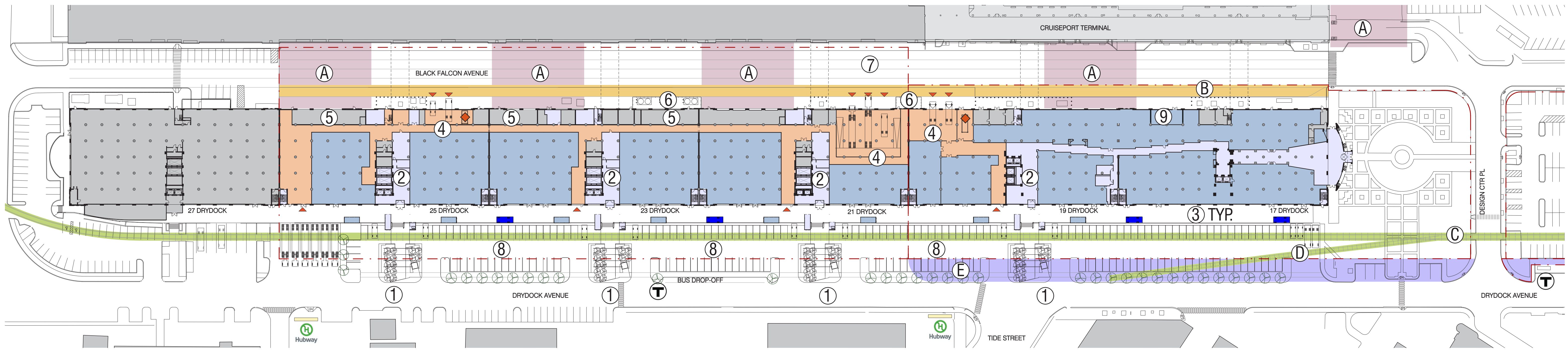
Figure 1-4
Existing Site Photos



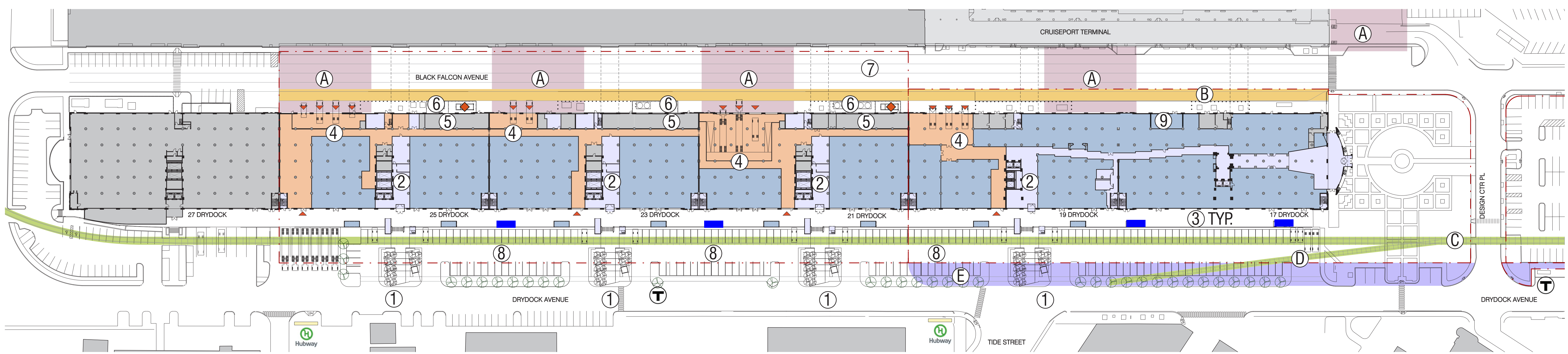
x EXISTING FIRST FLOOR PLAN

LEGEND:

- A. UNLOADING AREA
- B. EXISTING EASEMENT
- C. RAIL EASEMENT
- D. RAIL SPUR EASEMENT
- E. PARKING EASEMENT



2 PROPOSED FIRST FLOOR PLAN WITH AS-OF-RIGHT LOADING OPTION



3 PROPOSED FIRST FLOOR PLAN WITH PREFERRED LOADING OPTION

SCALE: 1" = 50'-0"

LEGEND:

01. NEW ACCESSIBLE ENTRY PLAZA
02. UPDATED ENTRY LOBBY
03. NEW STOREFRONT
04. NEW LOADING AREA @ BLACK FALCON
05. NEW MECHANICAL/STORAGE AREA
06. NEW COOLING TOWERS @ BLACK FALCON
07. RE-STRIPING OF BLACK FALCON
08. NEW PARKING + PEDESTRIAN ACCESS @ DRYDOCK
09. POTENTIAL BLACK FALCON AVE. RETAIL

TENANT
SERVICE/LOADING
LOBBY/COMMON
MECH/STORAGE
EXISTING/PROPOSED LOADING DOOR
FOOD TRUCK
TRASH AREA

A. UNLOADING AREA
B. EXISTING EASEMENT
C. RAIL EASEMENT
D. RAIL SPUR EASEMENT
E. PARKING EASEMENT

The Innovation and Design Building Boston, MA

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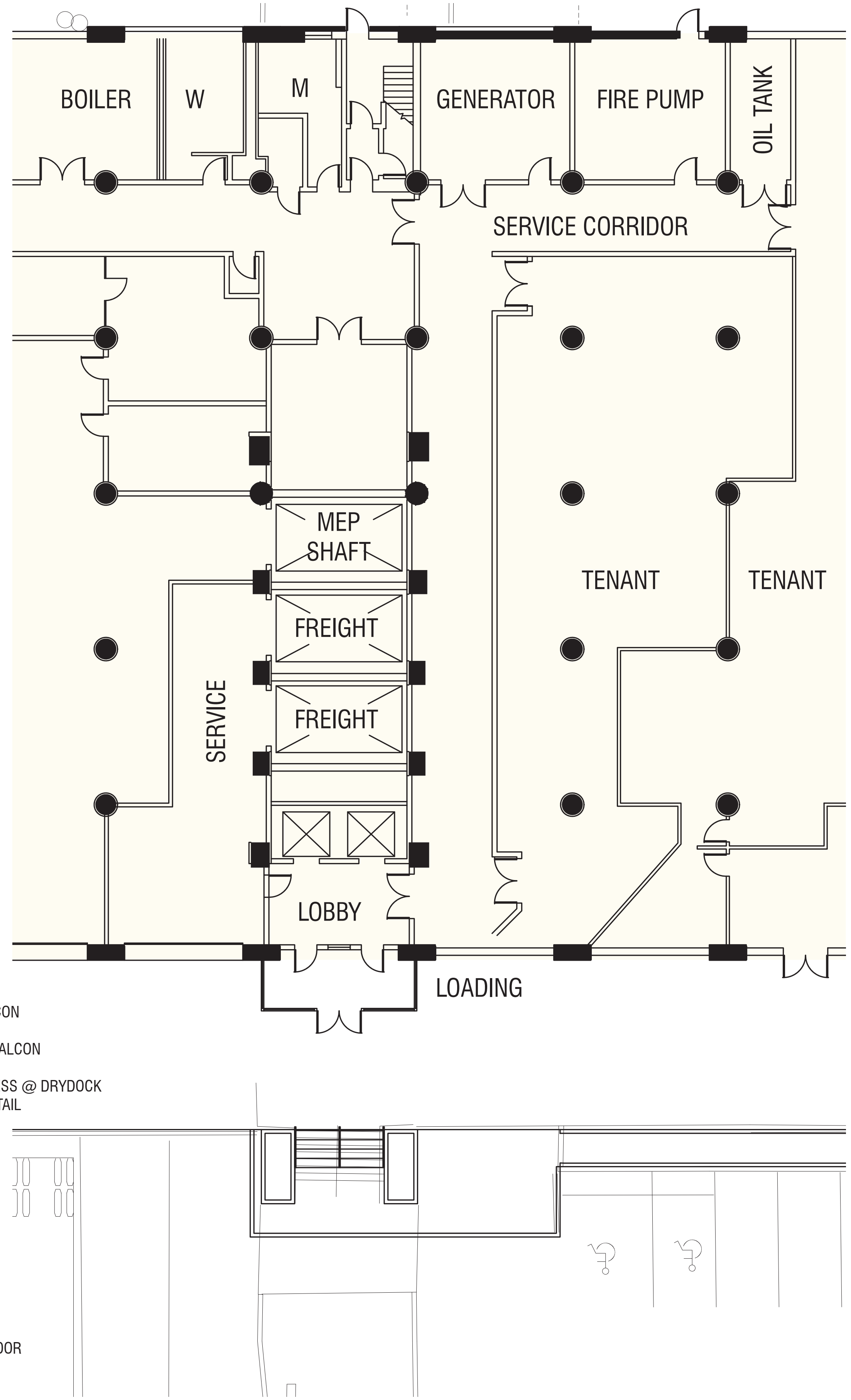
N 0 30 60 120

Figure 1-6

Proposed First Floor Plan with As-Of-Right or Preferred Loading Option



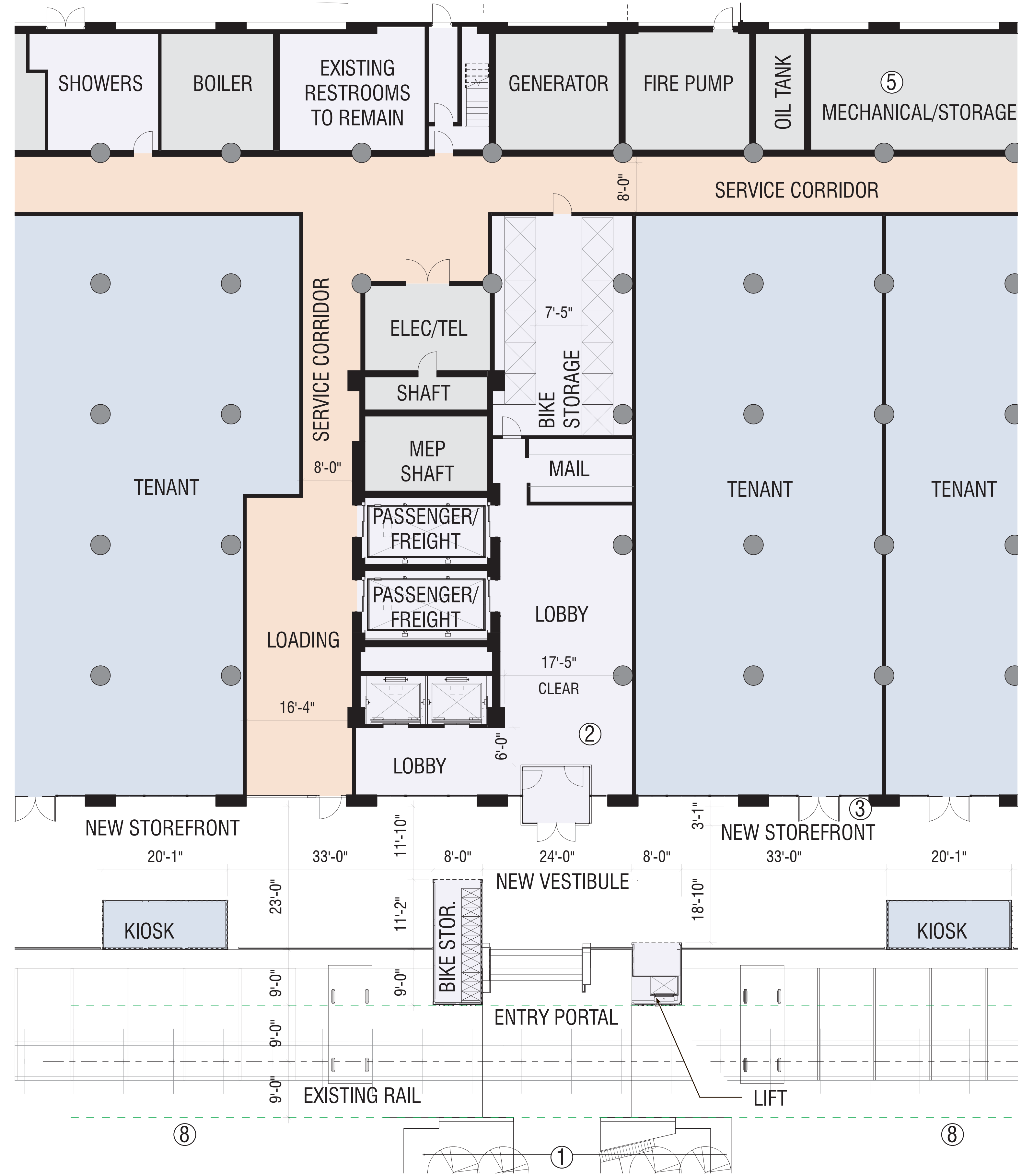
LEGEND:

01. NEW ACCESSIBLE ENTRY PLAZA
02. UPDATED ENTRY LOBBY
03. NEW STOREFRONT
04. NEW LOADING AREA @ BLACK FALCON
05. NEW MECHANICAL/STORAGE AREA
06. NEW COOLING TOWERS @ BLACK FALCON
07. RE-STRIPING OF BLACK FALCON
08. NEW PARKING + PEDESTRIAN ACCESS @ DRYDOCK
09. POTENTIAL BLACK FALCON AVE. RETAIL

- TENANT
- SERVICE/LOADING
- LOBBY/COMMON
- MECH/STORAGE
- EXISTING/PROPOSED LOADING DOOR
- FOOD TRUCK

1 **ENLARGED PLAN @ EXISTING LOBBY, TYP.**

SCALE: 1" = 10'-0"



2 **ENLARGED PLAN @ PROPOSED LOBBY, TYP.**

SCALE: 1" = 10'-0"

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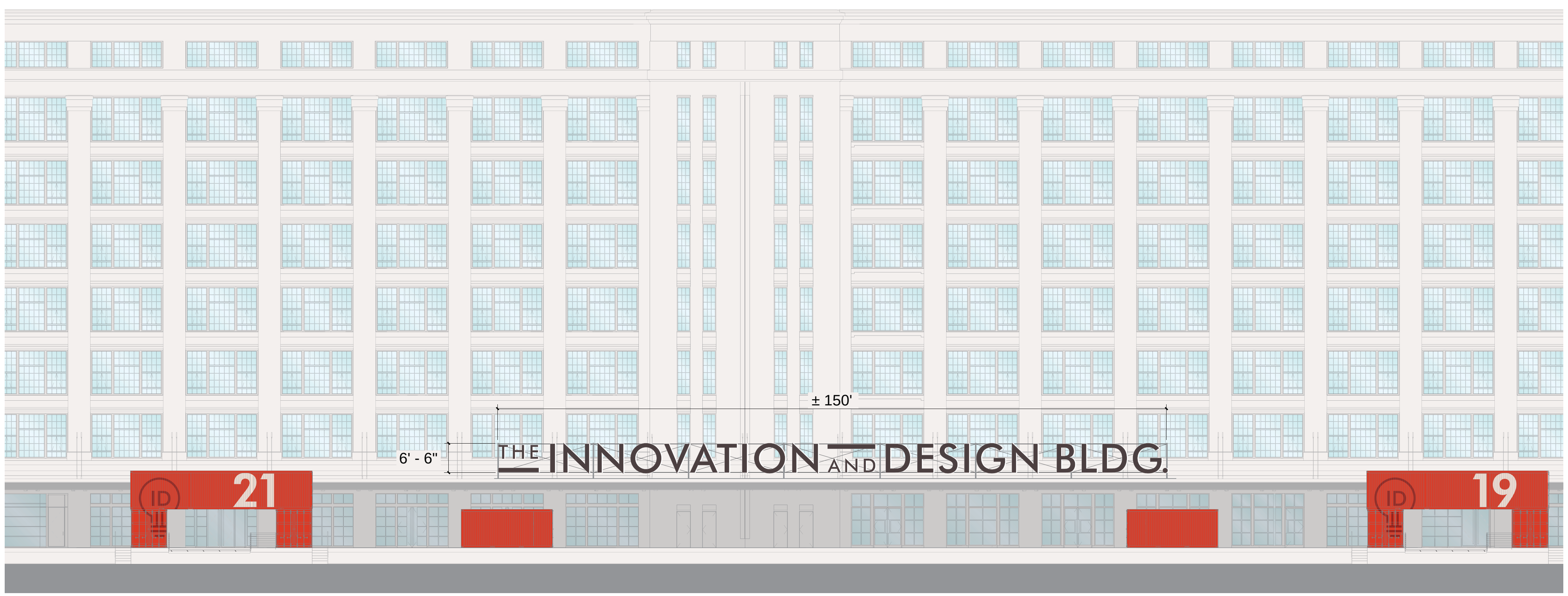
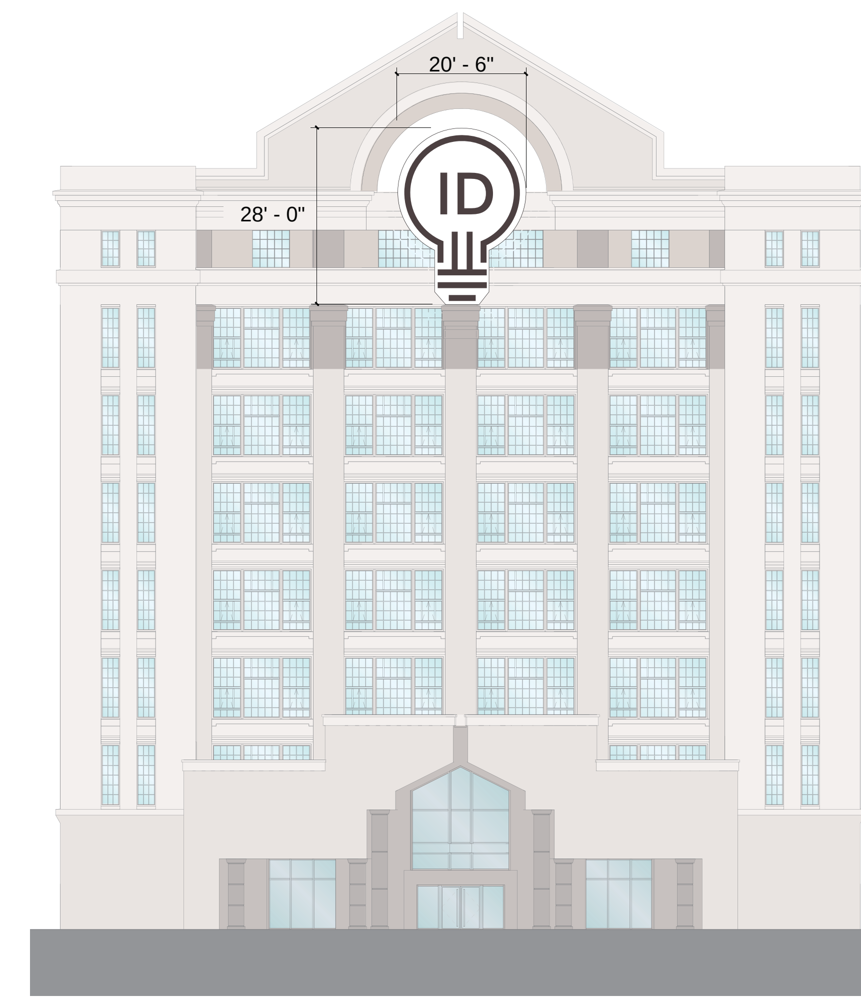
Figure 1-7

Enlarged Plan of Existing and Proposed Lobby

North Elevation



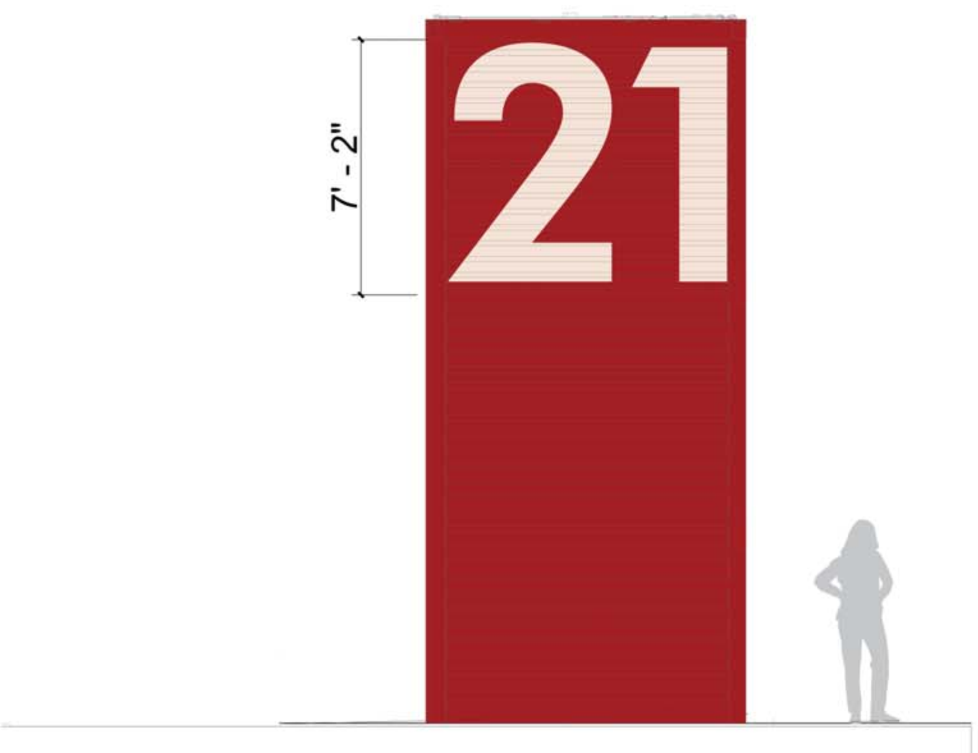
Partial North Elevation



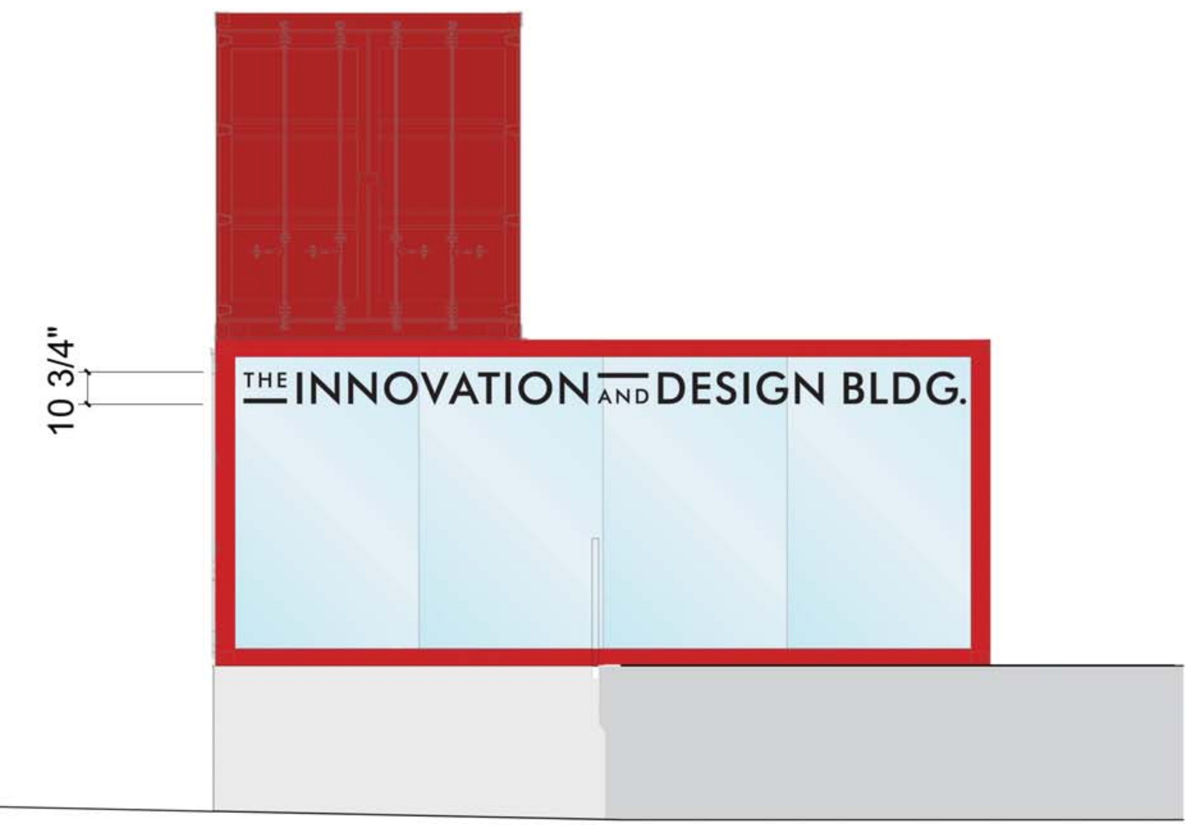
West Elevation

EXISTING BOSTON DESIGN CENTER
SIGNAGE REMOVED

North Elevation - Entry Portal at Promenade

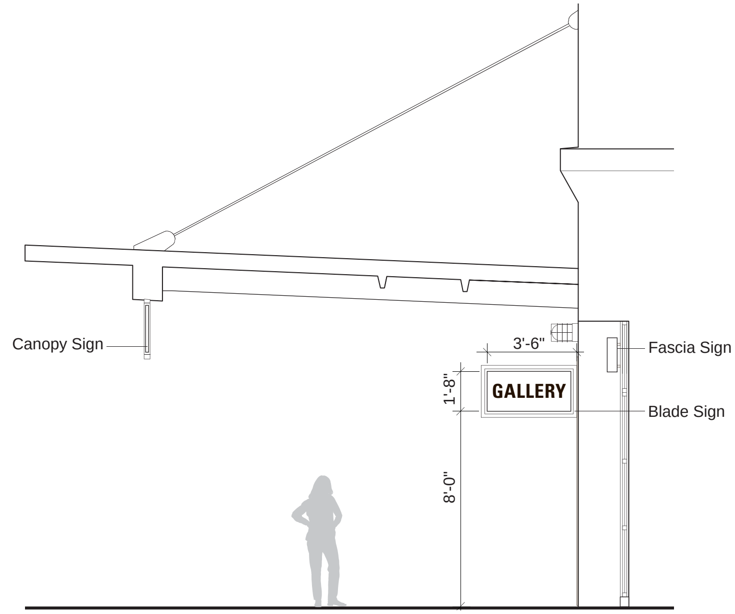


West Elevation - Pylon at Drydock Ave

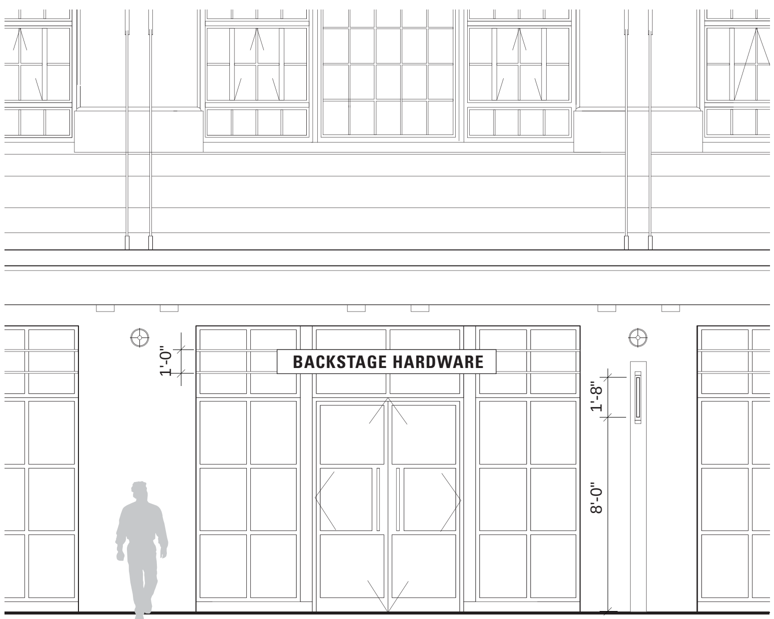


West Elevation - Entry Portal at Promenade

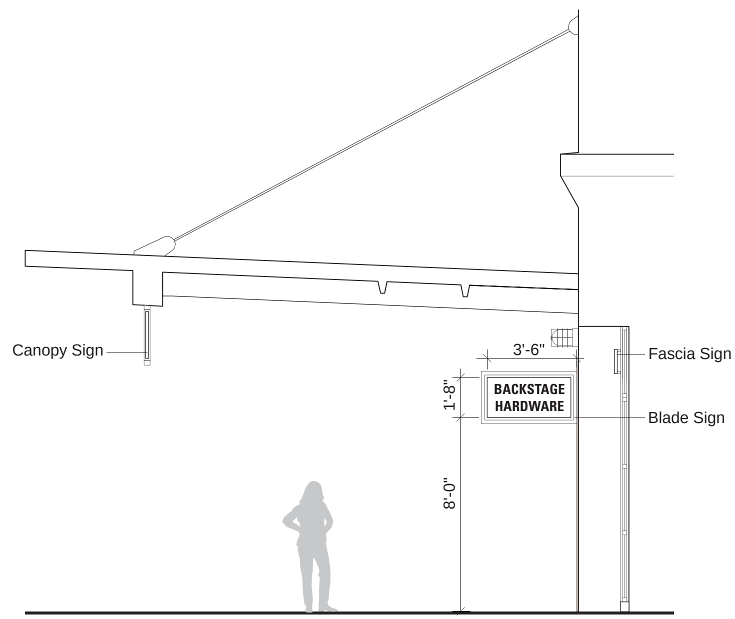
North Elevation



Section



North Elevation



Section

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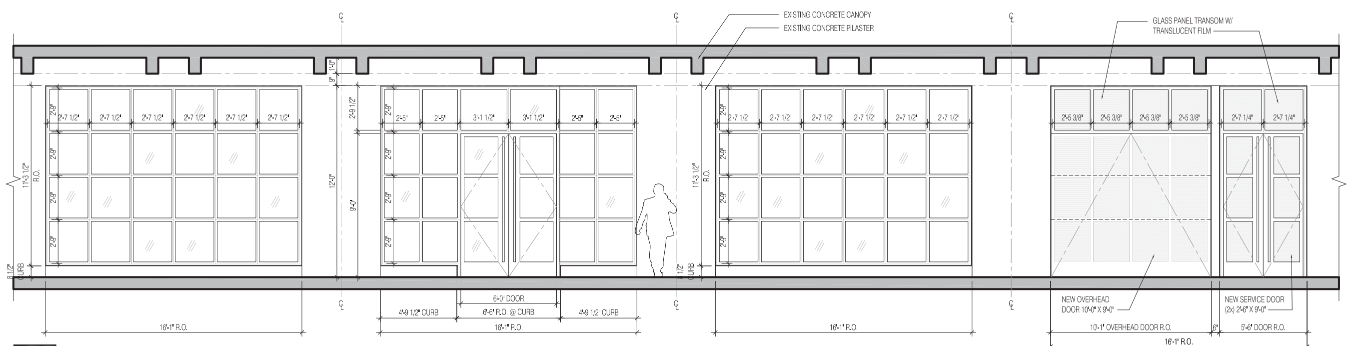
0 2 4 8

Figure 1-10
Tenant Signage

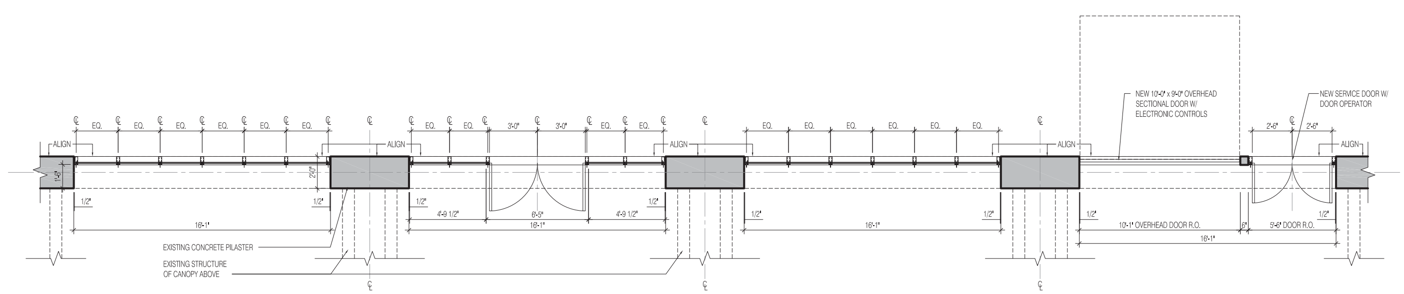
03 ELEVATION - DEMO SCOPE

SCALE: 1/4" = 1'-0"



02 ELEVATION - PROMENADE STOREFRONT

SCALE: 1/4" = 1'-0"



01 PLAN - PROMENADE STOREFRONT

SCALE: 1/4" = 1'-0"

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Figure 1-12
View of Entry Plaza

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Figure 1-13
View of Ground Floor Promenade

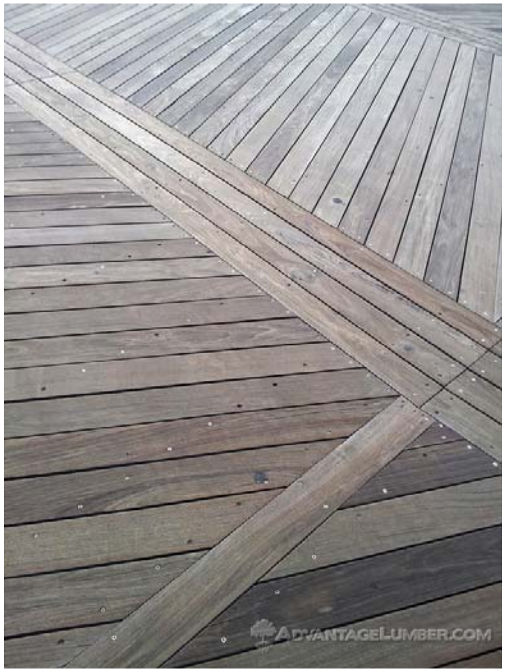
Figure 1-14
View of Black Falcon Avenue

The Innovation and Design Building Boston, MA

Figure 1-15
Rendered Landscape Plan

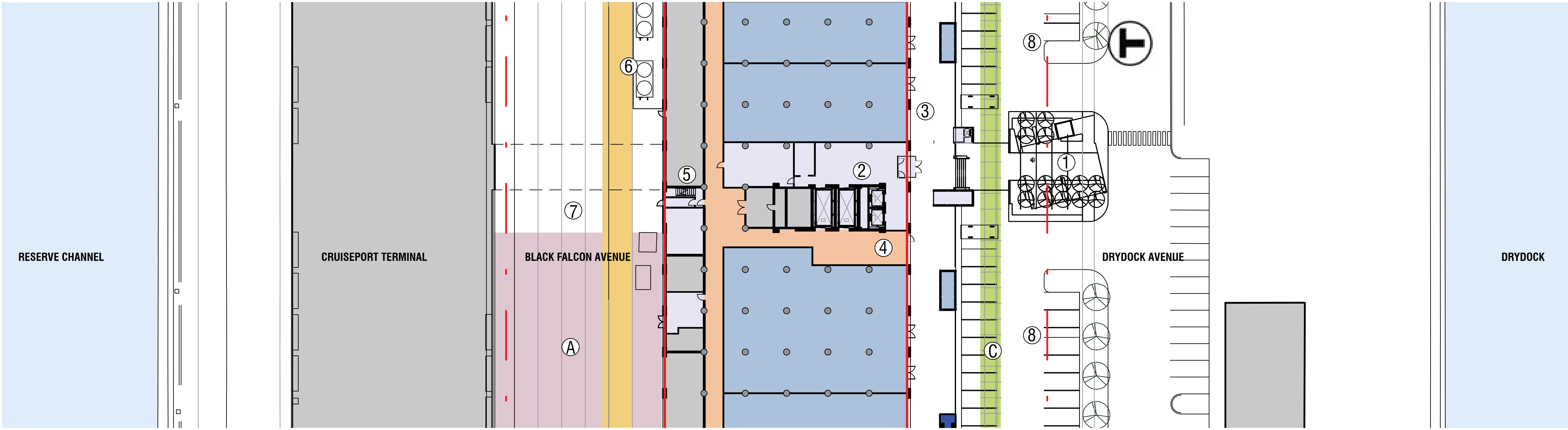






The Innovation and Design Building   Boston, MA

Figure 1-16
Landscape Precedents



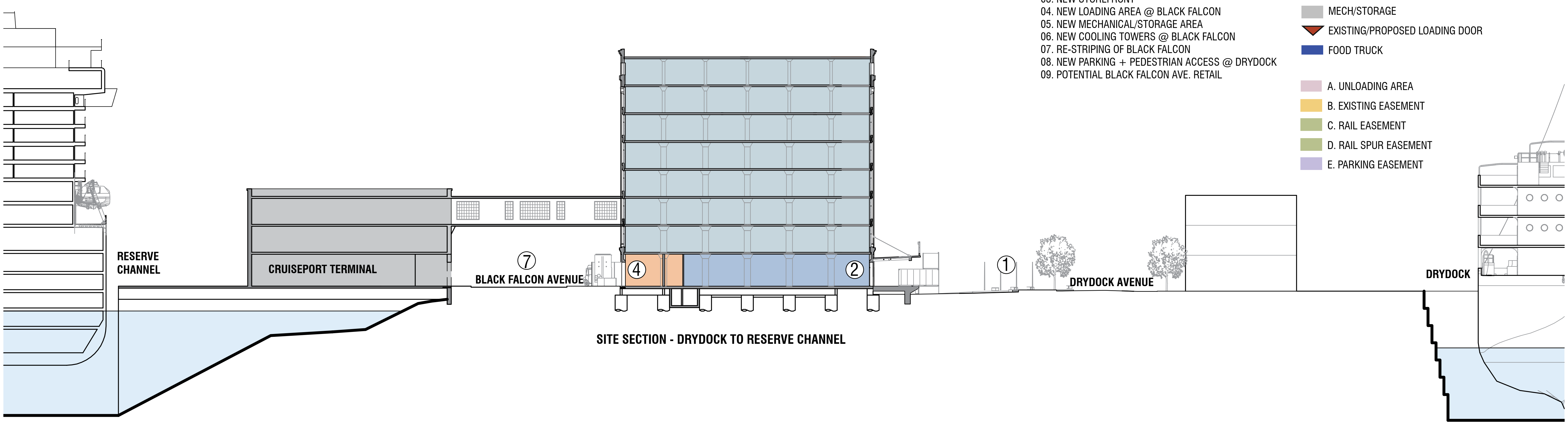
SITE PLAN - DRYDOCK TO RESERVE CHANNEL

LEGEND:

01. NEW ACCESSIBLE ENTRY PLAZA
02. UPDATED ENTRY LOBBY
03. NEW STOREFRONT
04. NEW LOADING AREA @ BLACK FALCON
05. NEW MECHANICAL/STORAGE AREA
06. NEW COOLING TOWERS @ BLACK FALCON
07. RE-STRIPING OF BLACK FALCON
08. NEW PARKING + PEDESTRIAN ACCESS @ DRYDOCK
09. POTENTIAL BLACK FALCON AVE. RETAIL

TENANT
SERVICE/LOADING
LOBBY/COMMON
MECH/STORAGE
EXISTING/PROPOSED LOADING DOOR
FOOD TRUCK

A. UNLOADING AREA
B. EXISTING EASEMENT
C. RAIL EASEMENT
D. RAIL SPUR EASEMENT
E. PARKING EASEMENT



SITE SECTION - DRYDOCK TO RESERVE CHANNEL

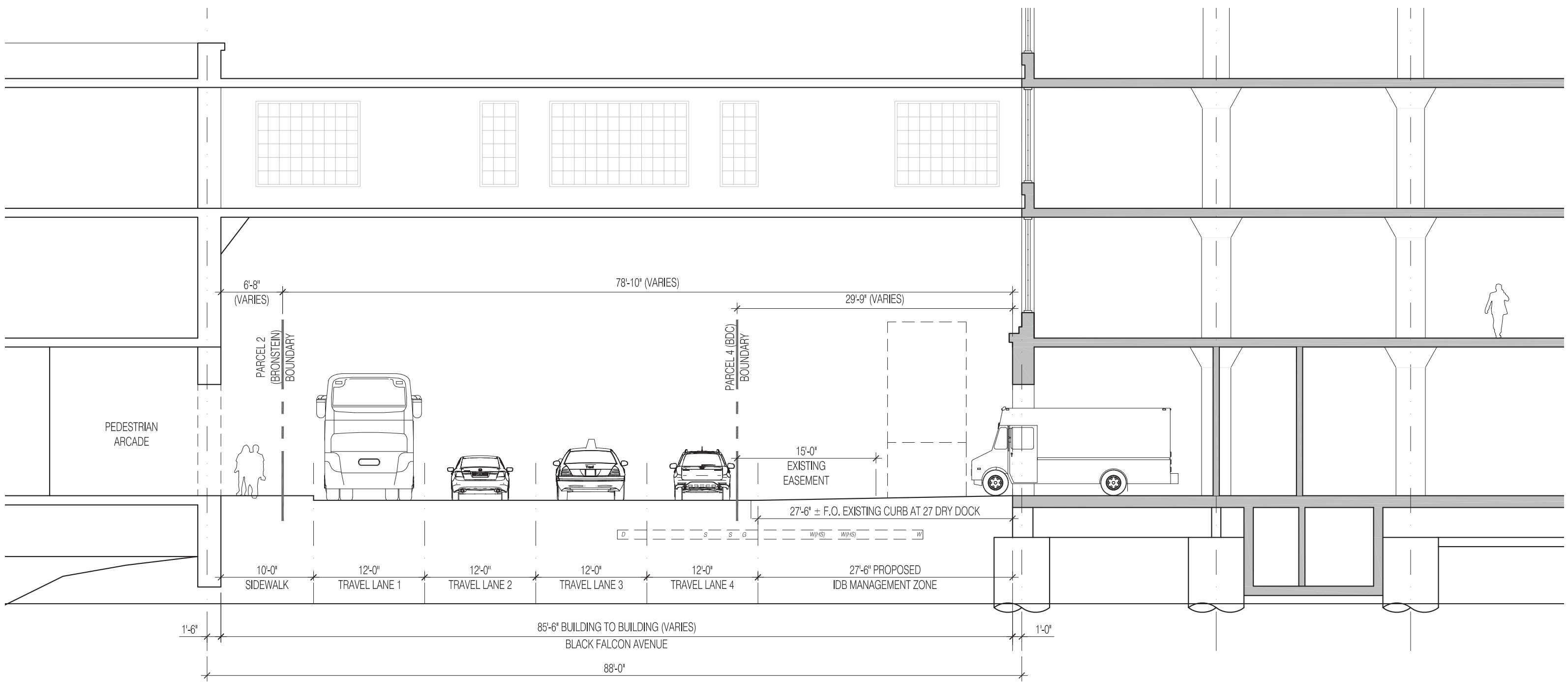
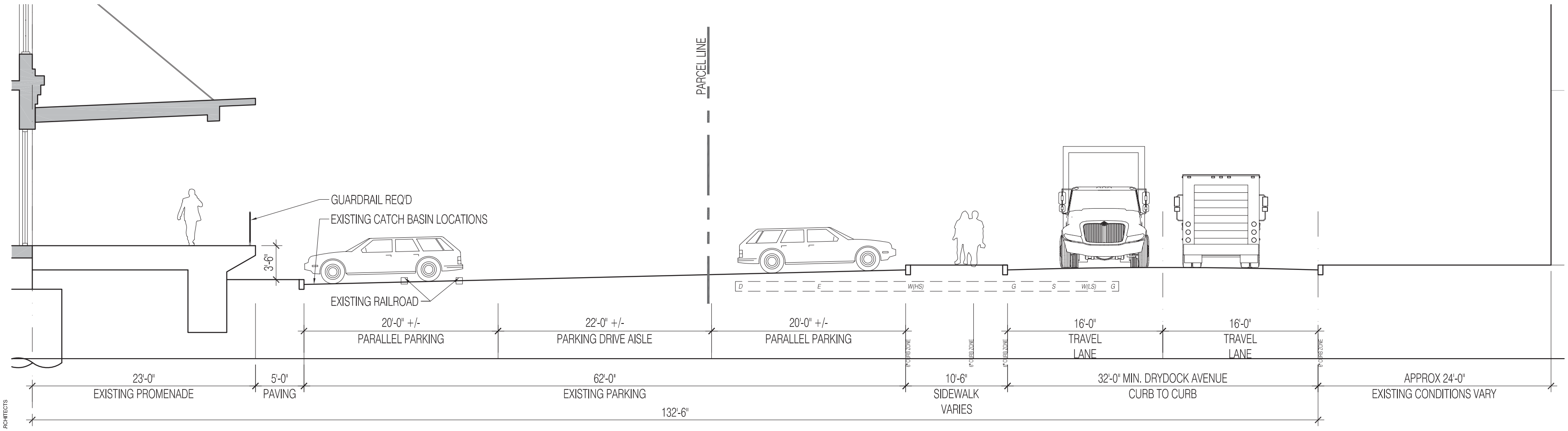
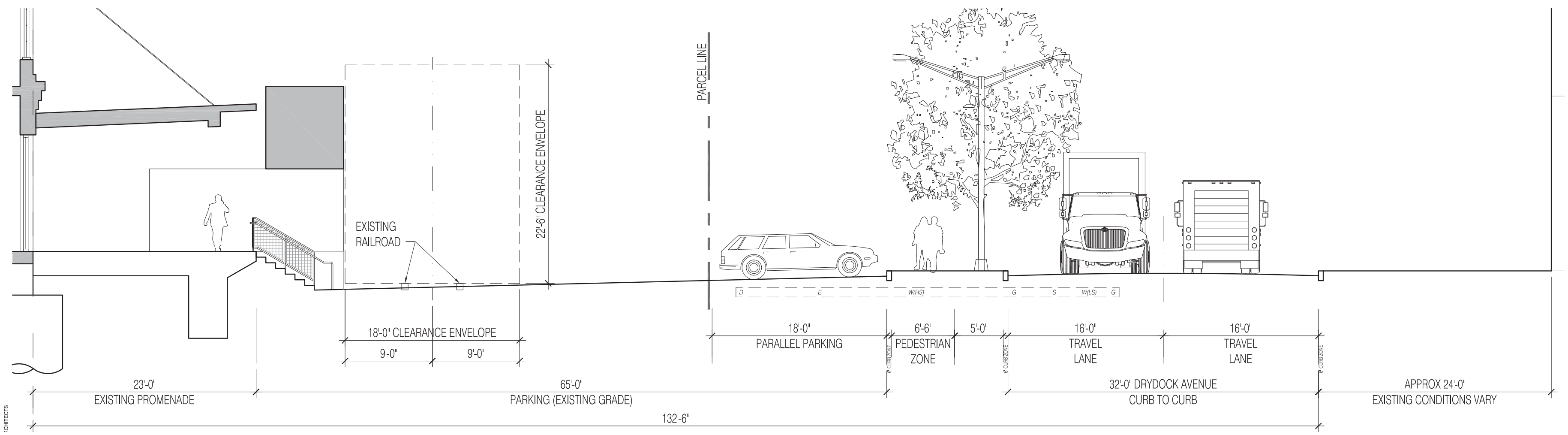


Figure 1-18

Street Sections @ Black Falcon Ave



Existing Dry Dock Ave



Proposed Dry Dock Ave

Source: Figure 3-1 BMIP Final Master Plan, 1999

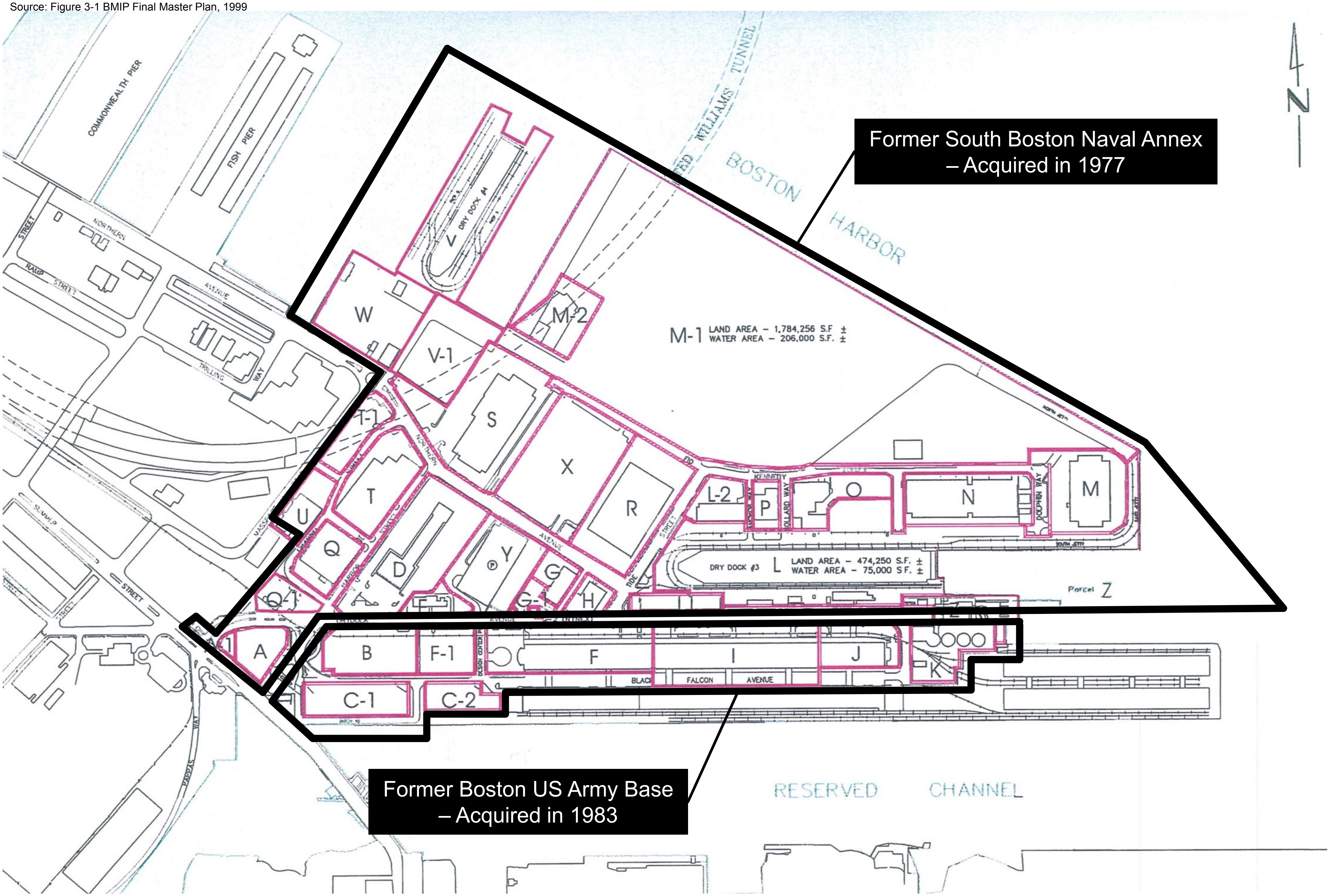


Figure 1-20

BMIP Boundary Plan

Chapter 2.0

Transportation

2.0 TRANSPORTATION

2.1 Introduction

In accordance with the City of Boston's Transportation Access Plan Guidelines, this section describes roadway, pedestrian, and bicycle conditions; parking and loading; pedestrian and bicycle circulation; proposed mitigation; transportation demand management (TDM); and transportation goals for the Project.

2.1.1 Project Description

The Project includes two interconnected buildings [note: the "site" includes more than just the two buildings: the site includes Parcel F-1], which together include five of the six sections of the IDB, which is located on Drydock Avenue within the BMIP in South Boston. The first building, the BDC, is located at 1 Design Center Place and comprises the two western sections of the complex. The second building, the Bronstein Center, is located at 21, 23, and 25 Drydock Avenue and includes three sections adjacent to the BDC. The sixth section, at 27 Drydock Avenue, is not controlled by the Proponent and is not part of this Project.

The Proponent has rebranded the five, contiguous sections it controls into one unified complex, now referred to as "The Innovation and Design Building," or IDB. The Project includes conversion or reclassification of 206,388 square feet from industrial or vacant space to commercial uses, and some physical improvements to the property, including new building entrances, exterior signage, loading and parking reconfiguration, and new ground floor storefronts. Ground-level bays along Drydock Avenue will offer supporting retail and food venues serving the IDB and the BMIP more generally. New internal loading docks will supplement existing external loading bays along Drydock Avenue and Black Falcon Avenue.

Table 2-1 shows the summary of proposed land uses for the approximately 206,388 square feet to be either converted or reclassified from its current industrial or vacant use to a commercial use.

Table 2-1 Project Program

Land Use	Size (square feet)
General Commercial	
Commercial Office	156,388 sf
Specialty/Support Retail	40,000 sf
Food & Beverage	10,000 sf
Total	**206,388 sf**

2.1.2 Summary of Impacts

Below is a summary of the transportation impacts discussed throughout this chapter.

Traffic

Under a scenario in which the IDB is fully leased to tenants and the Project's proposed conversion of space to commercial space has been implemented (the Build Conditions), the total number of net new daily vehicle trips is estimated to be 3,136, with 1,924 new trips expected from leasing up the presently vacant space in the IDB and an additional 1,212 new trips from the conversion or reclassification of space to commercial uses. Note that these estimates consider a vehicle entering and exiting the site in the same day as two separate "trips."

The traffic analysis incorporates several conservative (i.e., higher impact) assumptions:

- Under the No-Build Conditions, the IDB's occupancy is maintained at the current 60% rate, whereas the ordinary practice for No-Build analysis is to assume full occupancy. Of the new peak hour trips added under Build Conditions, 68% are attributable to leasing up the vacant space and only 32% are attributable to the conversion to commercial uses, the focus of this Expanded PNF.

- The analysis includes an exceptionally large study area that captures significant background growth and traffic from several other projects in and beyond the immediate IDB area. Even without the proposed Project, the growth in traffic from other projects in the area is expected to result in deterioration of peak hour level of service at several intersections in the study area.

- The analysis uses conservative travel mode share estimates, reflecting a higher percentage of vehicle trips than was revealed in employee survey data collected from tenants of 27 Drydock Avenue. (Travel mode shares, though, are consistent with those approved by BTD for use in the Article 80 Project Notification Form/Minor Revision to Chapter 91 License for Innovation Square at Northern Avenue (6 Tide Street) and other nearby developments.)

As a result of these conservative assumptions, several intersection approaches are projected to experience level of service E or F.

Parking

It is expected that IDB tenants will continue to use parking spaces which are allocated under existing leases with EDIC. The Project contemplates reconfiguring some of the existing parking spaces; however, it will not result in any net new spaces.

Public Transportation

Under the Build Conditions, the number of net new daily transit trips is estimated to be 5,132 (in + out). The IDB is well served by MBTA transit options and, as exhibited by the 27 Drydock Avenue tenant survey, transit use continues to increase in this area with on-going improvements to transit services and facilities. To encourage non-auto mode choices, the Proponent will be supplementing existing transit options with a shuttle bus for the IDB's tenants. Peak hour access to the IDB via the MBTA's Route 7 bus, the primary bus serving the site from South Station, is opposite that route's existing peak commuter use (i.e., commuters to the IDB are "reverse commuting"), so the Project is unlikely to contribute to congestion on this route. Excess capacity exists on the MBTA's Silver Line 2 during peak hours to accommodate additional riders to the IDB.

Bicycle and Pedestrian

Under the Build Conditions, the number of net new daily walk/bicycle trips is estimated to be 3,254 (in + out). The study area has a well-maintained network of sidewalks, and a major focus of the Project's improvements along Drydock Avenue are upgraded pedestrian amenities that will focus pedestrian activity closer to the building and away from active loading areas and will, in general, improve the pedestrian experience. The newly landscaped pedestrian walkways will identify building entrances through the use of shipping containers organized as building portals. The streetscape on the existing raised loading platform will incorporate reconfigured loading and service functions to distinguish them from the pedestrian zone.

The BMIP is well served by bicycle facilities. To promote bicycle use further, the Proponent recently installed two new Hubway bike share stations at the IDB and will be adding secure employee bicycle storage spaces, shower/changing facilities, and visitor bike racks. The new entry plazas will incorporate bicycle storage safely away from loading activity.

Loading and Building Service

The IDB currently is, and will continue to be, served by ample loading and delivery facilities. The Proponent will reconfigure loading and service areas to improve operations that currently occur on Drydock Avenue and Black Falcon Avenue. As the IDB's mix of uses evolves and the building is leased up, the Proponent and its property management team will continue to work closely with tenants, neighbors, and EDIC to ensure loading and deliveries operate smoothly. The Proponent is in active discussions with Massport to coordinate traffic management along Black Falcon Avenue related to activities at the Cruiseport. The traffic analysis in this study incorporates the appropriate level of truck volumes through each study area intersection and would not be affected by redistributing deliveries to the IDB between Drydock Avenue and Black Falcon Avenue from time to time.

2.1.3 Methodology

In accordance with the Transportation Access Plan Guidelines, the study team conducted a transportation analysis for the proposed Project. The analysis is summarized in the following sections:

- Section 2.2 (Existing Transportation Conditions) includes an inventory of existing transportation conditions, including intersection operation, parking, public transportation, pedestrian conditions, bicycle conditions, and loading and service activity.

- Section 2.3 and Section 2.4 (Evaluation of Long-term Impacts) includes future transportation conditions and potential traffic impacts associated with the proposed Project and other neighboring projects. Long-term impacts are evaluated for the Year 2019, based on a five-year horizon from the 2014 base year. Expected roadway, parking, transit, pedestrian/bicycle, and loading conditions are identified. These sections include the following scenarios:

    - No-Build Conditions (2019) includes general background growth and volumes from specific projects expected by the design year without the Project; and

    - Build Conditions (2019) includes specific travel demand forecasts for the proposed Project.

- Section 2.5 (Transportation Mitigation Measures) includes the Proponent's actions to mitigate the traffic impacts, supplement transit services, improve the bicycle environment, accommodate the IDB's loading and delivery services, and coordinate with Massport on adjacent Cruiseport activities.

- Section 2.6 (Transportation Demand Management) summarizes measures that may be addressed in a Transportation Access Plan Agreement (TAPA) with BTD.

2.1.4 Study Area

The primary study area includes the two BMIP gateway locations (Summer Street/Drydock Avenue and Northern Avenue/Massport Haul Road) and six intersections within the BMIP. The analysis of four additional intersections along the D Street corridor was performed at the request of BTD and BRA staff. All of the study area intersections are shown in Figure 2-1 and listed below:

Innovation and Design Building Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 2-1
Study Area

Signalized intersections:

Summer Street/Drydock Avenue;
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street
Northern Avenue/D Street (northbound);
Congress Street/D Street; and
Summer Street/D Street.

Unsignalized intersections:

Drydock Avenue/Harbor Street;
Drydock Avenue/Design Center Place;
Drydock Avenue/Tide Street;
Northern Avenue/Tide Street; (continued)
Northern Avenue/Seafood Way;
Northern Avenue/Harbor Street; and
Northern Avenue/Massport Haul Road (roundabout).

2.2 Existing Conditions

2.2.1 Existing Roadway Conditions

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

Summer Street, an urban principal arterial, runs generally east–west between Washington Street in Downtown Crossing to the west and East First Street in South Boston to the east, where it then becomes L Street within the study area. Summer Street has two lanes in each direction. On-street parking is allowed on various sections of Summer Street throughout the study area. Sidewalks are provided on both sides of the street. Pavement markings on Summer Street are in good condition in the study area.

Northern Avenue is an urban minor arterial east of D Street and an urban collector from Sleeper Street to Seaport Boulevard. At the intersection with Seaport Boulevard, Northern Avenue is the southbound approach. Northern Avenue consists primarily of two lanes in each direction. In the study area, sidewalks along Northern Avenue are in good condition and vary in width.

Drydock Avenue is a local roadway that generally runs east-west with Summer Street to the west and Black Falcon Avenue to the east. Drydock Avenue generally has one lane in each direction. On-street parking is allowed in sporadic locations within the study area. Sidewalks are provided on both sides of the street. Pavement markings are worn in many areas of Drydock Avenue. There are bike lanes and sharrows present in various locations within the study area.

D Street is an urban minor arterial south of Summer Street and an urban extension of a minor arterial north of Summer Street. D Street runs generally north–south between Seaport Boulevard to the north and Dorchester Avenue to the south. D Street generally consists of two lanes in each direction separated by a raised median north of Summer Street. North of Congress Street, the D Street northbound and southbound approaches diverge into two one-way sections in what is known as the "D Street Couplet." At Northern Avenue, the north- and southbound roadways are separated by a 150-foot median. Parking is allowed between Ramp DB and Congress Street on the east side and metered parking is available between Congress Street and Seaport Boulevard on the east side of D Street (southbound). Sidewalks are located on both sides of D Street throughout the study area and are generally in good condition.

2.2.2 Existing Intersection Conditions

Signalized Intersections

Summer Street/Drydock Avenue is a signalized intersection with four approaches under BTD jurisdiction. The Summer Street eastbound approach consists of a 12-foot wide exclusive left-turn land, a 12-foot wide exclusive through lane, and a 16-foot wide shared through and right-turn lane. There is a 5-foot wide median present at the eastbound approach. There is an MBTA bus stop adjacent to the intersection on the eastbound approach. The Summer Street westbound approach consists of a 12-foot wide exclusive left-turn pocket lane, a 12-foot wide exclusive through lane, and a 12-foot wide shared through and right-turn lane. There is a 7-foot wide median separating the two directions of travel. There is an MBTA bus stop shelter on the far side of the interaction from this approach. The Pappas Way northbound approach consists of one 15-foot wide general purpose travel lane. The Drydock Avenue southbound approach consists of a 12-foot wide shared use left-turn/through lane and a 13-foot wide left-turn lane. There is also a 7-foot-wide median separating the two directions of travel. Parking is not permitted on any of the approaches of this intersection. Sidewalks are provided along both sides of all four approaches and marked crosswalks are provided across each approach.

Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Road is a four-leg, signalized intersection with three approaches. The eastbound Seaport Boulevard approach consists of a 12-foot left-turn/through lane and an 11-foot through/right-turn lane. The west-bound Northern Avenue approach consists of two general use lanes. The southern leg of the intersection, D Street, is one-way southbound and consists of two receiving lanes. The southbound approach provides access to Fish Pier and consists of a shared, 16-foot left-turn/through/ right-turn lane. Parking is allowed on the south side of Seaport Boulevard west of the intersection. Crosswalks and handicapped-accessible ramps are located across the north, south, and west sides of the intersection.

Northern Avenue/D Street (northbound) is a signalized T intersection. The eastbound Northern Avenue approach consists of a 10-foot through lane and a 19-foot through lane. The westbound Northern Avenue approach consists of two through lanes. The northbound D Street approach is one-way northbound and consists of a 14-foot left-turn lane and a 14-foot right-turn lane. Parking is allowed on the south side of Northern Avenue east of the intersection. Crosswalks and handicapped-accessible ramps are located across the south and east sides of the intersection.

Congress Street/D Street is a signalized intersection with four approaches. The eastbound Congress Street approach consists of a 13-foot, shared left-turn/through lane, a 12-foot, shared through/right-turn lane, and a 12-foot, exclusive right-turn lane. The westbound Congress Street approach consists of a 12-foot, shared left-turn/through lane and a 13-foot, shared through/right-turn lane. Parking is provided along the north side of Congress Street west of the intersection, but no parking is allowed along Congress Street east of the intersection. D Street runs north–south through the intersection with the directions separated by 1) a wide, planted median south of the intersection and 2) the South Boston Maritime Park north of the intersection. The distance separating the D Street travel ways gradually widens from the south to the north. The median is 45 feet wide on the south side of the intersection and 85 feet wide at the Park. The northbound D Street approach consists of a dual left turn comprising an 11-foot lane and a 12-foot lane, and an 11-foot, shared through/right-turn lane. The southbound D Street approach consists of a 13-foot left-turn/through lane and a 14-foot through/right-turn lane. Parking is allowed on the east side of D Street south of the intersection and on east side the D Street southbound approach north of the intersection. All approaches have sidewalks, handicapped-accessible ramps, and crosswalks.

Summer Street/D Street is a four-leg, signalized intersection with four approaches. The Summer Street eastbound approach consists of an 11-foot, exclusive left-turn lane, an 11-foot, exclusive through lane, and a 15-foot, shared through/right-turn lane. Summer Street westbound consists of a 12-foot, shared left-turn/through lane, a 16-foot through lane, and a channelized, 24-foot, exclusive right-turn lane. D Street northbound is a three-lane approach with a 12-foot, exclusive left-turn lane, a 12-foot through lane, and a 12-foot, shared through/right-turn lane with an eight-foot adjacent parking lane. Southbound D Street is a three-lane approach with one 11-foot, exclusive left-turn lane, an 11-foot, shared left-turn/through lane, and a 15-foot through/right-turn lane. Parking is allowed along the north side of Summer Street west of the intersection and along both sides of D Street south of the intersection. All approaches have crosswalks and handicapped-accessible ramps. Pedestrian pushbuttons activate concurrent pedestrian phases at the intersection.

Unsignalized Intersections

Drydock Avenue/Harbor Street is an unsignalized intersection with four approaches. The Drydock Avenue eastbound approach consists of two 11-foot wide general use travel lanes with bike sharrows present within the right lane. There is a channelized right-turn island present that is flush with the roadway. There is also a 5-foot median that ends approximately 50 feet before the intersection. The Drydock Avenue westbound approach consists of one 10-foot wide general use lane and a bike lane. There is a MBTA bus stop located on the far side of the intersection of this approach. The Harbor Street northbound approach is stop-controlled and consists of one 11-foot wide shared left-turn/through lane and one 13-foot wide exclusive right-turn lane. The Harbor Street southbound approach is also stop controlled and consists of one 12-foot wide general use lane. Parking is not permitted on any of the approaches of this intersection. Sidewalks are provided along both sides of all four approaches and marked crosswalks are provided across each approach.

Drydock Avenue/Design Center Place is an unsignalized intersection with four approaches. The Drydock Avenue eastbound approach consists of one 15-foot wide general use lane and a bike lane. There is an MBTA bus stop adjacent to the approach. The Drydock Avenue westbound approach consists of one 15-foot wide general use lane and a bike lane. The Design Center Place northbound approach is stop-controlled and consists of one 15-foot wide general use lane. The 6th Street southbound approach is also stop controlled and consists of one 15-foot wide general use lane. Handicapped parking is available on the south side of the westbound approach. Parking is not permitted on any other locations adjacent to the intersection. Sidewalks are provided along both sides of all four approaches and marked crosswalks are provided across the westbound, northbound, and southbound approaches.

Drydock Avenue/Tide Street is an unsignalized intersection with four approaches. The Drydock Avenue eastbound approach consists of one 12-foot wide general use lane and a wide bike lane. The Drydock Avenue westbound approach consists of one 15-foot wide general use lane. The parking lot northbound approach is stop-controlled and consists of one 15-foot wide general use lane. The Tide Street southbound approach is also stop controlled and consists of one 15-foot wide general use lane and a 7-foot wide bike lane. On-street parking is not permitted on any of the approaches of this intersection. Sidewalks are provided along both sides of the eastbound, westbound, and southbound approaches. Crosswalks are provided across the eastbound, westbound, and southbound approaches. Crosswalk signs are in place on both Drydock Avenue approaches.

Northern Avenue/Tide Street is an unsignalized intersection with four approaches. The Northern Avenue eastbound approach consists of one 20-foot wide general use lane and a bike lane. There are MBTA bus stops on the northern and southern sides of this approach. The westbound approach is an alley that consists of one 14-foot wide general use lane. The Tide Street northbound approach is stop-controlled and consists of one 17-foot wide general use lane and a bike lane. The Tide Street southbound approach is also stop controlled and consists of one 23-foot wide general use lane. On-street parking is not permitted on any of the approaches of this intersection. Sidewalks are provided along both sides of all approaches. Crosswalks are provided across the eastbound, northbound, and southbound approaches.

Northern Avenue/Seafood Way is an unsignalized intersection with three approaches. The Northern Avenue eastbound approach consists of one 20-foot wide general use lane and a bike lane. The Northern Avenue westbound approach consists of one 20-foot wide general use lane and a bike lane. The Seafood Way southbound approach is stop controlled and consists of one 14-foot wide general use lane. Metered on-street parking is only permitted on the south side of the eastbound approach. Sidewalks are provided along both sides of all approaches. Crosswalks are not provided across all of the approaches.

Northern Avenue/Harbor Street is an unsignalized intersection with three approaches. The Northern Avenue eastbound approach consists of one 20-foot wide general use lane and a bike lane. There is an MBTA bus stop adjacent to this approach on the southern side. The Northern Avenue westbound approach consists of one 20-foot wide general use lane and a bike lane. There is also an MBTA bus stop adjacent to this approach on the northern side. The Harbor Street northbound approach is stop controlled and consists of one 11-foot wide general use lane. On-street parking is prohibited on all approaches. Sidewalks are provided along both sides of all approaches. Crosswalks are provided across the eastbound and southbound approaches only.

Roundabout

Northern Avenue/Massport Haul Road is a 120-foot diameter roundabout that consists of four approaches. The Northern Avenue eastbound approach consists of one through/left-turn lane and one right-turn. There is a 17-foot wide median separating the directions of travel at this approach. Northern Avenue westbound approach consists of two general use lanes with a bike sharrow in the right lane. There is a 15-foot wide median separating the directions of travel at this approach. Massport Haul Road northbound approach consists of one 12-foot-wide general use lane and one 12-foot-wide right-turn lane. There is a 15-foot wide median separating the directions of travel at this approach. The southbound approach is a driveway entrance for Yankee Lobster and consists of a single wide travel lane. The circulating width of the roundabout is approximately 40-50 feet wide. Sidewalks are generally provided around the outside of the roundabout. On the east side of the northbound approach, the sidewalk ends about 10 feet behind the stop line. Crosswalks are provided across all legs of the roundabout.

2.2.3 Existing Traffic Volumes

Turning movement counts for the intersections of Summer Street/Drydock Avenue and all the unsignalized intersections in the study area were collected during the weekday morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak periods in January 2014. Based on these counts, the weekday peak hours were identified as 7:45-8:45 a.m. and 4:30–5:30 p.m.

Counts at Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Road, Northern Avenue/D Street (northbound), and Congress Street/D Street were collected during the weekday morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak periods in August 2012. Counts at Summer Street/D Street in the study area were collected from 7:00 a.m. to 7:00 p.m. in April 2013. Using the weekday peak hours identified by the most recent data (7:45 to 8:45 a.m. and 4:30 to 5:30 p.m.), the volumes at both these locations were factored to Year 2014 conditions by applying a 1% annual growth rate.

It is standard practice to apply seasonal adjustment factors to count data to obtain average annual volumes. To account for such variation in area traffic, the study team assessed the seasonal adjustment per MassDOT's weekday seasonal adjustment factor for Group 6 roadways (Urban Arterials, Collectors, and Rural Highways). The seasonal adjustment factors for January, April, and August are 1.02, 0.93, and 0.92, respectively. The January volumes were increased by 2% to account for seasonality. Because application of the April and August factors would have yielded volumes 7% to 8% lower than the actual counts, the study team conservatively chose not to apply the April or August seasonal adjustments but use the higher count data for analysis. Peak hour volumes were balanced appropriately between closely spaced intersections.

Figures 2-2 and 2-3 show the Year 2014 peak hour turning volumes for the study area intersections for the a.m. peak hour and p.m. peak hour, respectively.

Count data are provided in Appendix B.

2.2.4 Existing Traffic Operations

Traffic operations are determined through a capacity analysis of intersections. Level of Service (LOS) and delay at the intersections were analyzed using the Synchro software developed by Trafficware. Synchro 6 was used to evaluate the effects that closely spaced intersections may have on one another. Synchro is based on the traffic operational analysis methodology of the Transportation Research Board's *2000 Highway Capacity Manual* (HCM)[1]; LOS and delay (in seconds) are determined based on intersection geometry and available traffic data for each intersection.

1 Methodologies presented in the 2010 HCM have not yet been approved by MassDOT for intersection analysis.

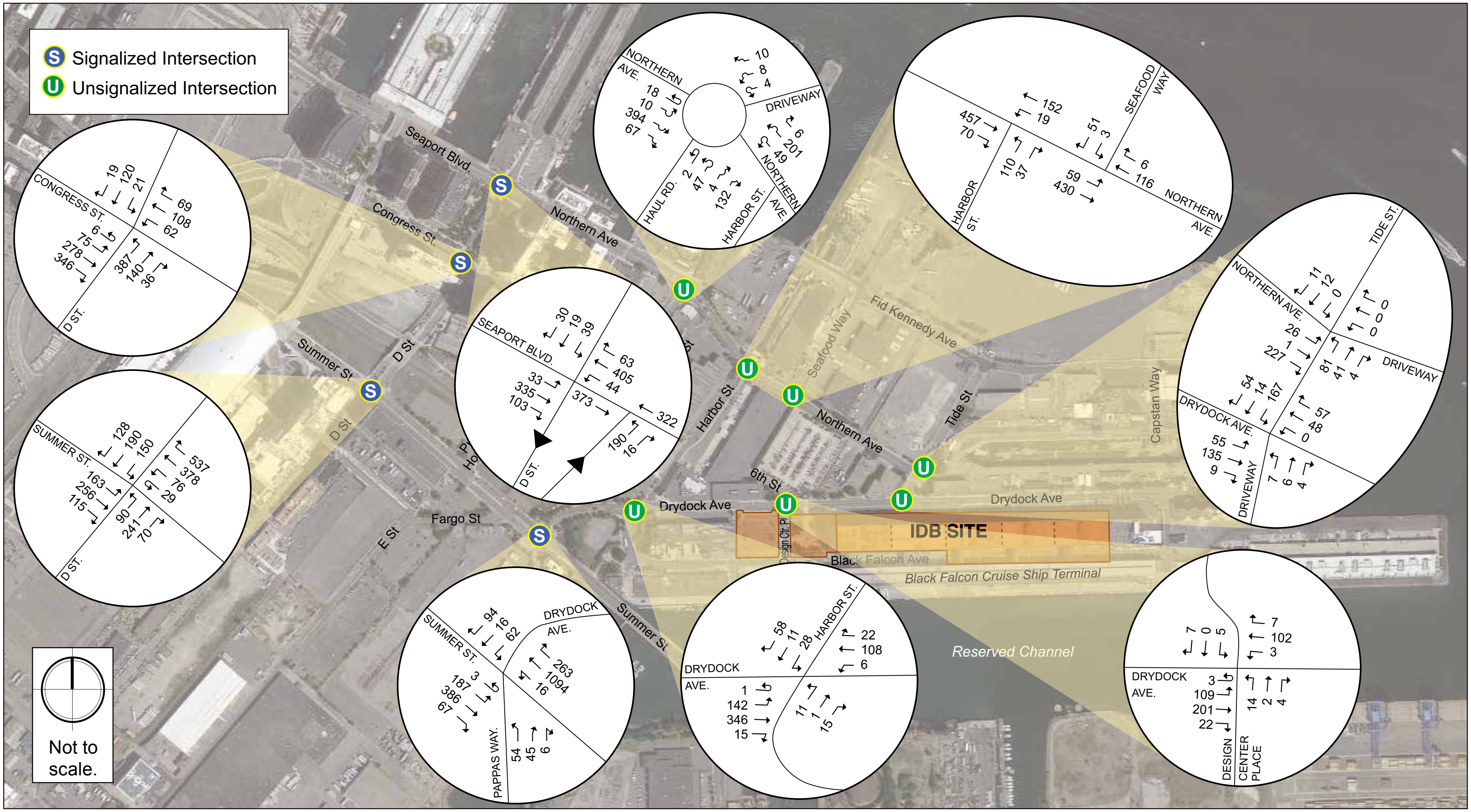


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Figure 2-2

Existing Conditions (2014) Intersection Volumes, a.m. Peak Hour (7:45-8:45 a.m.)

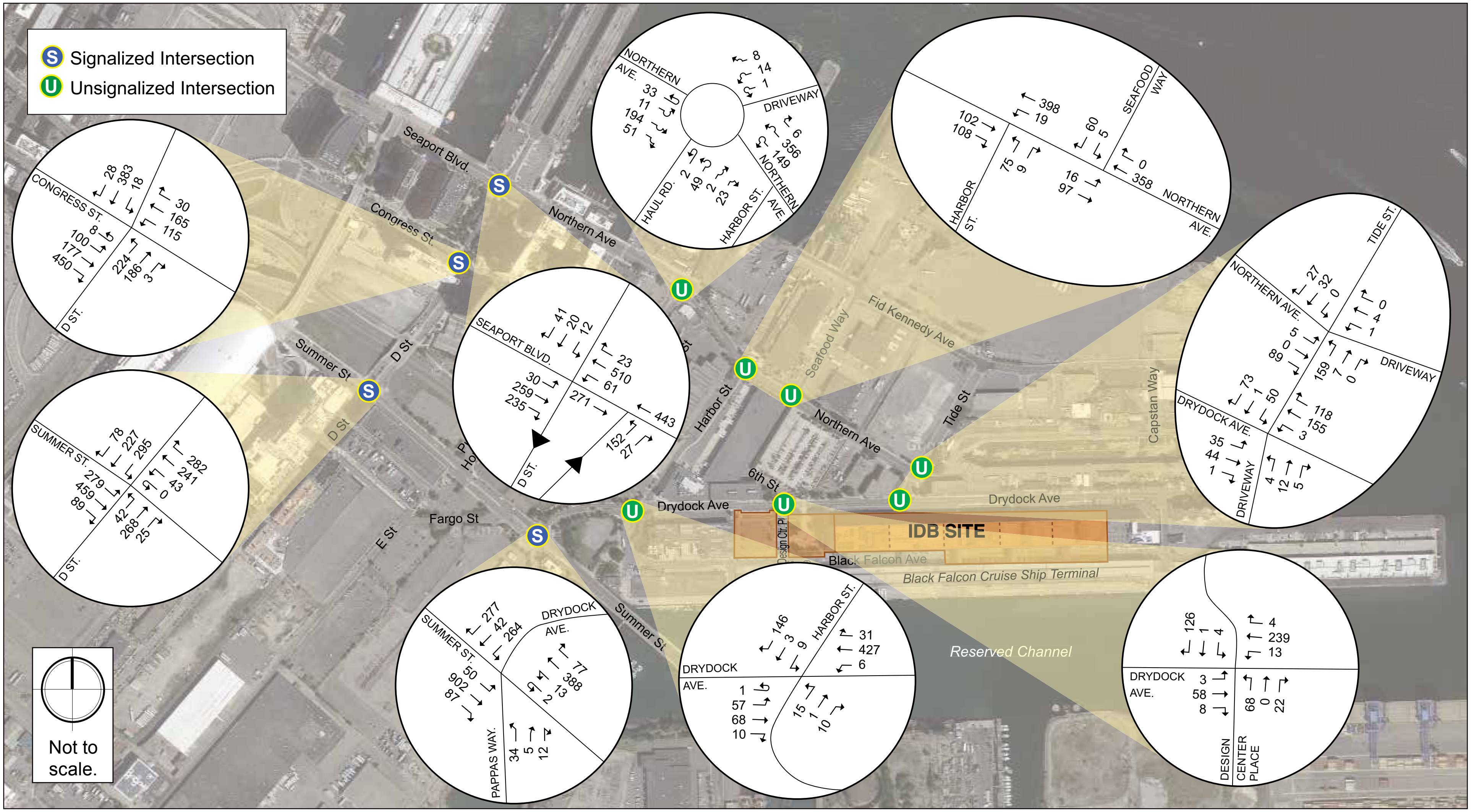

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Figure 2-3

Existing Conditions (2014) Intersection Volumes, p.m. Peak Hour (4:30 – 5:30 p.m.)

SIDRA 5.1 was used to evaluate the roundabout at Northern Avenue/Massport Haul Road. SIDRA is a Massachusetts Department of Transportation approved software for analyzing roundabouts and is based on the 2010 HCM[2]. Roundabouts are analyzed as an isolated location and are not evaluated in conjunction with a network. LOS and delay are determined based on geometry, lane use, and traffic volume data. The LOS grades are based on the same delay ranges as unsignalized intersections.

The study team performed field observations to establish intersection geometry (i.e., number of turning lanes, lane length, and lane width). Signal timing and phasing used in this analysis were obtained from BTD and through field observations conducted by the study team.

Table 2-2, derived from the HCM, shows LOS criteria for signalized and unsignalized intersections. LOS A defines the most favorable condition, with minimum traffic delay. LOS F represents the worst condition (over capacity), with significant traffic delay. LOS D is generally considered acceptable in an urban environment, such as South Boston.

Table 2-2 Level of Service Criteria

Level of Service	Average Stopped Delay (sec./veh.)	
	Signalized Intersections	Unsignalized Intersections and Roundabouts
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.

Tables 2-3 and 2-4 show the Existing Conditions capacity analysis summary for study area intersections during the a.m. peak hour and p.m. hour, respectively. The tables show LOS, average delay, volume to capacity ratio, and 95th percentile queue length (feet) for the overall intersection and each approach. Complete Synchro reports are provided in Appendix B.

2 Because the process for analyzing roundabouts is significantly improved in the 2010 HCM (as compared to the 2000 HCM), the one roundabout in this study was analyzed using the latest 2010 HCM methodology.

Signalized

While each of the five signalized intersections operates at an acceptable overall LOS D or better during both peak hours, some individual approaches operate at LOS E or LOS F as described below.

The intersection of Summer Street/Drydock Avenue operates at an overall LOS D and C during the a.m. and p.m. peak hours, respectively. The Summer Street westbound through operates at LOS E during the a.m. peak hour. The Drydock Avenue southbound through lane operates at LOS E during both peak hours.

The intersection of Congress Street/D Street operates at an overall LOS D during both the a.m. and p.m. peak hours. The D Street northbound left-turn lane operates at LOS E in the a.m. peak hour.

The intersection of Summer Street/D Street operates at an overall LOS D and LOS C during the a.m. and p.m. peak hours, respectively. The Summer Street westbound left-turn/through and exclusive through lane operate at LOS F in the a.m. peak hour. The Drydock Avenue southbound left-turn/through lane operates at LOS E in the a.m. and p.m. peak hours.

The intersection of Northern Avenue/D Street (northbound) operates at an overall LOS C during both the a.m. and p.m. peak hours. The D Street northbound left-turn lane operates at LOS E in the a.m. and p.m. peak hours.

Table 2-3 Existing Conditions (2014), Capacity Analysis Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Signalized Intersections				
Summer Street/Drydock Avenue	**D**	**44.9**		
Summer EB left	D	47.9	0.85	#224
Summer EB thru | thru/right	A	6.4	0.29	119
Summer WB left	D	40.4	0.43	23
Summer WB thru | thru/right	E	57.9	>1.00	#728
Pappas NB left/thru/right	D	54.3	0.72	#117
Drydock SB left/thru	E	62.5	0.75	#106
Drydock SB right	A	5.8	0.22	32
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**B**	**16.8**		
Seaport EB left/thru | thru/right	C	23.3	0.49	207
Seaport WB left/thru | thru/right	A	1.9	0.33	m0
Fish Pier SB left/thru/right	D	51.2	0.70	96

Table 2-3 Existing Conditions (2014), Capacity Analysis Summary, a.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Northern Avenue/D Street (northbound)	**C**	**23.1**		
Northern EB thru | thru	A	3.0	0.23	20
Northern WB thru | thru	B	19.7	0.25	133
D NB left	E	70.1	0.85	m#209
D NB right	B	17.7	0.11	m6
Congress Street/D Street	**D**	**41.8**		
Congress EB left/thru | thru/right	D	45.2	0.83	226
Congress EB right	B	14.2	0.69	100
Congress WB left/thru | thru/right	D	40.4	0.71	83
D NB left	E	56.9	0.80	236
D NB left/thru | thru/right	D	41.5	0.79	137
D SB left/thru | thru/right	D	53.4	0.54	79
Signalized Intersections				
Summer Street/D Street	**D**	**43.6**		
Summer EB left	C	32.6	0.68	#134
Summer EB thru | thru/right	B	15.7	0.34	104
Summer WB left/thru | thru	F	>80.0	>1.00dl	#344
Summer WB right	C	24.6	0.75	381
D NB left	D	39.1	0.44	92
D NB thru | thru/right	C	34.6	0.54	136
D SB left	D	37.9	0.63	169
D SB thru | thru/right	B	17.3	0.49	141
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	2.3	0.13	12
Drydock WB left/thru/right	A	0.8	0.01	1
Harbor NB left/thru	E	42.4	0.17	15
Harbor NB right	B	11.0	0.04	3
Harbor SB left/thru/right	C	21.9	0.41	49
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	3.6	0.11	10
Drydock WB left/thru/right	A	0.5	0.01	0
Design Center NB left/thru/right	C	16.2	0.09	7
Garage SB left/thru/right	B	13.1	0.03	3
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	2.1	0.04	4
Drydock WB left/thru/right	A	0.0	0.00	0
Parking NB left/thru/right	B	12.5	0.06	5
Tide SB left/thru/right	C	17.5	0.49	66

Table 2-3 Existing Conditions (2014), Capacity Analysis Summary, a.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Northern Avenue/Tide Street				
Northern EB left/thru/right	B	10.7	0.33	36
Alley WB left/thru/right	A	0.0	0.00	0
Tide NB left/thru/right	A	5.3	0.08	6
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.06	5
Northern WB thru/right	A	0.0	0.09	0
Seafood SB left/right	B	10.6	0.10	8
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.36	0
Northern WB left/thru	A	1.5	0.03	2
Harbor NB left/right	C	23.9	0.50	66
Unsignalized Roundabout				
Northern Avenue/Massport Haul Road				
Northern EB left/thru	A	10.0	0.49	48
Northern EB right	A	4.6	0.08	5
Northern WB left	A	6.1	0.08	5
Northern WB thru/right	A	7.2	0.27	19
Massport Haul NB left/thru	A	7.5	0.11	9
Massport Haul NB right	A	9.8	0.26	24
Parking SB left/thru/right	A	6.4	0.05	3

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

m = 95th percentile queue is metered by upstream traffic signal.

* = defacto lane

Light grey shading indicates LOS E or LOS F.

Table 2-4 Existing Conditions (2014), Capacity Analysis Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Summer Street/Drydock Avenue	**C**	**25.4**		
Summer EB left	B	11.0	0.19	37
Summer EB thru | thru/right	B	15.6	0.69	347
Summer WB left	D	41.8	0.40	24
Summer WB thru | thru/right	C	21.4	0.60	173
Pappas NB left/thru/right	D	38.2	0.51	#57
Drydock SB left/thru	E	76.7	>1.00	#337
Drydock SB right	A	3.7	0.39	24
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**B**	**13.0**		
Seaport EB left/thru | thru/right	C	20.4	0.51	224
Seaport WB left/thru | thru/right	A	2.2	0.39	m7
Fish Pier SB left/thru/right	C	31.8	0.61	57
Northern Avenue/D Street (northbound)	**C**	**23.0**		
Northern EB thru | thru	A	2.9	0.16	15
Northern WB thru | thru	B	17.3	0.34	172
D NB left	E	70.0	0.84	m174
D NB right	C	20.5	0.17	m15

Table 2-4 Existing Conditions (2014), Capacity Analysis Summary, p.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Congress Street/D Street	**D**	**39.1**		
Congress EB left/thru | thru/right	D	54.4	0.85	141
Congress EB right	C	21.8	0.85	#202
Congress WB left/thru | thru/right	D	45.5	0.71	128
D NB left	D	41.2	0.65	162
D NB left/thru | thru/right	D	35.2	0.65	150
D SB left/thru | thru/right	D	38.8	0.74	222

Table 2-4 Existing Conditions (2014), Capacity Analysis Summary, p.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Summer Street/D Street	**C**	**28.9**		
Summer EB left	C	33.2	0.74	#240
Summer EB thru | thru/right	B	19.1	0.44	175
Summer WB left/thru | thru	D	39.1	0.66	138
Summer WB right	B	17.2	0.48	170
D NB left	C	33.7	0.18	50
D NB thru | thru/right	D	38.5	0.60	127
D SB left	D	37.1	0.73	m#254
D SB thru | thru/right	C	26.6	0.73	m199
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	3.6	0.11	9
Drydock WB left/thru/right	A	0.2	0.01	0
Harbor NB left/thru	F	61.1	0.27	25
Harbor NB right	A	9.7	0.02	1
Harbor SB left/thru/right	D	28.4	0.61	97
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	0.8	0.01	0
Drydock WB left/thru/right	A	0.6	0.02	1
Design Center NB left/thru/right	D	26.3	0.47	59
Garage SB left/thru/right	B	12.8	0.31	32
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	3.9	0.05	4
Drydock WB left/thru/right	A	0.3	0.01	1
Parking NB left/thru/right	B	13.9	0.10	8
Tide SB left/thru/right	B	14.4	0.30	31
Northern Avenue/Tide Street				
Northern EB left/thru/right	B	10.4	0.16	14
Alley WB left/thru/right	B	14.3	0.05	4
Tide NB left/thru/right	A	7.5	0.13	11
Tide SB left/thru/right	A	0.0	0.00	0
Unsignalized Intersections				
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.02	2
Northern WB thru/right	A	0.0	0.24	0
Seafood SB left/right	B	12.6	0.15	13
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.15	0
Northern WB left/thru	A	0.8	0.03	2
Harbor NB left/right	C	16.2	0.25	24

Table 2-4 Existing Conditions (2014), Capacity Analysis Summary, p.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Unsignalized Roundabout				
Northern Avenue/Massport Haul Road				
Northern EB left/thru	A	7.5	0.30	23
Northern EB right	A	4.5	0.06	4
Northern WB left	A	6.2	0.19	14
Northern WB thru/right	A	8.3	0.41	37
Massport Haul NB left/thru	A	5.1	0.07	6
Massport Haul NB right	A	7.0	0.04	4
Parking SB left/thru/right	A	0.1	0.05	3

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

m = 95th percentile queue is metered by upstream traffic signal.

* = defacto lane

Light grey shading indicates LOS E or LOS F.

Unsignalized and Roundabout

At the unsignalized intersections and roundabout, most minor approaches operate at LOS D or better during each peak hour, with the exception discussed below.

At Drydock Avenue/Harbor Street, the northbound Harbor Street left-turn/through lane operates at LOS E during the a.m. peak hour and LOS F during the p.m. peak hour. It should be noted that the approach volume is only about 25 vehicles per hour and is comprised of exiting vehicles from the Boston Police Harbor Patrol, the rear of 5-11 Drydock Avenue, and other various uses along the Reserved Channel waterfront.

2.2.5 Existing Parking

Marine Industrial Park

Within the BMIP, on-street parking is generally not permitted. Figure 2-4 shows the curbside regulations near the Project site. Off-street, tenant-controlled spaces are located throughout the BMIP on individual parcels.

The parking requirements applicable to the IDB's tenants are different for the BDC than the Bronstein Center under the terms of the two EDIC leases under which the Proponent controls the IDB. Collectively, the Proponent has rights to approximately 1,511 spaces for

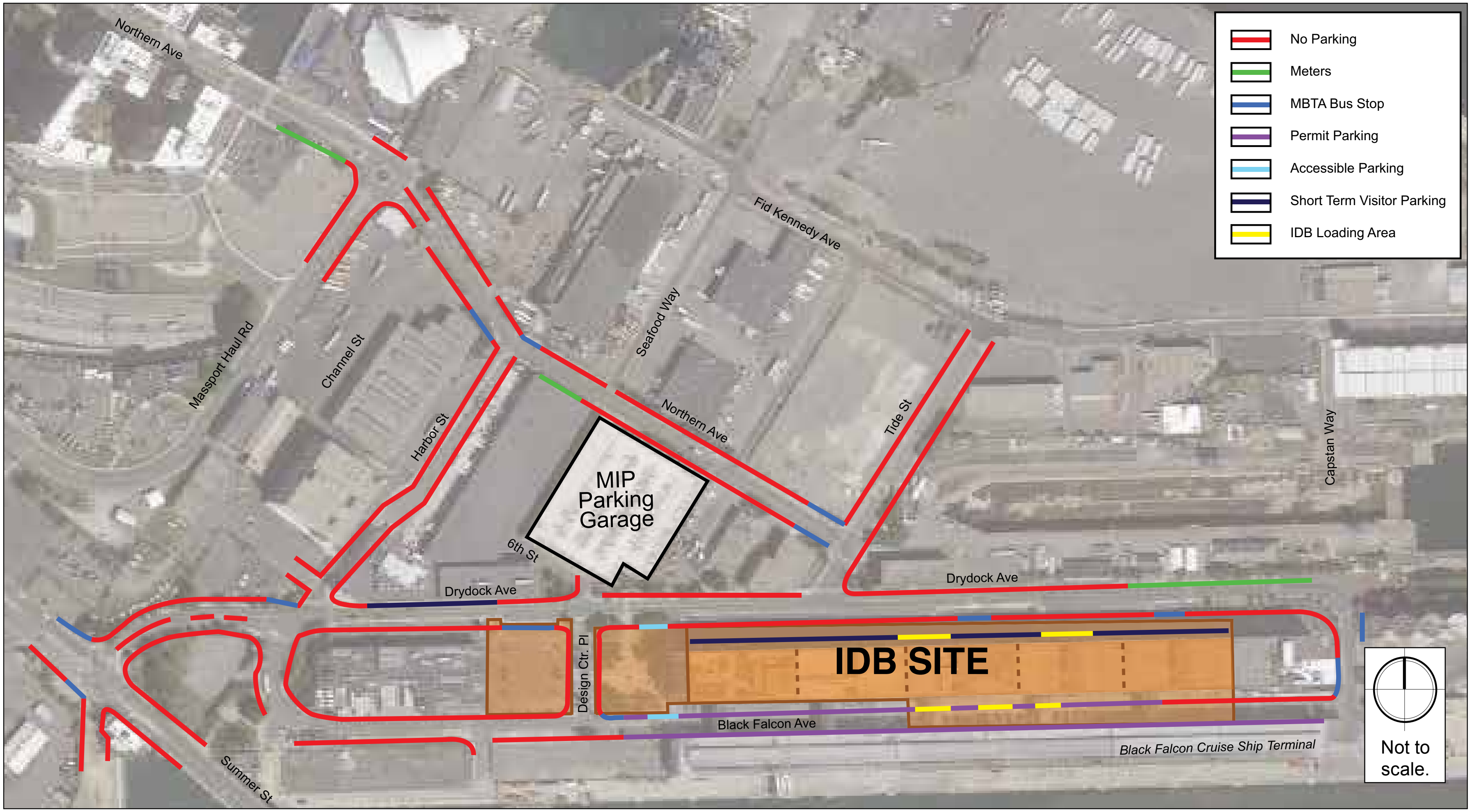

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Figure 2-4
Existing Curbside Inventory

tenant use, including up to 1,000 parking spaces in the BMIP garage (on a first-come, first-served basis), plus spaces in the Parcel F-1 surface lot, spaces to the south of Drydock Avenue, and spaces along Black Falcon Avenue.

Table 2-5 shows the allocation of spaces to each building. Estimates in the table are based on terms of the two EDIC leases under which the Proponent controls the IDB and on ALTA/ACSM land title surveys by Feldman Land Surveyors dated October 19, 2012. Passcards permit entry to the garage, while spaces along Drydock Avenue and Black Falcon Avenue are controlled by permit-only parking signs. Parking in the surface lot is available at market rates.

With 1,766 total spaces, the EDIC-owned garage at 12 Drydock Avenue has the largest concentration of parking in the BMIP. Although the garage was built to serve BMIP tenants, transient (public) parking is permitted. Through lease agreements with EDIC, various BMIP tenants hold rights to park in the garage, and those rights can be exercised through the purchase of garage passcards for employees. Transient parking activity is primarily generated by visitors to the BDC, employees without passes, and cruise ship passengers at the Cruiseport. It should be noted that the Cruiseport is not located within the BMIP, but rather on adjoining property along Black Falcon Avenue.

During evenings and weekends (when BMIP tenant parking demand is low), the garage also serves visitors to the Blue Hills Bank Pavilion (formerly Bank of America Pavilion) at 290 Northern Avenue. The Boston Convention and Exhibition Center (BCEC) also has an arrangement with EDIC to use the garage as overflow parking during major conventions, typically in the evenings and on weekends.

Table 2-5 IDB Parking Space Allocation

Location	IDB Parking Allocation (spaces) [1]		
	Boston Design Center	Bronstein Center	Total
BMIP Parking Garage[2]	600	400	1,000
Parcel F-1 (surface lot)	140	0	140
South of Drydock Avenue	96[3]	105	201
Black Falcon Avenue	50[3]	120	170
Total	**886**[3]	**625**	**1,511**

1) Estimates are based on terms of the two EDIC leases under which the Proponent controls the IDB and on ALTA/ACSM land title surveys by Feldman Land Surveyors dated October 19, 2012.
2) In common with public parking at market rates on a first-come first-served basis.
3) To be verified with EDIC

Cruiseport

Passenger ships docking at the Cruiseport are either on a port-of-call or turnaround call. Between May and November 2014, about 60 port-of-calls and about 60 turnaround calls are scheduled, occurring on both weekdays and weekends. During a port-of-call stop, passengers may disembark to sightsee, but Boston is not their trip origin or final destination. Port-of-call passengers generally rely on tour buses, trolleys, and taxicabs for ground travel and typically do not generate transient parking activity in the BMIP. Turnaround calls are made when a ship docks, passengers end their cruise and disembark with their luggage, the crew readies the ship, and a new group of passengers boards the ship. Turnaround calls do generate a significant amount of parking activity because many passengers are picked-up/dropped-off by drivers that park short-term at the BMIP garage. A turnaround call can be completed in one day, with passengers disembarking in the morning and new passengers boarding in the afternoon.

Based on 2013 BMIP garage parking data, during the most active cruise season months (May-October), transient parking activity was approximately 440 vehicles/day, or about 60% higher than the 270 vehicles/day during off-season months.

2.2.6 Existing Public Transportation

MBTA services in the study area are summarized in Table 2-6 and shown in Figure 2-5.

Table 2-6 MBTA Transit Service in the Study Area

Transit Service	Description	Peak-Hour Headway (minutes)[1]
	Rapid Transit Routes	
Silver Line	Silver Line 1 (SL1): South Station – Logan Airport Silver Line 2 (SL2): South Station – Design Center	8 5
	Local Bus Routes	
Route 4	North Station-World Trade Center via Federal Courthouse and South Station	11-15
Route 7	City Point-Otis and Summer Streets via Summer Street	4-6

1) Headway is the time between buses.

The Silver Line routes SL1 and SL2 both serve the Silver Line Way Station located approximately one-third of a mile from the Project site. The walking time between the Silver Line Way Station and the Project site is about 10 minutes via Northern Avenue. While the SL1 service continues to Logan Airport, the SL2 service continues into the BMIP,

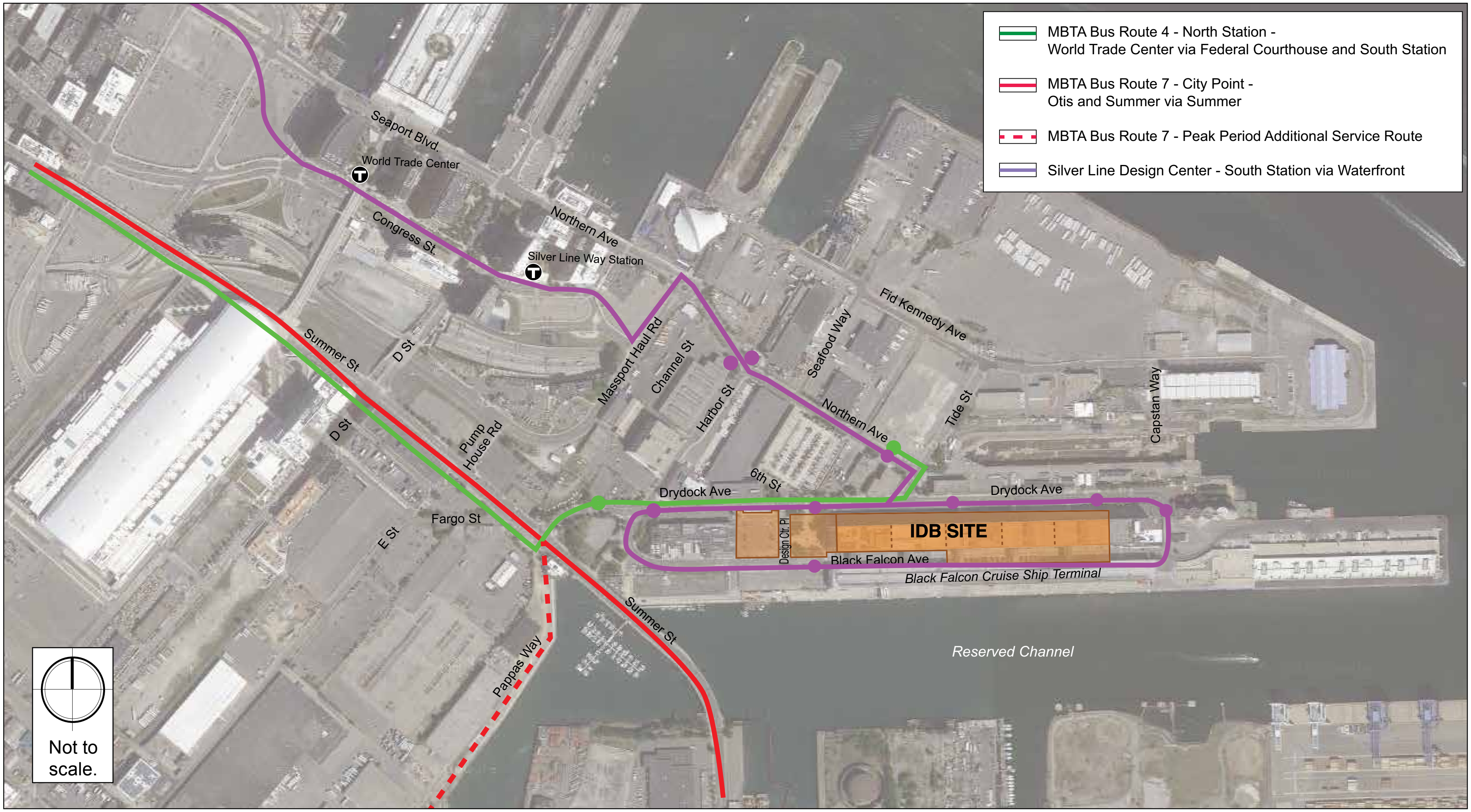

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Figure 2-5
Public Transportation

directly serving the Project site. Bus stops for the SL2 service are shown in Figure 2-4. During the weekday commuter peak periods, the SL1 runs every eight minutes, and the SL2 every five minutes. The Silver Line also operates on Saturdays and Sundays with headways of 12-15 minutes.

The Silver Line and the Route 7 bus serve South Station, located approximately one and a half mile west of the BMIP on Summer Street. At South Station, passengers can connect to regional commuter rail lines serving points west and south of Boston, the Red Line, local and express bus service, private bus services, and Amtrak trains.

Route 4 operates between North Station and Tide Street and provides connection to South Station; Red, Green, Blue, Orange, and Silver Line service; and commuter rail service. Service runs approximately every 11 - 15 minutes during the weekday commuter peak periods; no service is provided on this route on weekends or holidays.

Route 7, operating between City Point in South Boston and Otis Street/Summer Street in downtown, provides connections to the World Trade Center; Federal Court House; South Station; Harbor Industrial Park; downtown business and shopping districts; and connections to the Red and Silver Lines. Service on this route runs approximately every 4-6 minutes during the weekday commuter period. Service is also provided approximately every 40 minutes on Saturday; no service on Sundays.

2.2.7 Existing Pedestrian Conditions

Crosswalk pedestrian counts were taken as part of the intersection data collection and are shown in Figures 2-6 and 2-7, for the a.m. peak and p.m. peak hours, respectively. Pedestrian counts within the study area are generally low, relative to the surrounding area. The busiest pedestrian pathways are located at the intersections of Northern Avenue/Tide Street and Drydock Avenue/Tide Street. These paths connect the Project site to the MBTA Silver Line stop at the Northern Avenue/Tide Street.

Sidewalks in the study area are generally in good condition and supply more than adequate capacity. Handicapped-accessible ramps and crosswalks are provided at most study area intersections. Pedestrian counts are included as part of the traffic count data in Appendix B.

2.2.8 Existing Car Sharing Locations

The increasingly popular car-sharing services provide easy access to vehicular transportation for urban residents and employees who do not own cars. Two companies, Zipcar and Enterprise, provide car-sharing services in the Boston area and offer short-term rental service for members. Vehicles are rented on an hourly and per-mile 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 and Enterprise car share services near the IDB can reduce peak hour

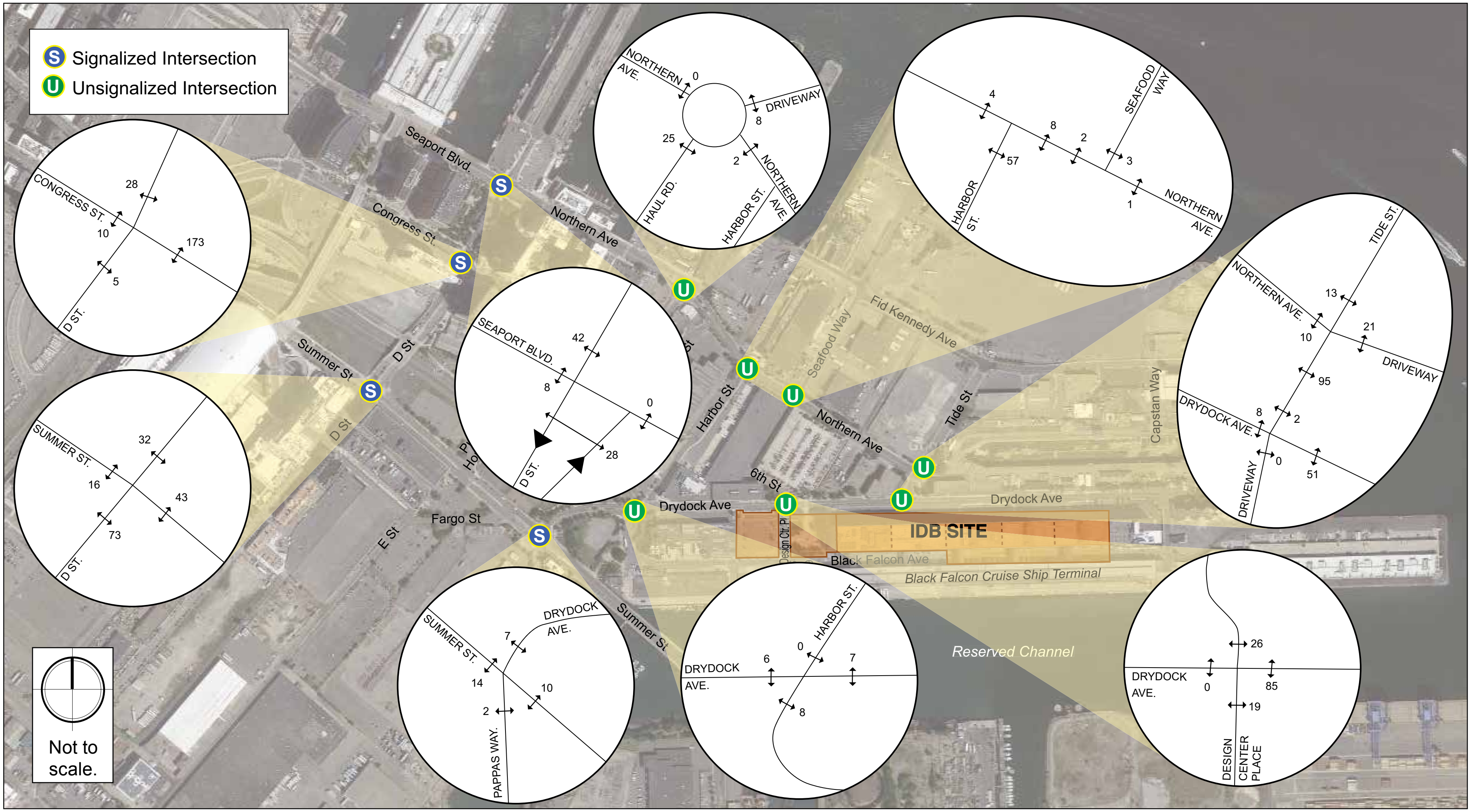

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Figure 2-6

Existing Conditions (2014) Pedestrian Volumes, a.m. Peak Hour

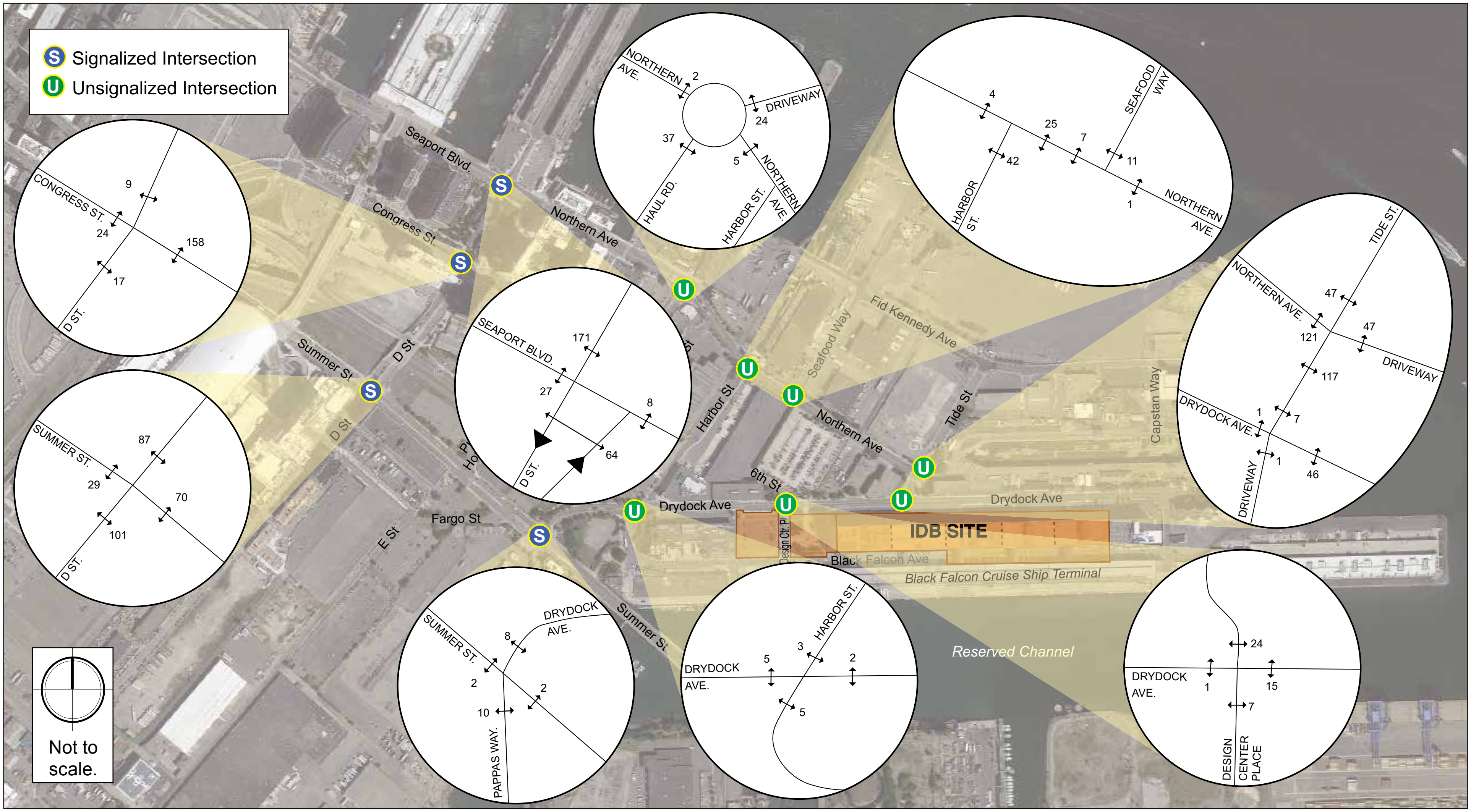

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Figure 2-7

Existing Conditions (2014) Pedestrian Volumes, p.m. Peak Hour commuter traffic by allowing tenants to commute to the IDB using transit while providing them with access to a car for a few hours in the middle of the day, if necessary, for off-site meetings or appointments. Figure 2-8 shows the nearby car sharing locations (and Hubway stations referenced below) with a total of seven Zipcars and two Enterprise cars in the vicinity.

2.2.9 Existing Bicycle Conditions

Hubway, launched in July 2011, is a bicycle sharing system with more than 100 stations and 1,000 bicycles available throughout Boston, Brookline, Cambridge, and Somerville. Hubway stations are installed in April and removed in November of each year. As shown in Figure 2-8, five Hubway stations are located within one mile of the Project site, including two stations (18 bicycles) recently installed by the Proponent along Drydock Avenue, across the street from the IDB site.

Bicycle counts were taken as part of the intersection data collection and are shown in Figures 2-9 and 2-10, for the a.m. peak and p.m. peak hours, respectively. A buffered bicycle lane exists along Drydock Avenue to the west of Tide Street and the City's five-year plan includes a new buffered bicycle lane on Northern Avenue.

2.2.10 Existing Loading and Service

Loading and service activity currently occurs in zones located along Drydock Avenue and Black Falcon Avenue as indicated on Figure 2-4. Most delivery activity occurs in existing designated loading spaces along Drydock Avenue and ten designated loading spaces along Black Falcon Avenue. Existing loading and delivery activities at the Black Falcon Avenue zones are currently dedicated to individual businesses while those along Drydock Avenue serve the entire IDB. There is a loading zone with 16 truck parking spaces in front of the building sections referred to as 19 and 21 Drydock Avenue and another zone with 21 truck parking spaces in front of the building sections referred to as 23 and 25 Drydock Avenue.

Loading Facilities Deficiencies

The current loading facilities at the IDB have been in use and unchanged for many years even as the use and occupancy of the IDB and the surrounding BMIP land uses have undergone substantial changes. In particular, Massport has repurposed its building along the length of Black Falcon Avenue opposite the IDB into an active cruise ship facility, while the IDB loading facilities along Black Falcon Avenue have not been improved and remain in locations that may not be most compatible with the Cruiseport's operations. Along the IDB's Drydock Avenue side, the linear pedestrian walkway connecting the length of the IDB also serves as an active raised loading dock. The increasingly pedestrian-oriented nature of the IDB increases the potential for conflicts between loading and deliveries and pedestrians along this raised linear walkway.

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Figure 2-8

Car Sharing and Hubway Locations

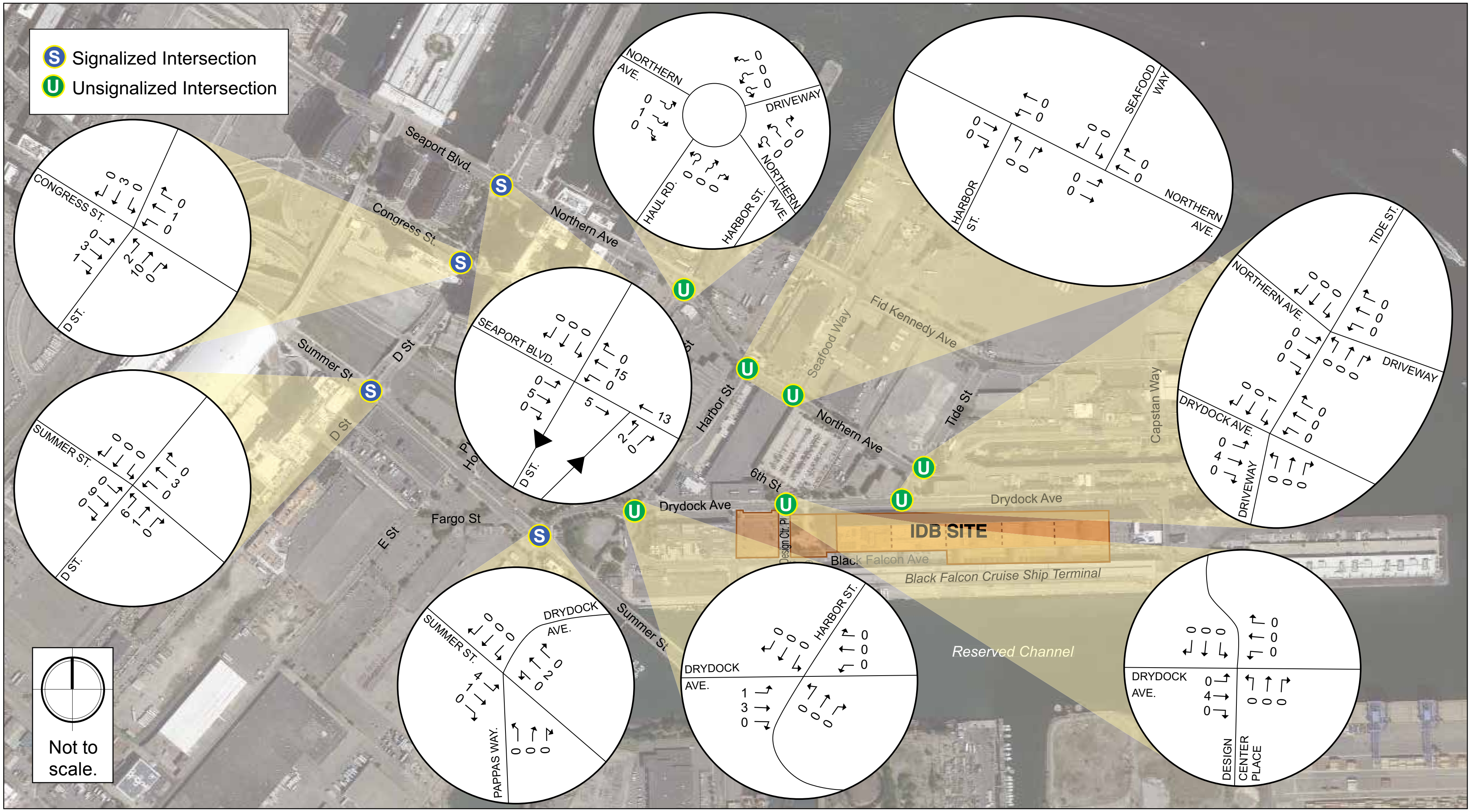

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Figure 2-9

Existing Conditions (2014) Bicycle Volumes, a.m. Peak Hour

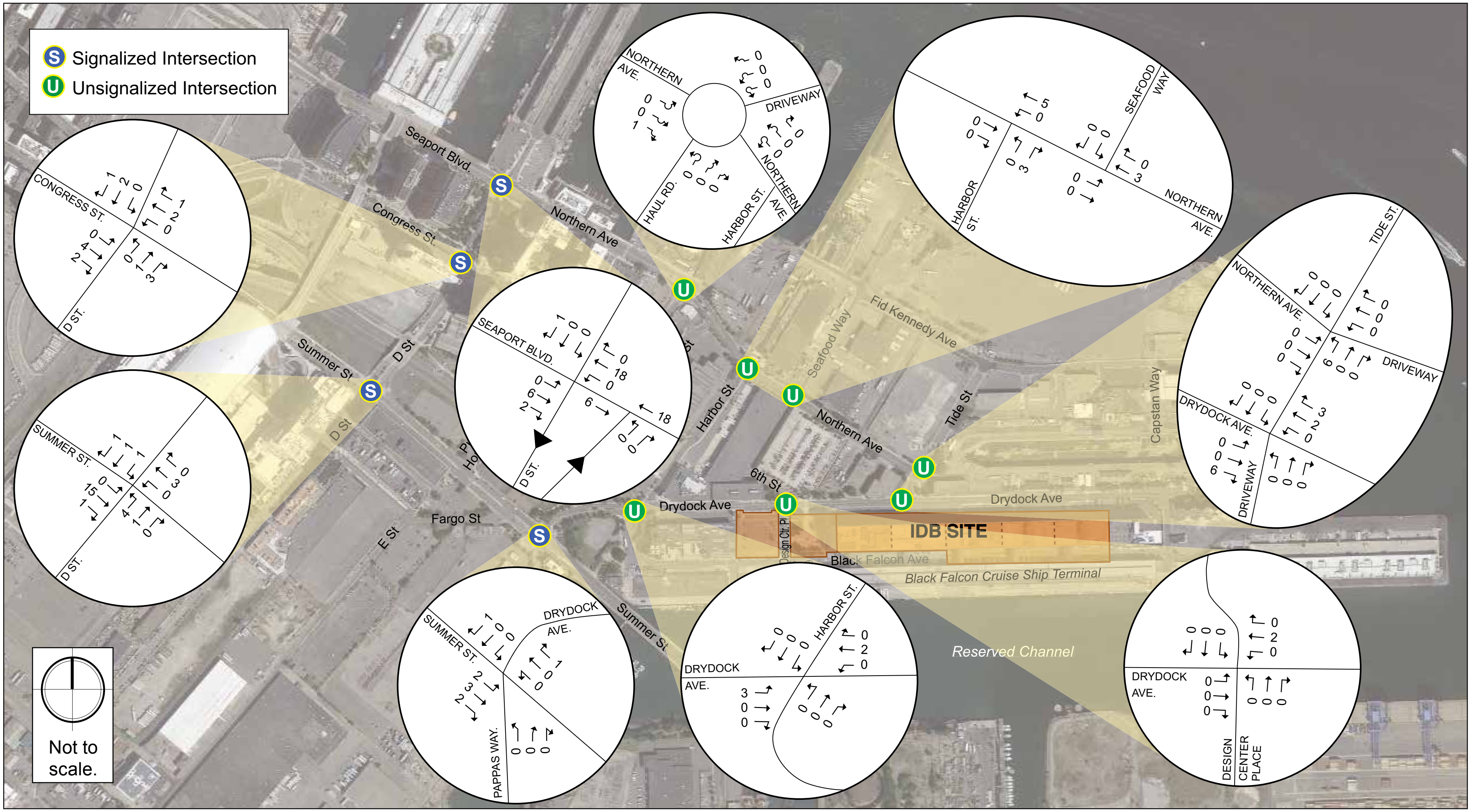

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Figure 2-10

Existing Conditions (2014) Bicycle Volumes, p.m. Peak Hour

Current Delivery Activity

The majority of IDB's loading and delivery operations occur weekdays between 6:00 a.m. and 5:00 p.m. The loading areas, both on Black Falcon Avenue and Drydock Avenue, are currently managed by IDB's property management team.

Current loading and building servicing demands were assessed through a detailed survey of delivery activity at the existing IDB. The survey was conducted for the week beginning Monday, January 27, through Friday, January 31, 2014. Building occupancy at the IDB during the survey was approximately 60%.

The delivery survey data indicate that the IDB is currently serviced by an average of 169 deliveries per weekday, with the highest demand on Monday (188 deliveries) and the lowest on Wednesday (155 deliveries). The survey discounted all activity within the loading areas that were not associated with building servicing, including activity associated with the Au Bon Pain, taxi and livery vehicle passenger pick-up and drop-off, and some long term parking (over three hours).

Delivery Vehicle Type and Delivery Purpose

Table 2-7 summarizes the vehicle types making weekday deliveries to the IDB loading areas. The majority of deliveries to the IDB (63%) are made by passenger car, van, SUV, or pick-up truck. Single-unit (SU) trucks measuring less than 30 feet in length, along with other panel trucks, account for an average of 21% of all deliveries. SU box trucks of between 34 feet and 40 feet in length averaged 11% of all weekday activity with trucks larger than 40 feet in length, including tractor-trailers, averaging 5% of daily deliveries. The maximum truck size observed in the loading area over the course of the weeklong survey was a tractor-trailer measuring approximately 73 feet in length.

The survey data were not detailed enough to identify the type of deliveries over the course of a typical day; however, enough information was collected indicating that most of the passenger car activity were local courier deliveries and approximately 15% of all deliveries were package deliveries by the typical overnight carriers (i.e., FedEx, UPS, etc.). This is consistent with the weeklong loading dock survey conducted by HSH Associates at the John Hancock Tower in February 2010 where 28% of deliveries were local courier and 15% were package deliveries.

Table 2-7 Weekday Delivery Vehicle Type

Type of Delivery Vehicle	Average Weekday Percent of Total
WB/SU-40+ Truck	5%
SU-40/SU-34 Truck	11%
Other SU/Panel Truck (up to 34 ft)	21%
Van/SUV/Pick-up	38%
Passenger Car	25%
Total	**100%**

Delivery Vehicle Duration of Stay and Peak Delivery Demand

A more detailed assessment of the data for Monday, January 27, 2014 was undertaken to identify delivery vehicle duration of stay and loading area occupancy by time of day. The average, median, and maximum duration of stay by vehicle type is presented in Table 2-8.

Table 2-8 Weekday Delivery Vehicle Type

Type of Delivery Vehicle	Duration of Stay Characteristics		
	Average (hh:mm)	Median (hh:mm)	Maximum (hh:mm)
WB/SU-40+ Truck	0:26	0:31	0:44
SU-40/SU-34 Truck	0:34	0:16	2:50
Other SU/Panel Truck (up to 34 ft)	0:31	0:21	2:48
Van/SUV/Pick-up	0:28	0:17	2:37
Passenger Car	0:23	0:09	2:50
All Vehicles	**0:28**	**0:17**	**2:50**

The average duration for all vehicles throughout the loading areas is about 28 minutes with the median being about 17 minutes. Passenger cars, which are mostly courier deliveries, have a significantly lower median duration of only 9 minutes.

Figure 2-11 depicts the observed loading demand by time of day for Monday, January 27, 2014. Between 6:00 a.m. and 5:00 p.m., the average number of vehicles on-site making deliveries is approximately 11. As indicated on this graph, there are several times during the day where loading and delivery activity peaks with the highest occupancy and longest demand period being between about 12:30 to 1:30 p.m. with a maximum occupancy of 18 vehicles. Additional peaks occur in the morning between 8:45 to 9:15 a.m. at 14 vehicles and between about 10:30 and 11:30 a.m. at about 16 vehicles. During the afternoon, an additional peak occurs between 2:25 and 2:45 p.m. (16 vehicles) and again in the evening at about 4:00 to 4:30 p.m. (13 vehicles).

2.3 No-Build Conditions

It is standard practice to evaluate the No-Build Conditions (without project) and the Build Conditions (with project) and determine to what extent the traffic operations will be affected. Year 2019, five years from the existing condition, has been designated as the future design year. The next two sections describe the projected 2019 No-Build and 2019 Build Conditions.

2.3.1 No-Build Traffic Volumes

No-Build traffic Conditions are those that would occur independent of the Project and include existing traffic and new traffic volumes resulting from 1) general background growth both within the BMIP and in the rest of the study area and 2) other future area development projects that have been permitted or are under review.

It should be noted that the IDB building space is currently 60% occupied. Often for Article 80 analysis where the existing tenancy is less than 100%, the study team incorporates full occupancy under the No-Build Conditions. The BRA, however, directed the IDB team to continue using the 60% occupancy rate under the No-Build conditions and then adopt a 100% occupancy rate under the Build Conditions (presented in the next section). Therefore, under the No-Build Conditions the IDB site would have the same activity level as today. (It should be noted that if the No-Build Conditions had instead incorporated lease up to 100% occupancy, an additional 1,717 daily vehicle trips would have been added to the No-Build traffic analysis. The subsequent Build Conditions would have only accounted for the change in traffic associated with the Project Program defined in Table 2-11, below.)

Based on a review of historical and recent traffic counts as well as the nature of the roadway network, a 0.5% annual growth rate was applied to the existing intersection volumes within the BMIP to account for background growth. Summer Street, as a major connecting arterial through the study area, would be subject to more growth than the BMIP peninsula area.

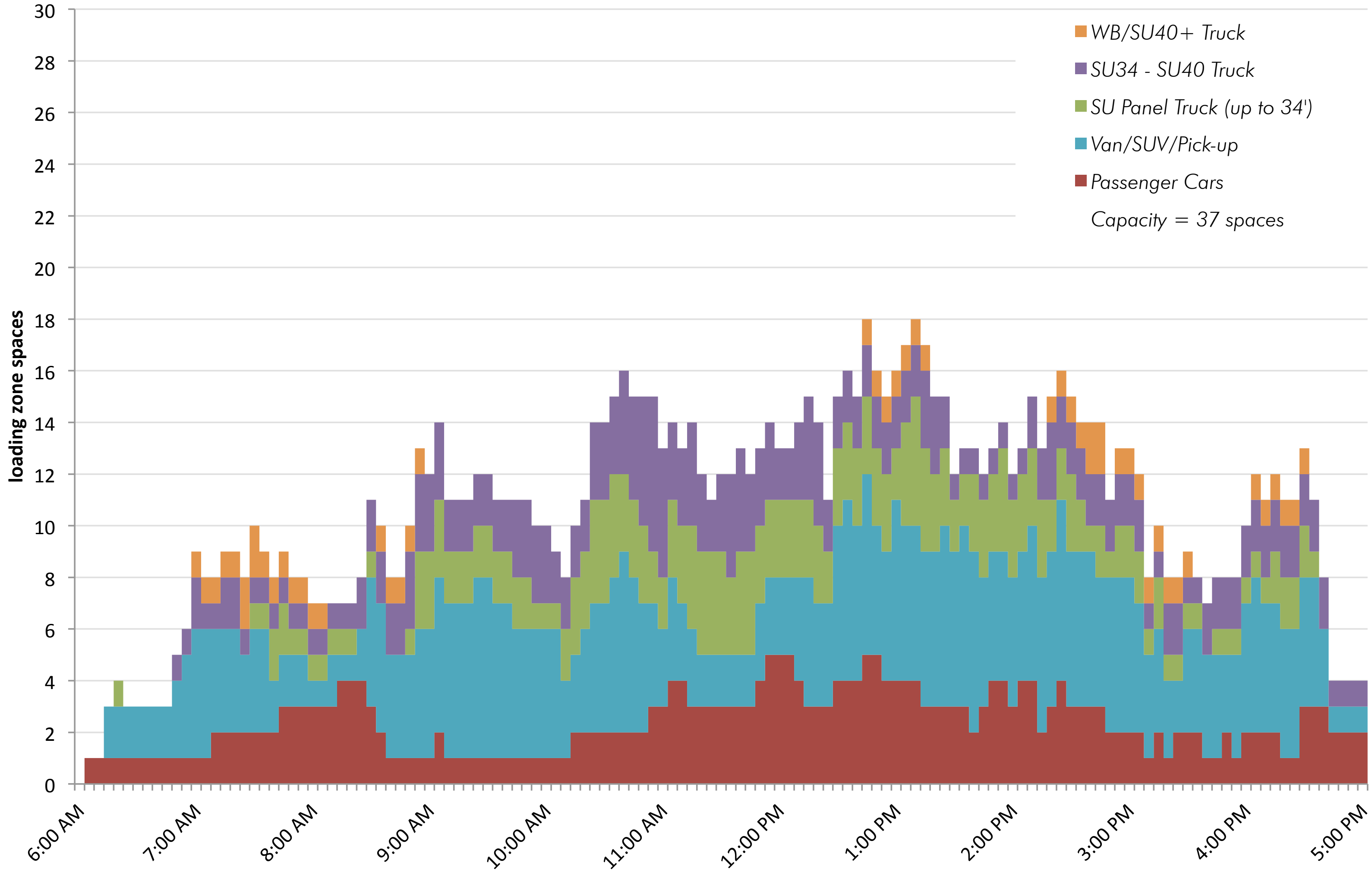

Figure 2-11

IDB Loading Areas - Existing Activity and Occupancy

Therefore, a 1.0% annual growth rate was applied to the existing through volumes on Summer Street.

Traffic volumes generated by the following new major developments have also been added into the No-Build Conditions:

Pier 4 Development is a mixed-use development with the first phase of construction consisting of 383 residential units, 12,600 sf of restaurant/retail space, 20,000 sf of civic space, and 258 parking spaces located north of Seaport Boulevard.

411 D Street is a residential development consisting of 197 residential units and 129 parking spaces.

368 Congress Street is a mixed-use redevelopment consisting of 120-room hotel and 5,000 sf of retail/restaurant space.

Congress Street Hotel is a hotel development consisting of a 505-room hotel located at 505 Congress Street.

Fan Pier is a mixed-use phased development consisting of office, residential, hotel, restaurant, and cultural space located north of Old Northern Avenue.

D Street Development is a mixed-use development consisting of 500 hotel rooms, 26,300 sf of retail space, and 1,350 parking spaces located at 401 D Street.

Waterside Place is a phased mixed-use development consisting of 347,700 sf of retail space, 236 residential units, and 140 parking spaces located off Congress Street.

Boston Cargo Terminal is a development consisting of an intermodal marine industrial facility including a 4.3-acre bulk cargo facility located off Northern Avenue.

6 Tide Street is a mixed-use development consisting of 355,000 sf of research development and manufacturing space and 60 parking spaces located at 316-318 Northern Avenue.

Parcel K is a mixed-use development consisting of 304 residential units, 247 hotel rooms, 16,500 sf of office space, 20,000 sf of retail/restaurant, and 640 parking spaces located at the corner of Northern Avenue and Massport Haul Road.

Seaport Square Development - Parcels A, B, C, D, K, L1 Development is a mixed use development located in several parcels generally along Seaport Boulevard between Sleeper Street and the East Service Road.

Traffic from the study area projects described below is reflected in the background growth rate:

339 D Street is a residential development consisting of 24 residential units and 30 parking spaces.

360 West Second Street is a residential development consisting of 25 residential units and 25 parking spaces.

630 East Second Street is a residential development with 18 units and 21 parking spaces.

Distillery Project is a mixed-use development consisting of residential space, commercial space, art gallery space, a greenhouse, and 147 parking spaces located at 516-524 East Second Street.

Saint Augustine's is a redevelopment project transforming the existing school building into 39 residential units with 47 parking spaces. .

E Street Self-Storage Facility is a development consisting of approximately 100,000 sf of self-storage located off E Street.

All background projects are mapped in Figure 2-12. The resulting 2019 No-Build traffic volumes are shown in Figures 2-13 and 2-14 for the a.m. and p.m. peak hour, respectively.

2.3.2 No-Build Conditions Traffic Operations

The 2019 No-Build analysis uses the methodology described under Existing Conditions.

The resulting intersection capacity analysis summaries are shown in Tables 2-9 and 2-10 for a.m. and p.m. peak hours, respectively. The tables show level of service, average delay, volume to capacity ratio, and 95th percentile queue length (feet) for the overall intersection and each approach.

Complete Synchro reports are provided in Appendix B.

Signalized

Under the No-Build Conditions, many overall levels of service worsened to an LOS E or LOS F during both the a.m. and p.m. peak hours.

During the a.m. peak hour, the intersection of Summer Street/Drydock Avenue worsens from an overall LOS D under Existing Conditions to an LOS E under the No-Build Conditions. The Summer Street eastbound left-turn lane worsens from an LOS D in Existing Conditions to an LOS F under the No-Build Conditions. The Pappas Way northbound approach worsens from an LOS D to an LOS E. During the p.m. peak hour, the Pappas Way northbound approach worsens from an LOS D to an LOS F under the No-Build Conditions.

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Figure 2-12
Area Development Projects

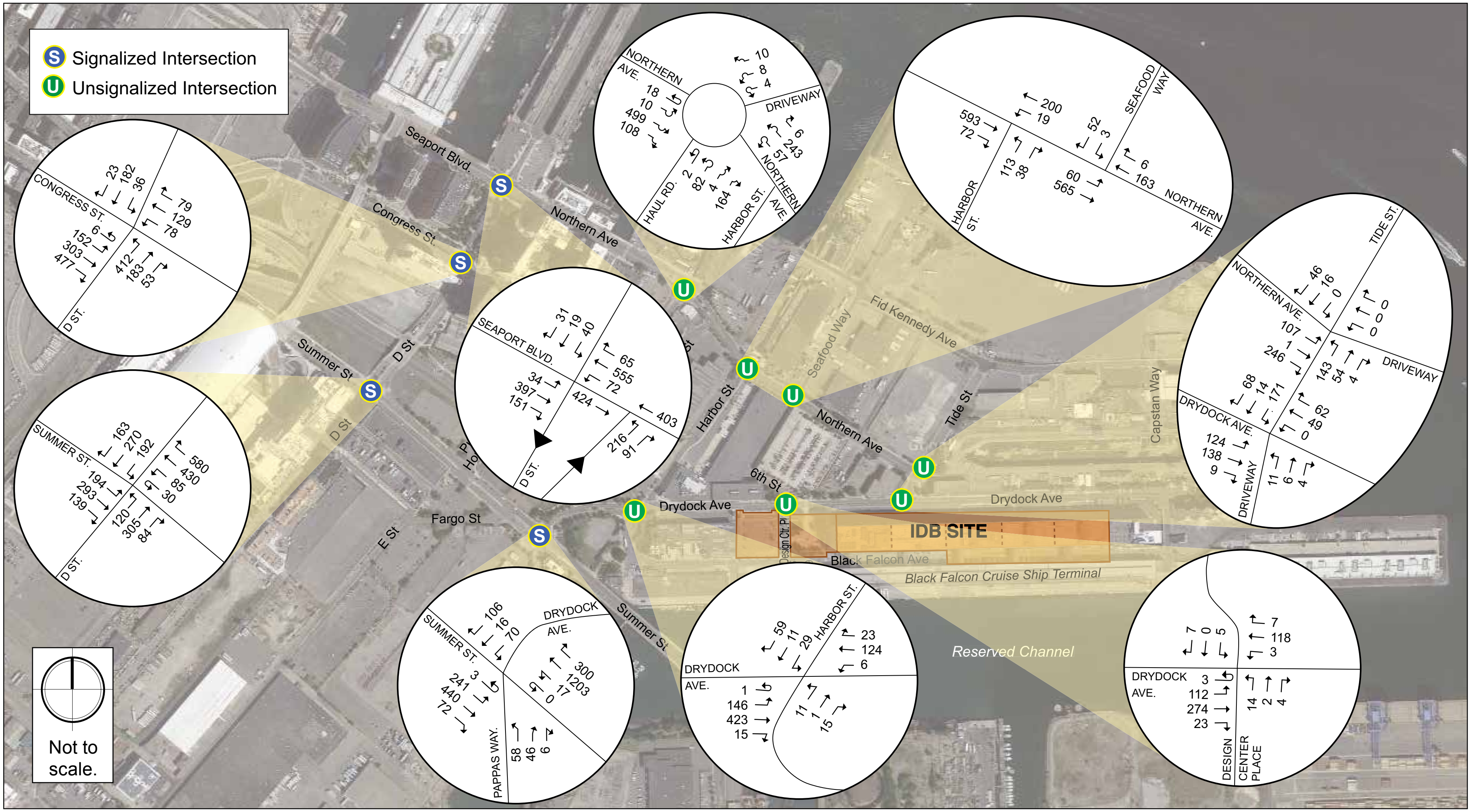

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Figure 2-13

No-Build Conditions (2019) Intersection Volumes, a.m. Peak Hour

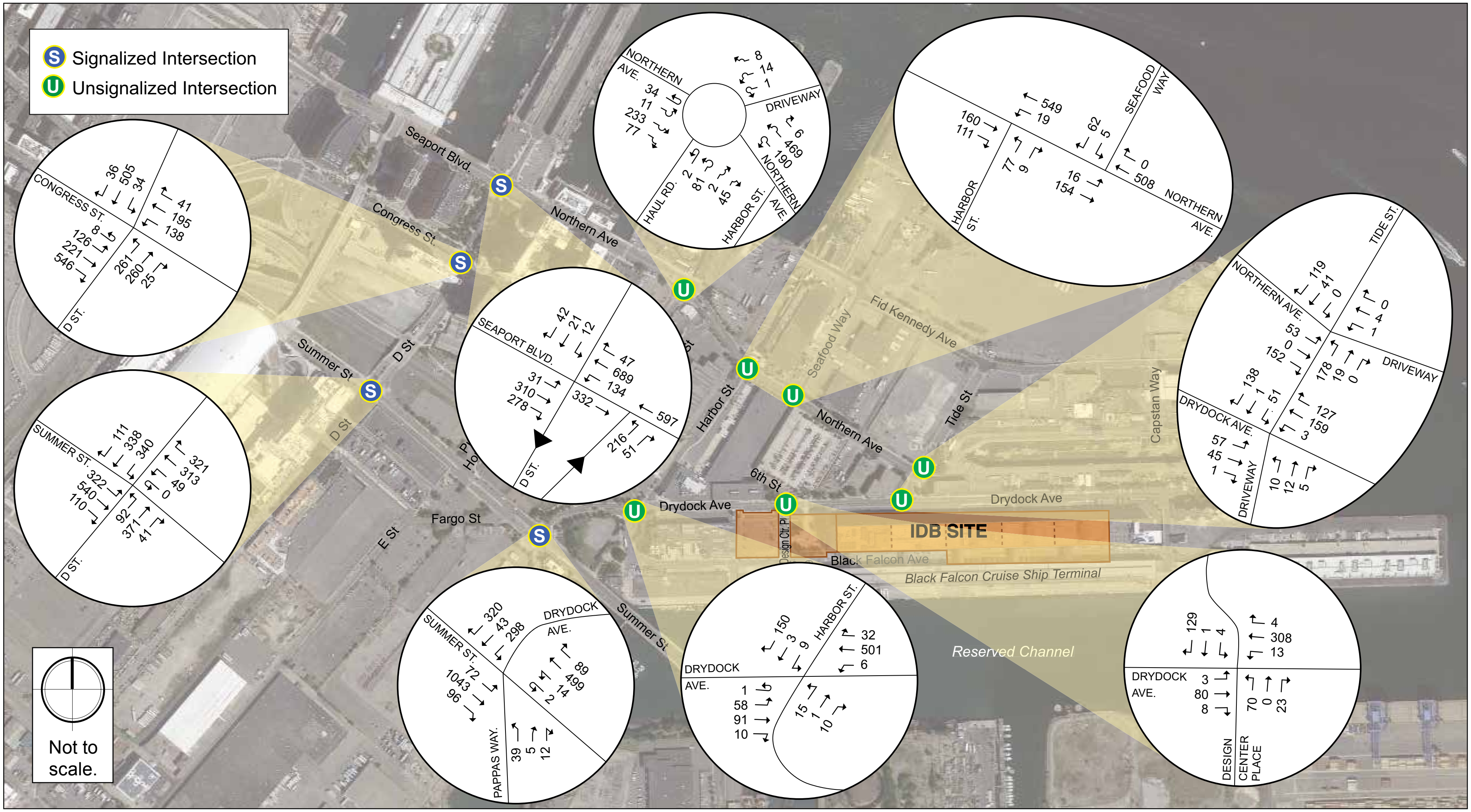

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Figure 2-14

No-Build Conditions (2019) Intersection Volumes, p.m. Peak Hour

During the a.m. peak hour, the intersection of Congress Street/D Street worsens from an overall LOS D under Existing Conditions to an overall LOS E. The Congress Street westbound approach worsens from an LOS D to an LOS F under the No-Build Conditions. The D Street northbound left/through lane and through/right lane worsens from an LOS D to an LOS E under the No-Build Conditions.

During the p.m. peak hour, the intersection of Congress Street/D Street worsens from an overall LOS D under Existing Conditions to an overall LOS F in the No-Build Conditions. The Congress Street westbound approach and eastbound left-turn/through lane and through/right-turn lane worsen from an LOS D to an LOS F. The Congress Street eastbound right-turn lane worsens from an LOS C to an LOS F. The D Street northbound left-turn lane and worsens from an LOS D to an LOS E. The D Street southbound approach worsens from an LOS D to an LOS F.

During the a.m. peak hour, the intersection of Summer Street/D Street worsens from an overall LOS D under Existing Conditions to an overall LOS E under the No-Build Conditions. The Summer Street eastbound left-turn lane worsens from an LOS C to an LOS E. during both peak hours. During the p.m. peak hour, the Summer Street westbound left-turn/through lane and exclusive through lane worsens from an LOS D to an LOS E and the D Street southbound left-turn lane worsens from an LOS D to an LOS E.

Unsignalized and Roundabout

At the unsignalized intersections and roundabout, most minor approaches operate at LOS D or better during each peak hour, with the exceptions discussed below.

At Drydock Avenue/Harbor Street, during the p.m. peak hour, the Harbor Street southbound approach worsens from LOS D under Existing Condition to LOS E under the No-Build Conditions

At the intersection of Drydock Avenue/Design Center Place, during the p.m. peak hour, the Design Center Place northbound approach worsens from an LOS D to LOS E.

At the intersection of Northern Avenue/Harbor Street, during the a.m. peak hour, the Harbor Street northbound approach worsens from LOS C to LOS E under the No-Build Conditions.

Table 2-9 No-Build Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Summer Street/Drydock Avenue	**E**	**79.3**		
Summer EB left	F	>80.0	>1.00	#319
Summer EB thru | thru/right	A	7.0	0.33	139
Summer WB left	D	43.5	0.47	25
Summer WB thru | thru/right	F	>80.0	>1.00	#843
Pappas NB left/thru/right	E	57.8	0.76	#138
Drydock SB left/thru	E	66.4	0.79	#123
Drydock SB right	A	5.6	0.24	33
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**B**	**18.8**		
Seaport EB left/thru | thru/right	C	28.0	0.56	#301
Seaport WB left/thru | thru/right	A	4.2	0.51	m30
Fish Pier SB left/thru/right	D	51.4	0.71	97
Northern Avenue/D Street (northbound)	**C**	**23.8**		
Northern EB thru | thru	A	4.1	0.27	23
Northern WB thru | thru	C	20.7	0.32	167
D NB left	E	76.6	0.92	m#232
D NB right	B	10.9	0.43	m8
Congress Street/D Street	**E**	**63.6**		
Congress EB left/thru | thru/right	D	52.8	0.90	#302
Congress EB right	C	20.4	0.85	#231
Congress WB left/thru | thru/right	F	>80.0	>1.00	#109
D NB left	F	>80.0	0.89	#324
D NB left/thru | thru/right	E	62.7	0.87	164
D SB left/thru | thru/right	D	54.1	0.72	121
Summer Street/D Street	**E**	**65.6**		
Summer EB left	E	63.0	0.91	#224
Summer EB thru | thru/right	B	17.4	0.41	124
Summer WB left/thru | thru	F	>80.0	>1.00dl	#402
Summer WB right	C	29.4	0.82	#484
D NB left	D	42.8	0.57	119
D NB thru | thru/right	D	38.1	0.66	174
D SB left	D	49.8	0.76	206
D SB thru | thru/right	C	27.0	0.66	177

Table 2-9 No-Build Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	2.2	0.15	12
Drydock WB left/thru/right	A	0.8	0.01	1
Harbor NB left/thru	F	>50.0	0.22	19
Harbor NB right	B	11.5	0.05	4
Harbor SB left/thru/right	D	26.4	0.48	61
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	3.4	0.12	10
Drydock WB left/thru/right	A	0.5	0.01	0
Design Center NB left/thru/right	C	18.4	0.11	9
Garage SB left/thru/right	B	14.3	0.04	3
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	3.8	0.10	8
Drydock WB left/thru/right	A	0.0	0.00	0
Parking NB left/thru/right	C	15.2	0.09	8
Tide SB left/thru/right	D	27.3	0.66	115
Northern Avenue/Tide Street				
Northern EB left/thru/right	C	19.0	0.64	114
Alley WB left/thru/right	A	0.0	0.00	0
Tide NB left/thru/right	A	6.3	0.14	13
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.06	5
Northern WB thru/right	A	0.0	0.12	0
Seafood SB left/right	B	11.4	0.11	9
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.45	0
Northern WB left/thru	A	1.4	0.04	3
Harbor NB left/right	E	40.5	0.67	111

Table 2-9 No-Build Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Unsignalized Roundabouts				
Northern Avenue/Massport Haul Road				
Northern EB left/thru	B	13.0	0.62	73
Northern EB right	A	4.7	0.09	6
Northern WB left	A	6.3	0.09	6
Northern WB thru/right	A	8.1	0.33	25
Massport Haul NB left/thru	A	8.9	0.14	12
Massport Haul NB right	B	12.6	0.35	34
Parking SB left/thru/right	A	6.8	0.04	3

= 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.

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

Light grey shading indicates a decline in LOS from Existing Conditions to No-Build Conditions. Changes into LOS E or LOS F are shaded.

Table 2-10 No-Build Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Summer Street/Drydock Avenue	**D**	**38.0**		
Summer EB left	B	12.1	0.31	50
Summer EB thru | thru/right	B	16.8	0.75	436
Summer WB left	D	37.4	0.37	26
Summer WB thru | thru/right	C	22.2	0.66	231
Pappas NB left/thru/right	F	>80.0	0.85	#86
Drydock SB left/thru	F	>80.0	>1.00	#386
Drydock SB right	A	4.1	0.43	23
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**B**	**18.8**		
Seaport EB left/thru | thru/right	C	25.4	0.67	#319
Seaport WB left/thru | thru/right	B	11.7	0.72	m89
Fish Pier SB left/thru/right	C	32.1	0.61	59
Northern Avenue/D Street (northbound)	**D**	**39.1**		
Northern EB thru | thru	A	4.0	0.20	19
Northern WB thru | thru	B	19.6	0.47	241
D NB left	F	>80.0	>1.00	m#259
D NB right	B	15.2	0.27	m17

Table 2-10 No-Build Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Congress Street/D Street	**F**	**>80.0**		
Congress EB left/thru | thru/right	F	>80.0	>1.00	176
Congress EB right	F	>80.0	>1.00	#367
Congress WB left/thru | thru/right	F	>80.0	>1.00	155
D NB left	E	72.8	0.75	212
D NB left/thru | thru/right	E	56.9	0.75	194
D SB left/thru | thru/right	F	>80.0	0.93	#334
Summer Street/D Street	**D**	**44.4**		
Summer EB left	E	71.1	0.99	#300
Summer EB thru | thru/right	C	21.9	0.54	216
Summer WB left/thru | thru	E	65.4	0.94	#204
Summer WB right	B	19.6	0.56	198
D NB left	D	36.5	0.38	95
D NB thru | thru/right	D	45.8	0.80	181
D SB left	E	64.6	0.92	m#373
D SB thru | thru/right	D	47.0	0.92	m#317
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	3.5	0.13	11
Drydock WB left/thru/right	A	0.1	0.01	0
Harbor NB left/thru	F	>50.0	0.41	39
Harbor NB right	A	9.8	0.02	1
Harbor SB left/thru/right	E	42.4	0.74	138
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	0.6	0.01	1
Drydock WB left/thru/right	A	0.5	0.02	1
Design Center NB left/thru/right	E	41.3	0.62	92
Garage SB left/thru/right	B	14.6	0.36	40
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	5.1	0.08	6
Drydock WB left/thru/right	A	0.3	0.01	1
Parking NB left/thru/right	C	18.7	0.18	16
Tide SB left/thru/right	C	16.7	0.45	58
Northern Avenue/Tide Street				
Northern EB left/thru/right	D	31.6	0.75	160
Alley WB left/thru/right	C	18.2	0.07	5
Tide NB left/thru/right	A	7.4	0.16	15
Tide SB left/thru/right	A	0.0	0.00	0

Table 2-10 No-Build Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.3	0.03	2
Northern WB thru/right	A	0.0	0.34	0
Seafood SB left/right	C	15.4	0.20	19
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.19	0
Northern WB left/thru	A	0.7	0.03	2
Harbor NB left/right	C	22.1	0.34	37
Unsignalized Roundabouts				
Northern Avenue/Massport Haul Road				
Northern EB left/thru	A	8.7	0.37	29
Northern EB right	A	4.9	0.08	6
Northern WB left	A	6.8	0.24	18
Northern WB thru/right	B	10.7	0.54	58
Haul NB left/thru	A	5.6	0.09	8
Massport Haul NB right	A	8.0	0.09	7
Parking SB left/thru/right	A	7.1	0.05	3
Stuart EB left | left	A	4.1	0.51	98
Stuart EB thru | thru | thru	B	14.0	0.39	131
Stuart EB right	C	23.3	0.72	322
Dartmouth NB thru | thru	C	21.6	0.47	172
Dartmouth NB right	D	35.4	0.70	53

= 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.

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

Light grey shading indicates a decline in LOS from Existing Conditions to No-Build Conditions. Changes into LOS E or LOS F are shaded.

2.4 Build Conditions

2.4.1 Project Program

As presented in Section 2.1.1, the Project program includes converting 206,388 square feet of industrial space into commercial space. Because 91,474 square feet of this space is already actively used by commercial tenants (and already generating trips captured in the January 2014 traffic counts), only trips associated with the net change in use are added in this transportation analysis. Table 2-11 shows the overall Project program and the program used to evaluate transportation impacts.

Table 2-11 Project Program

Land Use	Project Program	
	Overall	For Transportation Analysis
General Commercial		
Office	156,388 sf	64,914 sf [1]
Specialty/Support Retail	40,000 sf	40,000 sf
Restaurant (Food & Beverage)	10,000 sf	10,000 sf
Total	**206,388 sf**	**114,914 sf**

1) 156,388 sf minus 91,474 sf (already occupied) = 64,914 sf

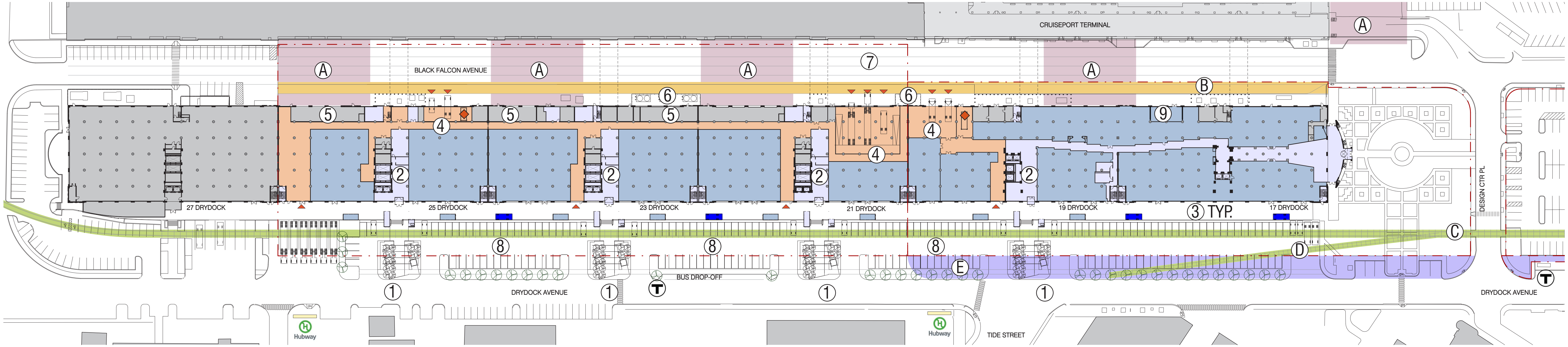
In addition to the Project program, the IDB building vacancy was factored into the Build Conditions transportation analysis. The BRA directed the IDB team to continue using the existing 60% occupancy rate under the No-Build Conditions and then adopt a 100% occupancy rate under the Build Conditions. Therefore, the Build Conditions reflect the combined effect of the Project Program (change in use) and 100% occupancy of the IDB.

A discussion of land uses within the entire IDB is presented in Section 2.4.2.

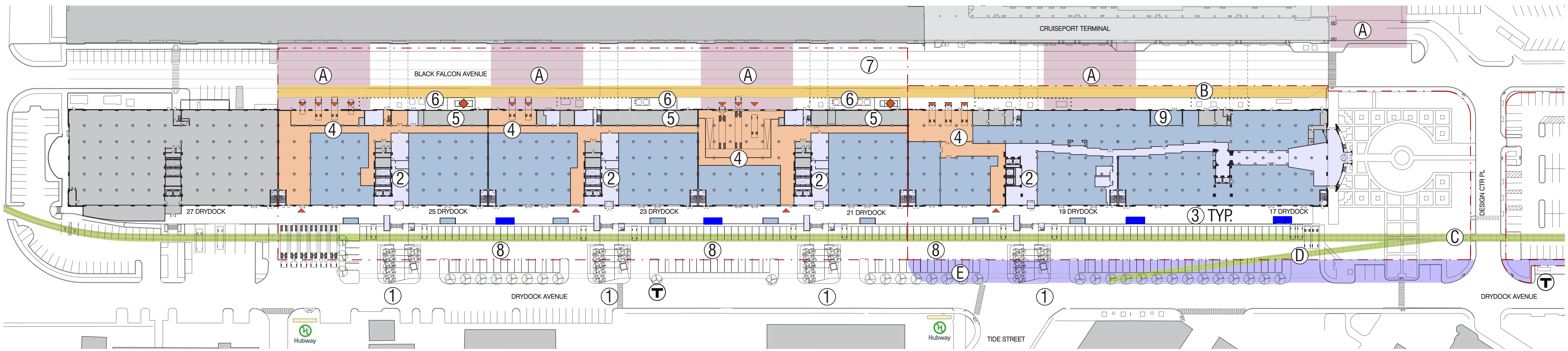
2.4.2 Site Access and Circulation

The IDB site plan is shown in Figure 2-15. Overall vehicle access will not change from Existing Conditions, with the possible exception of the proposed Black Falcon Avenue improvements noted below. Visitors and employees will continue to use parking locations as described in Section 2.2.5, although some changes to Black Falcon Avenue parking arrangements are currently being discussed with Massport. Loading and deliveries will still occur from both Drydock Avenue and Black Falcon Avenue.

Massport is currently contemplating ways to improve traffic operations of Black Falcon Avenue to assist in pick-up/drop-off activity associated with the Cruiseport located along the length of Black Falcon Avenue, to the south of IDB. Massport has indicated in meetings and discussions with the Proponent that it intends to improve pick-up/drop-off operations by converting Black Falcon Avenue to one-way westbound operations and demarcating four through travel lanes along the length of its terminal facility. These discussions are preliminary, and roadway plans are still conceptual, but it is likely that the outer lane closest to IDB would be kept open at all times for through travel while the remaining lanes would be used for pick-up/drop-off activity and vehicle queuing. An approximate 27.5-foot buffer between the outer travel lane and the IDB building would provide space for vehicle maneuvering areas for the proposed internal loading docks serving the IDB. Access to the utilities beneath the roadway would be maintained, and any new equipment would be located within fifteen feet of the southerly face of the IDB complex, with appropriate screening to provide a clean aesthetic.



1 PROPOSED SITE PLAN WITH AS-OF-RIGHT LOADING OPTION



2 PROPOSED SITE PLAN WITH PREFERRED LOADING OPTION

LEGEND:

01. NEW ACCESSIBLE ENTRY PLAZA
02. UPDATED ENTRY LOBBY
03. NEW STOREFRONT
04. NEW LOADING AREA @ BLACK FALCON
05. NEW MECHANICAL/STORAGE AREA
06. NEW COOLING TOWERS @ BLACK FALCON
07. RE-STRIPING OF BLACK FALCON
08. NEW PARKING + PEDESTRIAN ACCESS @ DRYDOCK
09. POTENTIAL BLACK FALCON AVE. RETAIL

- TENANT
- SERVICE/LOADING
- LOBBY/COMMON
- MECH/STORAGE
- EXISTING/PROPOSED LOADING DOOR
- FOOD TRUCK
- TRASH AREA

- A. UNLOADING AREA
- B. EXISTING EASEMENT
- C. RAIL EASEMENT
- D. RAIL SPUR EASEMENT
- E. PARKING EASEMENT

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Figure 2-15

Proposed Site Plan with As-OF-Right or Preferred Loading Option

2.4.3 Trip Generation Overview

Trip generation is a complex, multi-step process that produces an estimate of vehicle, transit, walk, and bicycle trips associated with a proposed development or land use change.

Following standard industry practice, and as required by the BTD, trip generation in this study was derived from the Institute of Transportation Engineers' (ITE) Trip Generation (9th edition, 2012). The ITE rates produce vehicle trip estimates, which are converted to person trips based on vehicle occupancy rates (VOR). Using appropriate mode split information for this specific study area, the total person trips are then allocated to vehicle, transit, and walk/bicycle trips.

Land Use Code Definitions

The BRA and EDIC typically refer to uses in the BMIP under three broad classifications of use: Marine Industrial, General Industrial, or Commercial. These classifications are further disaggregated into categories. For trip generation purposes, the categories were matched to the most appropriate standard ITE land use codes (LUC). Table 2-12 shows BMIP category and corresponding ITE code.

Below are descriptions of the land use codes adopted in this study. Trip generation estimates are based on fitted curve equations and average trip rates for the following land use codes (LUC):

Land Use Code 710 — General Office: A general office building houses multiple tenants; it is a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenants including professional services, insurance companies, investment brokers and tenant services, such as a bank or savings and loan institution, a restaurant or cafeteria, and service retail facilities.

Land Use Code 130 — Industrial Park: Industrial Parks contain a number of industrial facilities. They are characterized by a mix of manufacturing, service and warehouse facilities with a wide variation in the proportion of each type of use from one location to another.

Table 2-12 Land Use Categories

BMIP Plan Category	Corresponding ITE Category and Land Use Code (LUC)
General Office	General Office - LUC 710
Industrial Office	Industrial Park - LUC 130
Light Manufacturing	Manufacturing - LUC 140
Local Retail Business	Shopping Center - LUC 820
Marine-Dependent Industrial	General Office - LUC 710
Research and Development	Research and Development - LUC 760
Restaurant	Coffee/Donut Shop – LUC 936 High-Turnover Restaurant – LUC 932
Warehousing	Warehousing – LUC 150

Land Use Code 140 — Manufacturing: Manufacturing facilities are areas where the primary activity is the conversion of raw materials or parts into finished products. Size and type of activity may vary substantially from one facility to another. In addition to the production of actual goods, manufacturing facilities generally also have office, warehouse, research, and associated functions.

Land Use Code 820 — Shopping Center: A shopping center is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center's composition is related to its market area in terms of size, location, and type of store. Of the ITE retail categories, this one best suited the non-food-related accessory retail component proposed within IDB, despite the fact that IDB retail outlets will be independently operated and will primarily serve those who work in and near the IDB and BMIP as well as any visitors to the design center.

Land Use Code 760 — Research and Development: Research and development centers are facilities or groups of facilities devoted almost exclusively to research and development activities. The range of specific businesses contained in this category varies significantly. Research and development centers may contain offices and light fabrication areas.

Land Use Code 936 — Coffee/Donut Shop (Without Drive-Through Window): This land use includes single-tenant coffee and donut restaurants without drive-through windows. Freshly brewed coffee and a variety of coffee-related accessories are the primary retail products sold at these sites. Limited indoor seating is generally provided for patrons; table service is not provided. In an urban environment, particularly one with a high concentration of office use as seen at our site, this land use exhibits a high pass-by capture rate. Pass-by trips are those already in the transportation network and not specifically destined to the particular land use. For the existing Au Bon Pain restaurant at the IDB, a capture rate of 75% was assumed.

Land Use Code 932 — High-Turnover (Sit-Down) Restaurant: This land use consists of sit-down, full-service eating establishments with typical duration of stay of approximately one hour. This type of restaurant is usually moderately priced and frequently belongs to a restaurant chain. Generally, these restaurants serve lunch and dinner; they may also be open for breakfast and are sometimes open 24 hours per day. These restaurants typically do not take reservations. Patrons commonly wait to be seated, are served by a waiter/waitress, order from the menus and pay for their meal after they eat. Some facilities contained within this land use may also contain a bar area for serving food and alcoholic drinks. In an urban environment, particularly one with a high concentration of office use as seen at our site, this land use exhibits a high pass-by capture rate. Pass-by trips are those already in the transportation network and not specifically destined to the particular land use. Pass-by rate of 43% was assumed for this land use, as recommended by the *ITE Trip Generation Handbook, 2nd Edition*.

Land Use Code 150 — Warehousing: Warehouses are primarily devoted to the storage of material, but they may also include office and maintenance areas.

Land Use Program: Entire IDB and Net Change under Build Conditions

Table 2-11 shows the Project Program adopted for the Build Conditions transportation analysis, and the effect of leasing up of current vacant space at IDB was also incorporated into the Build Conditions, as directed by BRA and BTD staff. Therefore, the Build Conditions reflect the combined effect of the Project Program (change in use) and 100% occupancy of the IDB.

The land use quantities for leasing up the entire IDB were developed by the study team based on allowable uses. Table 2-13 presents a summary of land use quantities in the entire IDB under each analysis condition.

For evaluation of the Build Conditions, only the net new occupied land uses are subject to trip generation (i.e., the existing, occupied areas that are subject to a use reclassification do not affect new trip generation in this study). Table 2-13 also shows the net new land use quantities incorporated into the Build Conditions from both the lease up of vacant space and the Project Program as compared to the No-Build Conditions. Note that most – 79% – of the net change in space is attributable to the lease up and only 21% to the Project Program (change in use).

Table 2-13 Land Use by Category – Entire IDB and Net Change from No-Build to Build Conditions

BMIP Plan Category	Entire IDB			Net Change from No-Build to Build Conditions		
	Existing Uses 60% Occupied (Existing and No-Build Conditions)[1]	IDB Lease Up to 100% Occupied		Lease Up Vacant Space	Project Program	Net Change[3]
		With Current Allowable Uses [2]	With Project Program (Build Conditions)[1]			
General Office	166,820 sf	424,291 sf	237,250 sf	+5,566 sf	+64,864 sf	+70,430 sf
Industrial Office	429,104 sf	510,079 sf	595,782 sf	+166,678 sf	0 sf	+166,678 sf
Light Manufacturing	97,577 sf	143,787 sf	173,074 sf	+75,477 sf	0 sf	+75,477 sf
Local Retail Business	6,343 sf	18,137 sf	90,000 sf	+43,657 sf	+40,000 sf	+83,657 sf
Marine-Dependent Industrial	8,610 sf	18,337 sf	82,552 sf	+73,942 sf	0 sf	+73,942 sf
Research and Development	39,769 sf	84,698 sf	173,054 sf	+133,285 sf	0 sf	+133,285 sf
Restaurant	3,758 sf	5,314 sf	20,000 sf	+6,242 sf	+10,000 sf	+16,242 sf
Warehousing	86,519 sf	184,549 sf	17,500 sf	-69,019 sf	0 sf	-69,019 sf
Subtotal						
Occupied	838,500 sf	1,389,192 sf	1,389,192 sf	+435,828 sf	+114,864 sf	+550,692 sf
Vacant	550,692 sf	0 sf	0 sf	0 sf	0sf	0 sf
Total	**1,389,192 sf**	**1,389,192 sf**	**1,389,192 sf**	**+435,828 sf**	**+114,864 sf**	**+550,692 sf**

1) These conditions were analyzed in this study.
2) Note that the condition represented under "With Current Allowable Uses" was not analyzed in this report. It represents a condition where the entire IDB would be leased up without any change in use. Typically, this would represent No-Build Conditions but in this study, the existing occupancy rate of 60% was maintained under No-Build Conditions, as directed by BRA and BTD.
3) Trip generation rates were applied the quantities in this column for the Build Conditions analysis.

2.4.4 Travel Mode Share

The BTD publishes vehicle, transit, and travel mode shares specific to each area of Boston. The Project site is located within BTD Area 13. As dictated by the BTD, it is standard practice to use these specific neighborhood mode shares to estimate the number of new vehicle trips, transit trips, and walk/bicycle trips generated by the Project.

The published BTD mode shares for Area 13, however, do not consider the 2004 opening of the Silver Line Phase II or the proposed Phase III. Between 1999 and 2001, Massport filed a series of permitting documents with MEPA for overall development of the Commonwealth Flats Development Area (CFDA). In these documents, Massport adopted updated travel mode shares in the South Boston Waterfront to better reflect future transit services in the area. Later, during permitting of the Seaport Square project, the Boston Global Investors study team adopted these revised travel mode shares to maintain consistency with CFDA and other nearby projects.

For the General Office, Industrial Office, Research and Development, Retail, and Restaurant uses, adopted mode shares are consistent with prior studies. For the Light Manufacturing and Warehouse uses, which generate a higher proportion of truck trips than other site uses, the mode shares from prior studies were applied only to the non-truck portion of trips and then recombined with truck trips, resulting in a higher vehicle share and therefore more conservative impact results.

Table 2-14 shows the mode shares adopted for the Project uses and the vehicle occupancy rates, adopted from the 2009 National Household Travel Survey.

A recent survey of employees at 27 Drydock Avenue show that employee auto mode share is about 23%, transit mode share is about 75%, and other is 2%. This survey data indicates that the auto travel mode shares shown in Table 2-14 may be higher than actual conditions but will produce more conservative (i.e., higher) traffic impact results for this study.

2.4.5 Project Trip Generation

Table 2-15 shows the Project vehicle trips generated by each component of the program. During peak hours, the Project's use conversion (as opposed to lease up of the vacant space) accounts for only approximately 32% of all new vehicle trips included in the analysis.

Table 2-16 shows the Project transit trips and Table 2-17 shows the walk/bicycle trips.

The trip generation worksheets showing trips by land use and travel mode are included in Appendix B.

Table 2-14 Travel Mode Shares and Vehicle Occupancy

Land Use	Direction	Travel Mode Share			Vehicle Occupancy Rate
		Vehicle	Transit	Walk/ Bicycle	
Daily					
General Office Industrial Office Research and Development	In	31%	49%	20%	1.13
	Out	31%	49%	20%	
Light Manufacturing Warehousing	In	45%	39%	16%	1.13
	Out	45%	39%	16%	
Retail Restaurant	In	39%	34%	27%	1.78
	Out	39%	34%	27%	
a.m. Peak Hour					
General Office Industrial Office Research and Development	In	33%	55%	12%	1.13
	Out	27%	25%	48%	
Light Manufacturing Warehousing	In	46%	44%	10%	1.13
	Out	42%	20%	38%	
Retail Restaurant	In	38%	62%	0%	1.78
	Out	39%	46%	15%	
p.m. Peak Hour					
General Office Industrial Office Research and Development	In	29%	37%	34%	1.13
	Out	33%	56%	11%	
Light Manufacturing Warehousing	In	43%	30%	27%	1.13
	Out	46%	45%	9%	
Retail Restaurant	In	39%	38%	23%	1.78
	Out	39%	38%	23%	

Table 2-15 Vehicle Trips by Time Period

Time Period	Direction	Lease Up Vacant Space	Project Program	Net New [1]
Daily	In	962	606	1,568
	Out	962	606	1,568
	Total	1,924	1,212	3,136
a.m. Peak Hour	In	137	57	194
	Out	36	26	62
	Total	173	83	256
p.m. Peak Hour	In	68	47	115
	Out	167	67	234
	Total	235	114	349

1) Trips estimated for net change in land use shown in Table 2-13.

Table 2-16 Transit Person Trips by Time Period

Time Period	Direction	Lease Up Vacant Space	Project Program	Net New [1]
Daily	In	1,600	966	2,566
	Out	1,600	966	2,566
	Total	3,200	1,932	5,132
a.m. Peak Hour	In	286	136	422
	Out	59	51	110
	Total	345	187	532
p.m. Peak Hour	In	105	80	185
	Out	306	121	427
	Total	411	201	612

1) Trips estimated for net change in land use shown in Table 2-13.

Table 2-17 Walk/Bicycle Person Trips by Time Period

Time Period	Direction	Lease Up Vacant Space	Project Program	Net New [1]
Daily	In	936	691	1,627
	Out	936	691	1,627
	Total	1,872	1,382	3,254
a.m. Peak Hour	In	47	12	59
	Out	49	22	71
	Total	96	34	130
p.m. Peak Hour	In	76	50	126
	Out	88	53	141
	Total	164	103	267

1) Trips estimated for net change in land use shown in Table 2-13.

2.4.6 Trip Distribution

Vehicular trip distribution was developed using origin-destination data from BTD for Area 13, vehicle counts at the two BMIP gateway intersections (Northern Avenue/Massport Haul Road and Summer Street/Drydock Avenue) and knowledge of the local area roadway network.

Figures 2-16 and 2-17 show the trip distribution pattern for new vehicle trips for entering and exiting vehicles, respectively. Within the BMIP, the vehicles are distributed based on parking supply locations shown in Table 2-5.

2.4.7 Build Conditions Traffic Operations

The Project's new vehicle trips added to the study area intersections are shown in Figures 2-18 and 2-19 for the a.m. and p.m. peak hour, respectively.

The resulting 2019 Build Conditions traffic volumes are shown in Figures 2-20 and 2-21 for the a.m. and p.m. peak hours, respectively.

The resulting capacity analysis summaries for the Build Conditions are shown in Tables 2-18 and 2-19. The tables show LOS, average delay, volume to capacity ratio, and 95th percentile queue length (feet) for the overall intersection and each approach.

Complete Synchro reports are provided in Appendix B.

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Figure 2-16
Vehicle Trip Entering Distribution

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Figure 2-17
Vehicle Trip Exiting Distribution

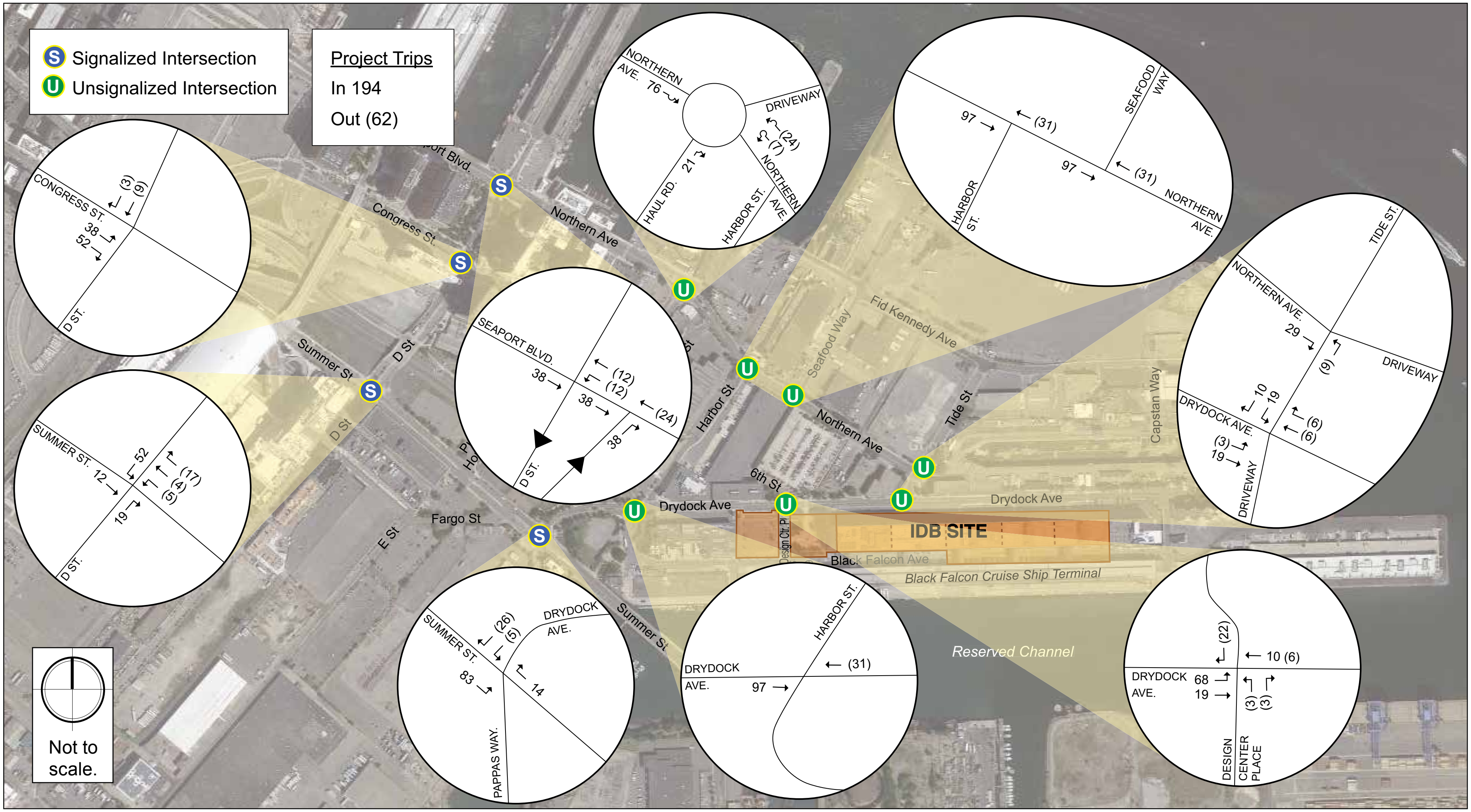

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Figure 2-18

Project-generated Vehicle Trips, a.m. Peak Hour

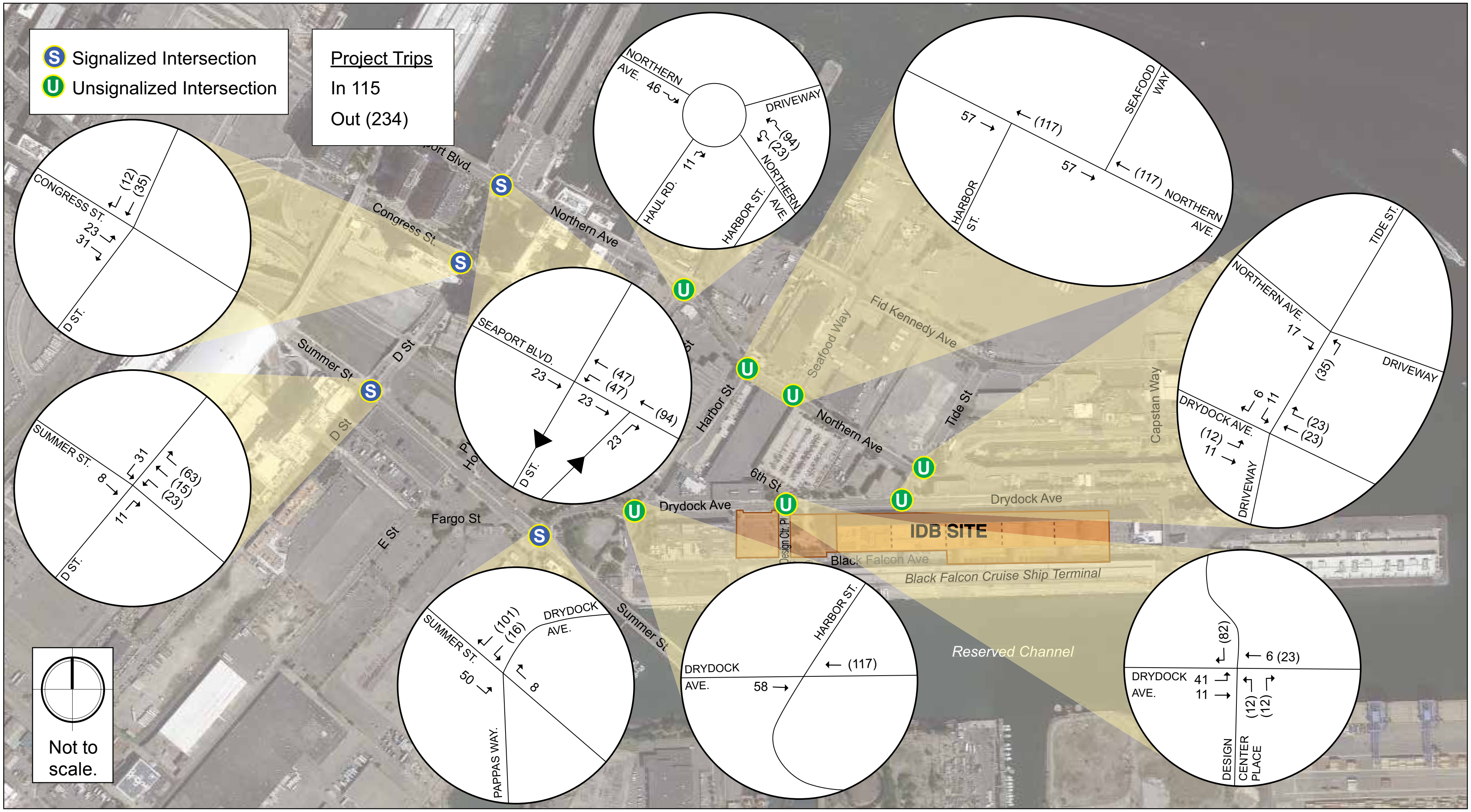

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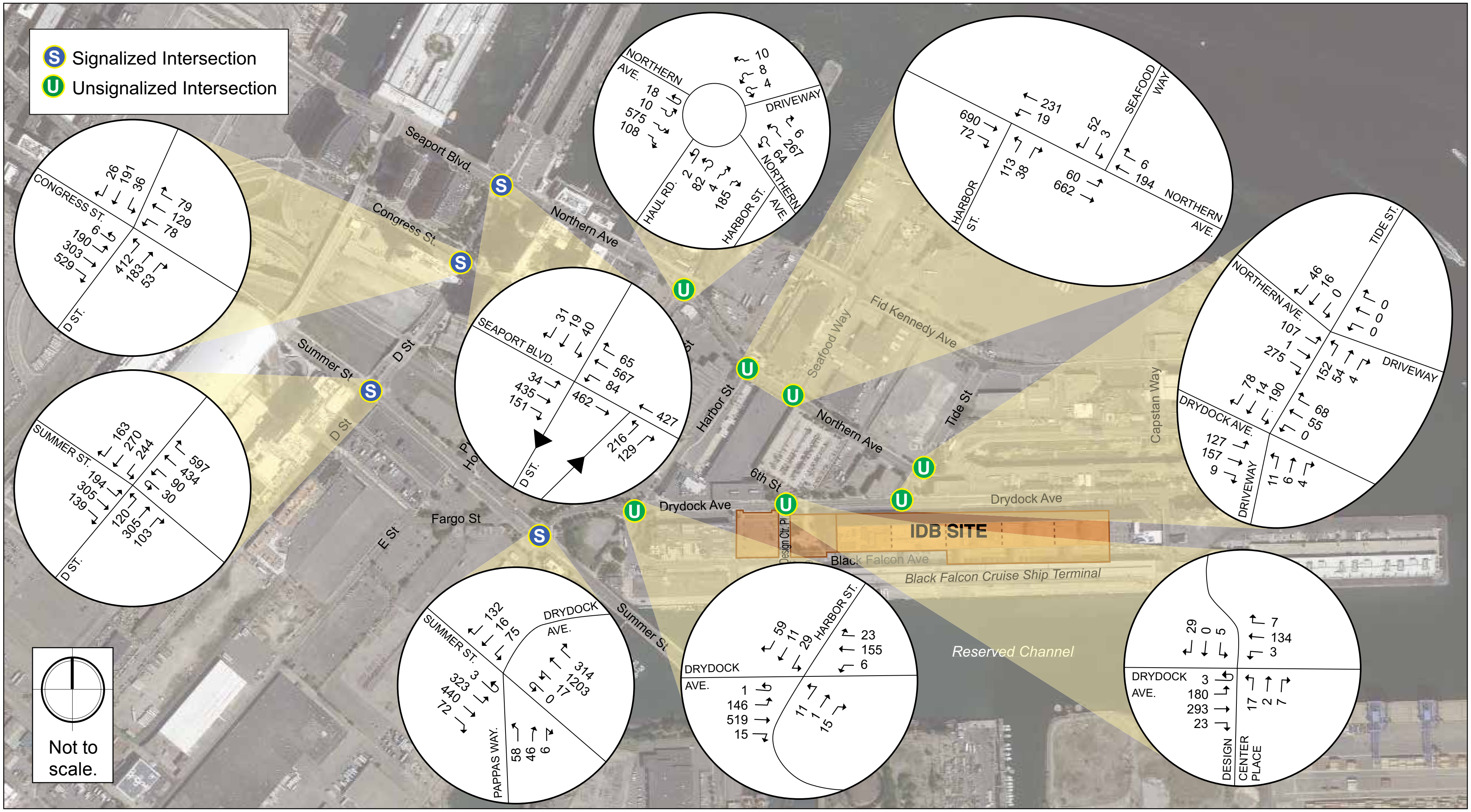
Figure 2-19

Project-generated Vehicle Trips, p.m. Peak Hour



Innovation and Design Building **Boston, Massachusetts**

Figure 2-20

Build Conditions (2019) Intersection Volumes, a.m. Peak Hour

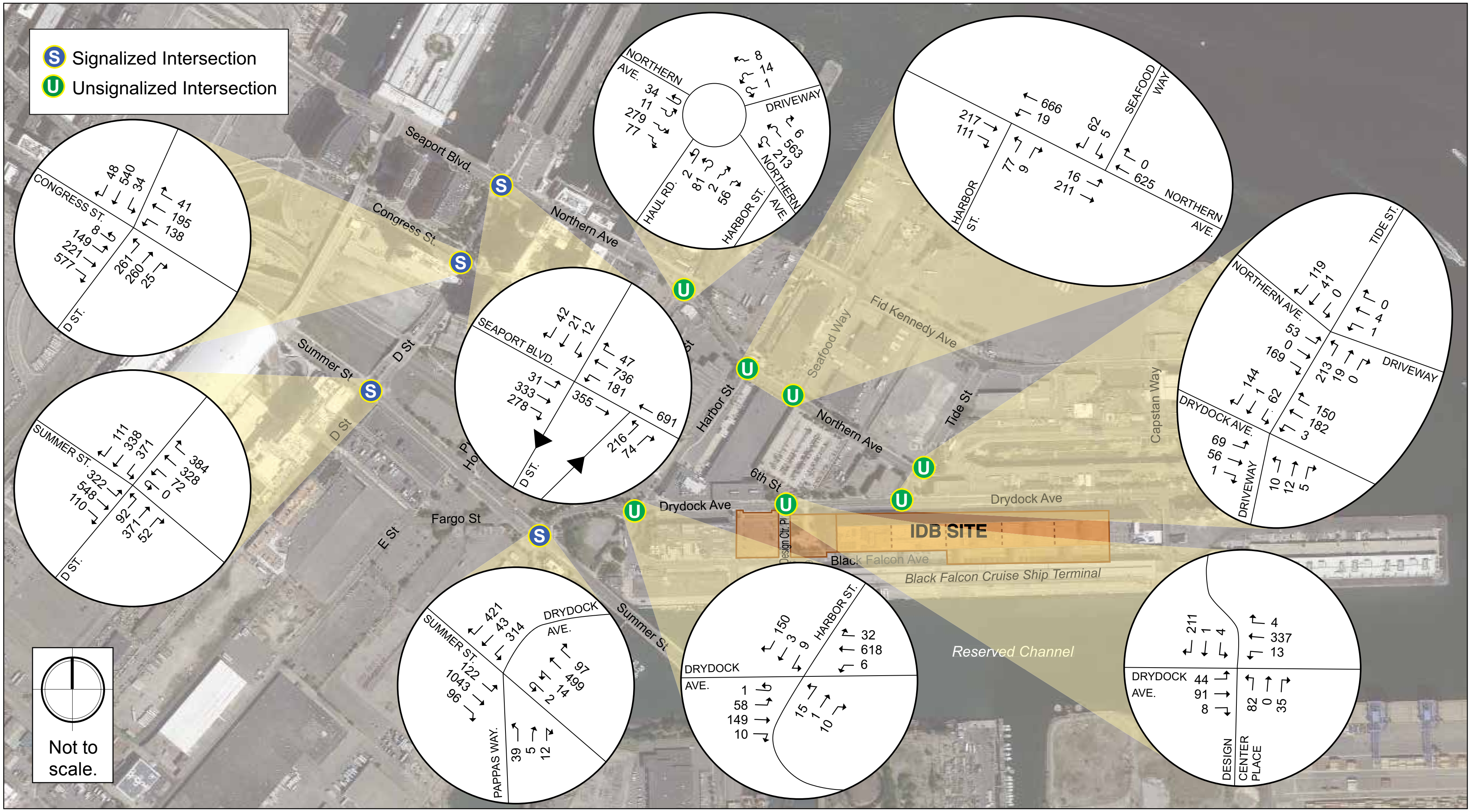


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Figure 2-21

Build Conditions (2019) Intersection Volumes, p.m. Peak Hour

Table 2-18 Build Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Summer Street/Drydock Avenue	**F**	**>80.0**		
Summer EB left	F	>80.0	>1.00	#461
Summer EB thru | thru/right	A	7.1	0.33	139
Summer WB left	D	43.9	0.47	25
Summer WB thru | thru/right	F	>80.0	>1.00	#853
Pappas NB left/thru/right	E	58.8	0.77	#142
Drydock SB left/thru	E	69.6	0.81	#133
Drydock SB right	A	5.4	0.28	35
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**C**	**20.2**		
Seaport EB left/thru | thru/right	C	29.6	0.70	#335
Seaport WB left/thru | thru/right	A	5.8	0.56	m51
Fish Pier SB left/thru/right	D	51.1	0.70	97
Northern Avenue/D Street (northbound)	**C**	**23.1**		
Northern EB thru | thru	A	4.3	0.29	25
Northern WB thru | thru	C	21.0	0.34	178
D NB left	E	78.8	0.92	m#234
D NB right	B	10.5	0.54	m6
Congress Street/D Street	**E**	**66.0**		
Congress EB left/thru | thru/right	E	56.8	0.93	#323
Congress EB right	C	24.2	0.90	#271
Congress WB left/thru | thru/right	F	>80.0	>1.00	#109
D NB left	F	>80.0	0.89	#324
D NB left/thru | thru/right	E	62.8	0.87	164
D SB left/thru | thru/right	D	54.6	0.74	126
Summer Street/D Street	**E**	**73.4**		
Summer EB left	E	68.5	0.93	#228
Summer EB thru | thru/right	B	18.2	0.43	130
Summer WB left/thru | thru	F	>80.0	>1.00dl	#410
Summer WB right	C	31.3	0.84	#538
D NB left	D	42.7	0.57	119
D NB thru | thru/right	D	38.2	0.69	180
D SB left	E	75.2	0.94	#291
D SB thru | thru/right	C	26.5	0.64	176

Table 2-18 Build Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	2.1	0.18	13
Drydock WB left/thru/right	A	0.7	0.02	1
Harbor NB left/thru	F	>50.0	0.29	27
Harbor NB right	B	12.2	0.05	4
Harbor SB left/thru/right	D	34.5	0.56	79
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	4.6	0.19	18
Drydock WB left/thru/right	A	0.4	0.01	0
Design Center NB left/thru/right	D	26.9	0.20	19
Garage SB left/thru/right	B	13.3	0.09	7
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	3.7	0.11	9
Drydock WB left/thru/right	A	0.0	0.00	0
Parking NB left/thru/right	C	16.2	0.10	8
Tide SB left/thru/right	E	37.7	0.78	165
Northern Avenue/Tide Street				
Northern EB left/thru/right	C	21.0	0.69	136
Alley WB left/thru/right	A	0.0	0.00	0
Tide NB left/thru/right	A	6.4	0.15	14
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.06	5
Northern WB thru/right	A	0.0	0.14	0
Seafood SB left/right	B	12.0	0.12	10
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.51	0
Northern WB left/thru	A	1.4	0.04	3
Harbor NB left/right	F	>50.0	0.82	154

Table 2-18 Build Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Unsignalized Roundabouts				
Northern Avenue/Massport Haul Road				
Northern EB left/thru	C	16.4	0.71	100
Northern EB right	A	5.1	0.13	9
Northern WB left	A	6.6	0.11	7
Northern WB thru/right	A	8.8	0.36	28
Massport Haul NB left/thru	B	10.8	0.21	17
Massport Haul NB right	C	15.7	0.43	45
Parking SB left/thru/right	A	7.2	0.04	3

\# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.

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

Light grey shading indicates a decline in LOS from No-Build Conditions into LOS E or LOS F.

Table 2-19 Build Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Summer Street/Drydock Avenue	**D**	**41.0**		
Summer EB left	B	17.0	0.52	79
Summer EB thru | thru/right	B	16.7	0.75	436
Summer WB left	D	37.1	0.37	26
Summer WB thru | thru/right	C	22.3	0.66	234
Pappas NB left/thru/right	F	>80.0	0.85	#86
Drydock SB left/thru	F	>80.0	>1.00	#408
Drydock SB right	A	7.4	0.60	70
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**C**	**23.6**		
Seaport EB left/thru | thru/right	C	27.7	0.73	#350
Seaport WB left/thru | thru/right	B	19.6	0.82	m#184
Fish Pier SB left/thru/right	C	31.9	0.61	59
Northern Avenue/D Street (northbound)	**D**	**39.2**		
Northern EB thru | thru	A	4.3	0.21	20
Northern WB thru | thru	C	21.2	0.54	289
D NB left	F	>80.0	>1.00	m#256
D NB right	B	14.4	0.35	m19

Table 2-19 Build Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Congress Street/D Street	**F**	**>80.0**		
Congress EB left/thru | thru/right	F	>80.0	>1.00	189
Congress EB right	F	>80.0	>1.00	#426
Congress WB left/thru | thru/right	F	>80.0	>1.00	155
D NB left	E	73.1	0.75	212
D NB left/thru | thru/right	E	57.2	0.75	194
D SB left/thru | thru/right	F	>80.0	0.93	m#374
Summer Street/D Street	**D**	**49.8**		
Summer EB left	F	>80.0	>1.00	#322
Summer EB thru | thru/right	C	22.1	0.55	220
Summer WB left/thru | thru	E	78.4	>1.00dl	#231
Summer WB right	C	23.2	0.68	248
D NB left	D	36.4	0.38	95
D NB thru | thru/right	D	47.5	0.83	186
D SB left	E	73.3	0.96	m#394
D SB thru | thru/right	D	53.9	0.96	#336
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	3.3	0.14	13
Drydock WB left/thru/right	A	0.2	0.01	0
Harbor NB left/thru	F	>50.0	0.89	70
Harbor NB right	B	10.1	0.02	2
Harbor SB left/thru/right	F	>50.0	0.98	226
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	4.8	0.11	9
Drydock WB left/thru/right	A	0.5	0.02	1
Design Center NB left/thru/right	F	>50.0	>1.00	415
Garage SB left/thru/right	C	22.0	0.62	104
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	5.4	0.10	8
Drydock WB left/thru/right	A	0.3	0.01	1
Parking NB left/thru/right	C	22.3	0.21	20
Tide SB left/thru/right	C	21.6	0.56	86
Northern Avenue/Tide Street				
Northern EB left/thru/right	E	47.4	0.87	225
Alley WB left/thru/right	C	20.8	0.08	7
Tide NB left/thru/right	A	7.7	0.20	18
Tide SB left/thru/right	A	0.0	0.00	0

Table 2-19 Build Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour (Continued)

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Unsignalized Intersections				
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.1	0.03	2
Northern WB thru/right	A	0.0	0.42	0
Seafood SB left/right	C	18.5	0.25	24
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.23	0
Northern WB left/thru	A	0.8	0.03	2
Harbor NB left/right	D	30.5	0.44	52
Unsignalized Roundabouts				
Northern Avenue/Massport Haul Road				
Northern EB left/thru	A	10.0	0.43	37
Northern EB right	A	5.2	0.10	7
Northern WB left	A	7.4	0.28	22
Northern WB thru/right	B	14.0	0.65	89
Massport Haul NB left/thru	A	6.3	0.13	11
Massport Haul NB right	A	8.8	0.12	10
Parking SB left/thru/right	A	8.0	0.05	3

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.
m = Volume for the 95th percentile queue is metered by the upstream signal.
Light grey shading indicates a decline in LOS from No-Build Conditions into LOS E or LOS F.

Signalized

During the a.m. peak hour Build Conditions, only one signalized intersection, Summer Street/Drydock Avenue, would experience a change in overall level of service compared to the No-Build Conditions. Therefore, even though certain individual approaches, discussed below, would deteriorate from LOS E to LOS F, the relative impact of the net new Project trips is minimal.

At Summer Street/Drydock Avenue during the a.m. peak hour, the overall LOS worsens from an overall LOS E to LOS F under the Build Conditions. During the p.m. peak hour, LOS would remain unchanged at LOS D. This location carries a significant volume of traffic from residential South Boston toward the Seaport, downtown, and regional ramp connections. Two approaches already operate at LOS E under a.m. peak hour Existing Conditions.

During the a.m. peak hour, the Congress Street eastbound approach at the Congress Street/D Street intersection worsens from LOS D to LOS E. The overall intersection operation remains at LOS E.

Similarly, during the a.m. peak hour at Summer Street/D Street, the D Street southbound left lane worsens from LOS D to LOS E, but the overall intersection remains at LOS E.

During the p.m. peak hour no signalized intersection would experience an overall change in LOS.

Unsignalized and Roundabout

Several minor street approaches, as discussed below, are forecasted to operate at LOS E or LOS F under the Build Conditions. This level of operation is not uncommon for unsignalized side streets (with stop signs) that intersect arterial roadways such as Drydock Avenue. The HCM analysis for unsignalized intersections incorporates more conservative parameters than what is typically experienced in an urban environment, such as critical gap.[3] Given the methodology, it is important to recognize that the forecasted delays/queues under LOS E or LOS F are likely overestimated when compared to real world conditions.

During the a.m. peak hour Drydock Avenue/Tide Street, the southbound Tide Street approach would worsen from LOS D to LOS E.

During the p.m. peak hour, at Drydock Avenue/Harbor Street, the Harbor Street southbound approach would worsen from LOS E to LOS F.

During the p.m. peak hour, at Drydock Avenue/Design Center Place, the Design Center Place northbound approach would worsen from LOS E to LOS F.

During the p.m. peak hour, at Northern Avenue/Tide Street, the Northern Avenue eastbound approach would worsen from LOS D to LOS E.

All approaches at the Northern Avenue/Mass Haul Road roundabout would operate at LOS C or better.

Traffic mitigation measures are discussed in Section 2.5.

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3 The critical gap is the minimum length of time interval in the major street traffic stream that allows intersection entry for one minor street vehicle.

2.4.8 Build Conditions Parking

Through long-term leases with EDIC, the Proponent currently has rights to an estimated 1,511 parking spaces. As shown previously in Table 2-5, approximately 511 of these spaces are tenant-controlled (with approximately 175 of these designated as short-term visitor parking, primarily serving the BDC, and 1,000 of the spaces are available in the BMIP garage on a first-come, first-served basis. The total number of parking spaces allocated to the IDB will not change under the Build Conditions.

BTD has set parking space goals and guidelines throughout the City to establish the amount of parking supply provided with new developments. In the South Boston Waterfront, the City has established a parking supply ratio goal of 0.7 spaces per 1,000 square feet for office and non-residential land uses. When the 1,000 spaces open to the general public on a first-come, first-served basis in the BMIP garage are considered in the calculation, the IDB's existing parking supply is 1.09 spaces per 1,000 square feet, higher than BTD's recommended supply ratio. The BMIP has historically provided higher than average parking ratios because of its lower than average access to public transit lines. Higher than average parking ratios in the BMIP have also served to keep the in-city location competitive with suburban areas that have successfully attracted industrial and innovation economy businesses over the last several decades.

Notwithstanding the forgoing, the Proponent recognizes that the total number of allocated parking spaces at the IDB exceeds the City's goals and it will continue to work to reduce the auto-dependency of building occupants by encouraging alternate means of transportation such as MBTA buses and the Proponent-sponsored shuttle bus; bicycles, including Hubway; and car share programs such as Zipcar and Enterprise. The Proponent is also willing to work with EDIC to explore options for transportation to/from the BMIP via water.

2.4.9 Build Conditions Public Transportation

As shown in Table 2-16, the Project will generate an estimated new 5,132 public transportation trips daily, with 532 new trips during the a.m. peak hour and 612 new trips during the p.m. peak hour.

As described in Section 2.2.6, both the Route 7 service, with stops on Summer Street near Drydock Avenue, and the Silver Line 2 (SL2) service, with stops on Drydock Avenue directly in front of the site, each run with five minute headways during peak hours. Route 4, which operates through BMIP, has a fifteen-minute headway during peak hours.

In the summer and fall of 2014, the Proponent will be implementing new shuttle bus connections from the IDB to South and North Stations to supplement existing transit options. It is anticipated that the two shuttles will run continuously during peak periods and each will have seats for approximately twenty-five passengers.

Based on hourly capacity and frequency of transit services, it is anticipated that, on average, the IDB will generate fifteen new transit riders on each SL2 trip (peak direction), eleven new riders on each Route 7 trip, four new riders on each Route 4 trip, and twenty-five new riders on each shuttle trip.

It is important to note that during the morning, most new IDB transit riders will be arriving outbound from connections in downtown and, conversely, during the evening, most will be destined inbound to downtown connections. The peak load points on the Route 7 bus, which operates between downtown Boston and residential South Boston, occur on the inbound (to downtown) direction in the morning and on the outbound direction (from downtown) in the afternoon. Therefore, the additional IDB transit riders on Route 7 will be travelling in the reverse commute direction and will not significantly impact peak direction conditions.

While the existing peak demand on both the SL2 and Route 4 service corresponds to the peak direction of travel for new IDB transit riders, excess capacity does exist on these services to accommodate the additional riders estimated above.

2.4.10 Build Conditions Pedestrian and Bicycle Conditions

As shown in Table 2-17, the Project will generate an estimated new 3,254 daily walk /bicycle trips, with 130 new trips during the a.m. peak hour and 267 trips during the p.m. peak hour. Sidewalks in the study area are generally in good condition, and supply more than adequate capacity. Handicapped-accessible ramps and crosswalks are provided at most study area intersections. A buffered bicycle lane exists along Drydock Avenue and the City's five-year transportation plan includes a new buffered bicycle lane on Northern Avenue.

The BTD has established bicycle parking guidelines for projects subject to a TAPA and Article 80 Review. The guidelines set standards for bicycle parking and shower facilities.

For employees, 0.3 secure/covered bicycle parking spaces per 1,000 sf for office/industrial uses is recommended. Associated shower facilities are to be provided at the rate of one shower/changing facility for the first 40,000 sf and one for each additional 80,000 sf. For visitors, open space parking is to be provided for 2.5% of building users. Based on the Project uses, a summary of recommended bicycle accommodations is presented in Table 2-20. Table 2-20 presents bicycle requirements of the entire IDB and not just the Project Program (change in use).

Table 2-20 BTD Guidelines for Project Bicycle Accommodation – Entire IDB

Project Use	Employees		Visitors
	Secure Bicycle Spaces	Showers/ Changing Facilities	Open Space Bicycle Racks
Office, Industrial and Other (1,279,192 sf)	384	16	117
Retail/Restaurant (110,000 sf)	33	na	22
Total (1,389,192 sf)	417	16	139

As part of the Project, the Proponent will initially provide 300 new, secure bicycle spaces inside the Bronstein Center for use by all of the IDB's tenants' employees and will provide multiple shower/changing facilities. The Proponent will work with Boston Bikes, BTD, and EDIC to identify the appropriate number of bicycle racks for visitors. All bicycle racks, signs, and parking areas will conform to BTD standards.

To encourage and support bicycle activity, the Proponent recently installed two new Hubway stations (for 18 bicycles) at the IDB site. In addition to sponsoring the stations, the Proponent also donated construction of the accompanying concrete pads, access ramps, and safety striping.

2.4.11 Build Conditions Loading and Service Activity

The IDB's service and loading areas will remain along Drydock Avenue and Black Falcon Avenue. In order to address existing loading facility deficiencies described above in Section 2.2.10, the IDB will upgrade the loading facilities along both Drydock Avenue and Black Falcon Avenue. The changes recommended in the Preferred Loading Option, as defined below, along Black Falcon Avenue as detailed below will require either EDIC approval under the leases or may require certain lease amendments. Further coordination with Massport regarding how these changes would benefit operations at the Cruiseport will also be required. As such, both an "As-of-Right" Loading Option and the Preferred Loading Option are detailed below.

The intent of both loading options is to improve overall loading and building service operations while simultaneously improving the pedestrian experience along Drydock Avenue's linear walkway and improving overall the access and experience to patrons of the Massport Cruiseport terminal. Under both loading options, trucks making deliveries requiring a raised loading platform will generally use the Black Falcon Avenue positions (approximately 22% of all deliveries) while the balance of the IDB's deliveries (i.e., those not requiring a platform) will generally be assigned to the Drydock Avenue positions. This scenario will reduce existing pedestrian/delivery conflicts that occur along the linear walkway fronting the Drydock Avenue side of the IDB.

The traffic analysis in this study incorporates the appropriate level of truck volumes through each study area intersection and would not be affected by changing the distribution of the IDB deliveries between Drydock Avenue and Black Flacon Avenue.

"As-of-Right" Loading Option

The As-of-Right Loading Option maintains delivery and building servicing infrastructure on both Drydock Avenue and Black Falcon Avenue while providing improvements to the current conditions. This plan anticipates a reconfiguration of truck parking and loading door locations on both sides of the building to improve overall efficiency and separate pedestrian and loading zones. Such changes would not require modifications to existing easements on Black Falcon Avenue. The existing Black Falcon Avenue loading positions would be shifted to keep trucks outside of easement areas and would be upgraded to provide for internal raised loading docks. The Black Falcon Avenue loading positions would be engineered to allow single unit box trucks of up to 40 feet in length to access the facility without interruption to traffic on Black Falcon Avenue. The Drydock Avenue loading positions would be redefined as noted below in the Loading and Delivery Operations and Management Plan. A new internal service corridor would run throughout the building connecting all loading docks, doors, and building cores.

Preferred Loading Option

The Preferred Loading Option provides improvements over the As-of-Right Loading Option (described above); however, its implementation would require modification or relocation of existing easement areas on Black Falcon Avenue. This plan provides twelve loading doors along Black Falcon Avenue, compared to seven in the As-of-Right Loading Option, which helps meet the projected loading demands. In addition, this preferred plan locates more loading doors further away from the existing Cruiseport, where cruise passenger pick-up/drop-off activity is highest. The preferred plan also spreads Black Falcon Avenue loading docks more evenly between the three sections of the Bronstein building, allowing for shorter travel paths to freight elevators and greater loading efficiency. It also allows more space and ability to group IDB cooling towers on Black Falcon Avenue, and such grouping of equipment allows for a cleaner configuration of screening around equipment, resulting in a more aesthetically appealing façade when viewed from the Cruiseport to the south. A new internal service corridor would run throughout the building connecting all loading docks, doors, and building cores. Similar to the As-of-Right Loading Option, the Drydock Avenue loading positions would be redefined as noted below in the Loading and Delivery Operations and Management Plan.

Future Projected Delivery Activity

An assessment of the future loading and delivery demand based on the proposed conversion or reclassification of industrial or vacant space to commercial space and 100% occupancy at the IDB has been developed for this Expanded PNF. The methodology employed the loading survey data collected at the IDB for this study (see Section 2.2.10) and developed a weighted growth factor based on land use changes and current vacant space.

As presented in Figure 2-22, it is expected that delivery activity at the IDB will increase by 50% as a result of the net new building program (change in use) and the lease up of vacant space.

Proposed Loading and Delivery Operations and Management Plan

The proposed loading and delivery management plan described in detail below applied to both the As-of-Right Loading Option and the Preferred Loading Option.

Drydock Avenue

The proposed project will include thirty-two exterior delivery positions along Drydock Avenue: twenty-one positions will be for short-term (i.e., 30 minutes or less) deliveries by small vehicles; eight positions will be for longer-term deliveries from small vehicles; and six positions will be for tractor-trailers.

In total, about 78% of all loading and delivery activity, or approximately 220 deliveries on an average day, will occur from Drydock Avenue under the proposed Loading and Delivery Operations and Management Plan. A total of thirty-five loading or delivery positions will be dispersed along the Drydock Avenue parking areas on the north side of the IDB. Of the thirty-five total loading Drydock Avenue positions, twenty-one will be short-term (30-minute) parking spaces providing service to small vehicles (e.g., cars, vans, SUVs, or pick-up trucks), which are usually either couriers or vehicles delivering small items. These deliveries generally exhibit a short duration of stay. This small vehicle delivery activity accounts for 63% of all deliveries to the IDB, or an expected 178 deliveries per day on average. As shown in Figure 2-23, small vehicle deliveries peak around 1:00 p.m. and exhibit a median duration of stay of between 9 and 17 minutes and average under 30 minutes.

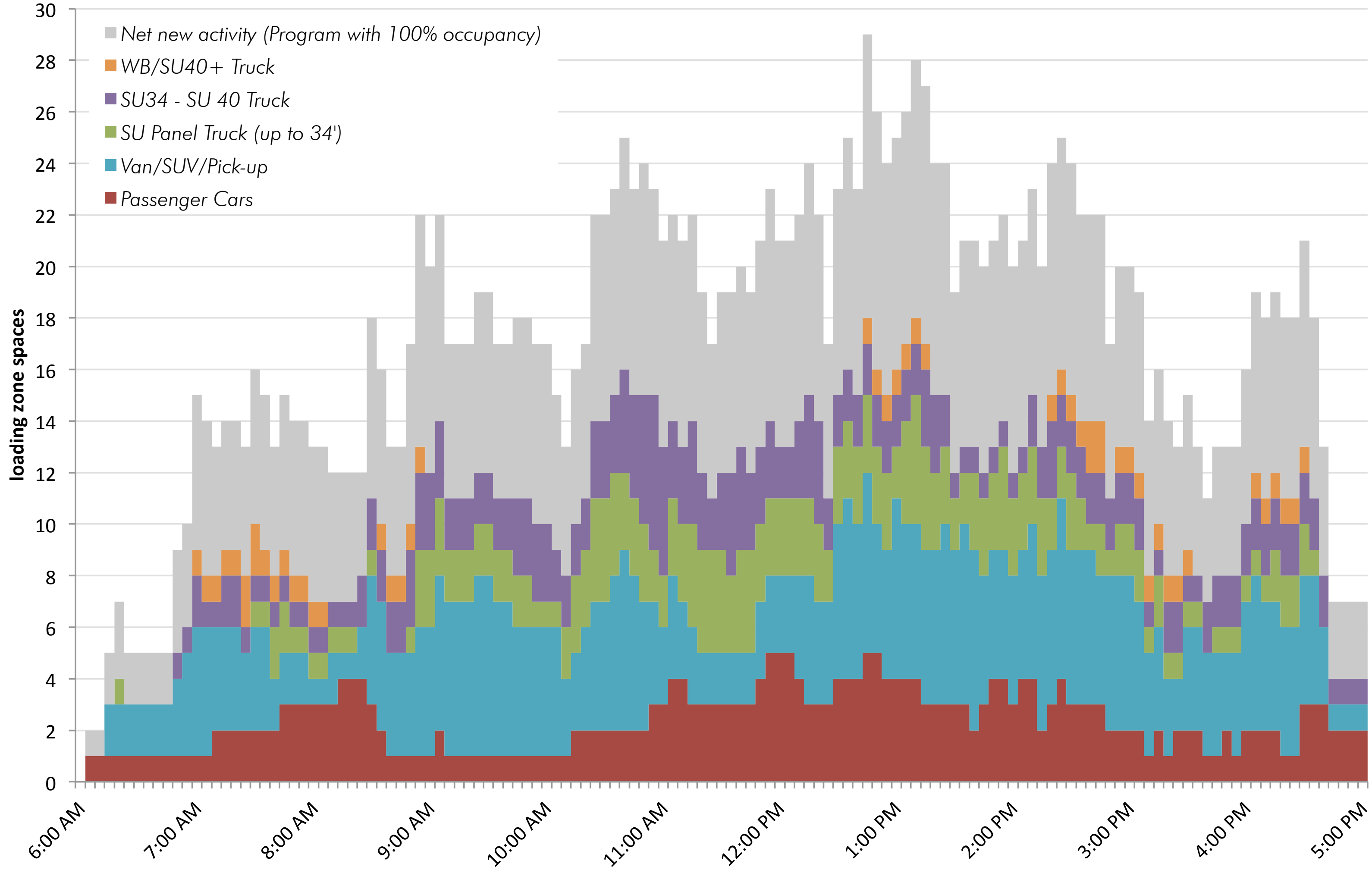

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Figure 2-22

IDB Loading Areas - Combined Future Activity and Occupancy

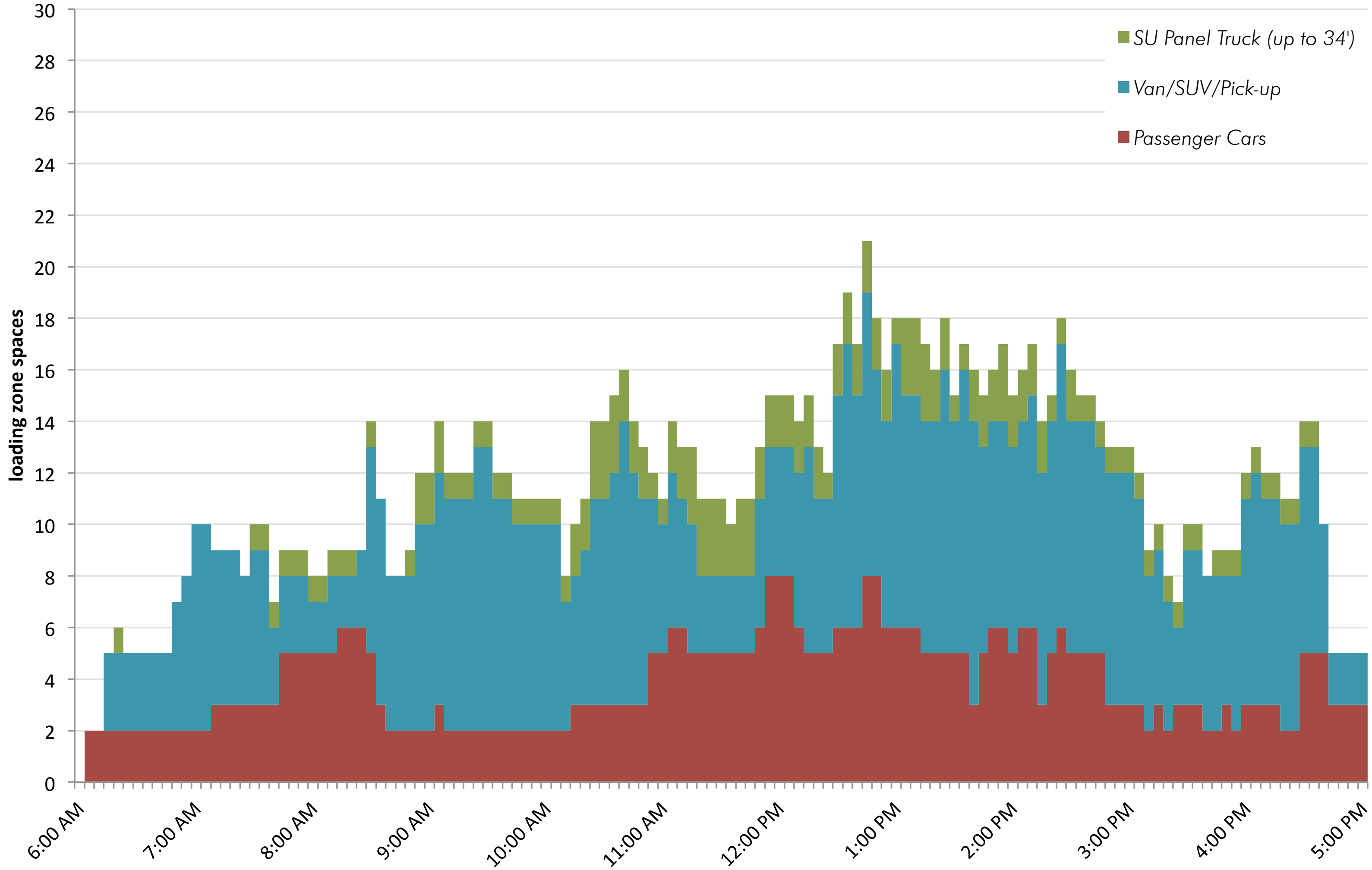

Figure 2-23

IDB Loading Areas - Future Activity and Occupancy - Drydock Avenue

Package deliveries by the typical overnight vendors (e.g., FedEx, Ups, etc.) are expected to comprise approximately 15% of all daily deliveries (42 deliveries on an average day). These package deliveries will use the Drydock Avenue parking areas because these are most convenient for such delivery and pick-up purposes, which often involve deliveries to multiple tenants in the IDB during one stop. In addition to the twenty-one short-term parking spaces described above, eight longer-term spaces will be provided near building entrances for larger package delivery vehicles. Six additional loading positions will be included along Drydock Avenue for tractor trailers and will accommodate all large vehicle delivery and loading activity during periods when the Black Falcon Avenue loading docks for tractor-trailers or other large vehicles are inaccessible due to Cruiseport activity.

Black Falcon Avenue

The Project anticipates providing twelve large vehicle loading positions in bays along Black Falcon Avenue.

Figure 2-24 presents the expected activity at the Black Falcon Avenue loading docks by vehicle size. The data show peak demand for between eight and eleven bays about three times a day. The median duration for deliveries by these large-size vehicles is double that of the duration by smaller vehicles (i.e., passenger cars, vans, SUVs, or pick-up trucks) with the average duration of such large vehicle deliveries being the same as that of the small vehicle deliveries (i.e., approximately 30 minutes). Approximately 22% of all deliveries, or approximately 62 deliveries per day are expected at the Black Falcon Avenue positions under the proposed loading and delivery operations and management plan.

Internal loading docks along Black Falcon Avenue will be built to accommodate all deliveries in vehicles larger than passenger cars, vans, SUVs, and pick-ups. Twelve new internal loading bays along Black Falcon Avenue will replace the ten existing loading doors. Large trucks of up to WB-50 (55-foot tractor-trailer) in size will be accommodated in six of these loading bays. The maximum number of tractor trailers projected to be on-site at any time is three. The remaining six bays will be able to accommodate vehicles of up to SU-40 size (40-foot single unit box truck).

Coordination with Massport Cruiseport Activity

The Proponent is in active discussions with Massport regarding coordination of loading activity at the IDB and activity associated with the Cruiseport across Black Falcon Avenue. As previously noted, Massport has proposed upgrades to Black Falcon Avenue to improve the pick-up/drop-off activity for the Cruiseport. These discussions have included conversion of Black Falcon Avenue to one-way westbound and demarcation of four through travel lanes, with the outer lane closest to the IDB likely to remain open at all times for through travel.

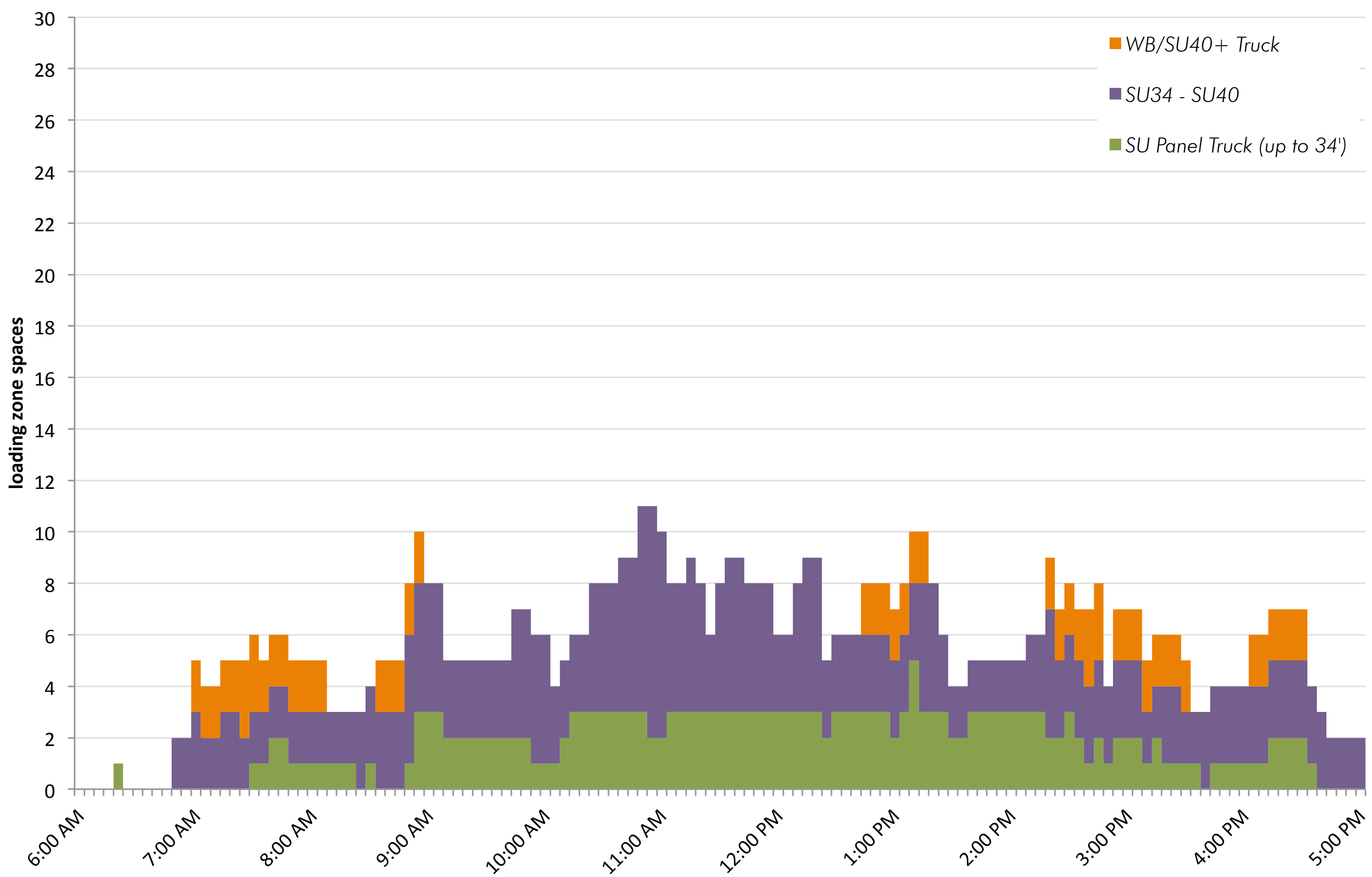

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Figure 2-24

IDB Loading Areas - Future Activity and Occupancy - Black Falcon Avenue

As presented in Figure 2-25, the IDB has designed the internal loading docks along Black Falcon Avenue for both the As-of-Right Loading Option and the Preferred Loading Option to allow for vehicles of up to SU-36 (36-foot single unit box truck) the ability to maneuver into the loading bay within a 27.5-foot buffer area without interfering with this outer through travel lane.

2.5 Transportation Mitigation Measures

The Proponent will continue to work with the City to create a Project that efficiently serves vehicle trips and protects truck access within the BMIP, maintains pedestrian safety, and encourages transit and bicycle use.

The Proponent is responsible for preparation of the 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 transportation mitigation elements that the Proponent has recommended in this section will be discussed with BTD and will be documented in the TAPA as agreed upon.

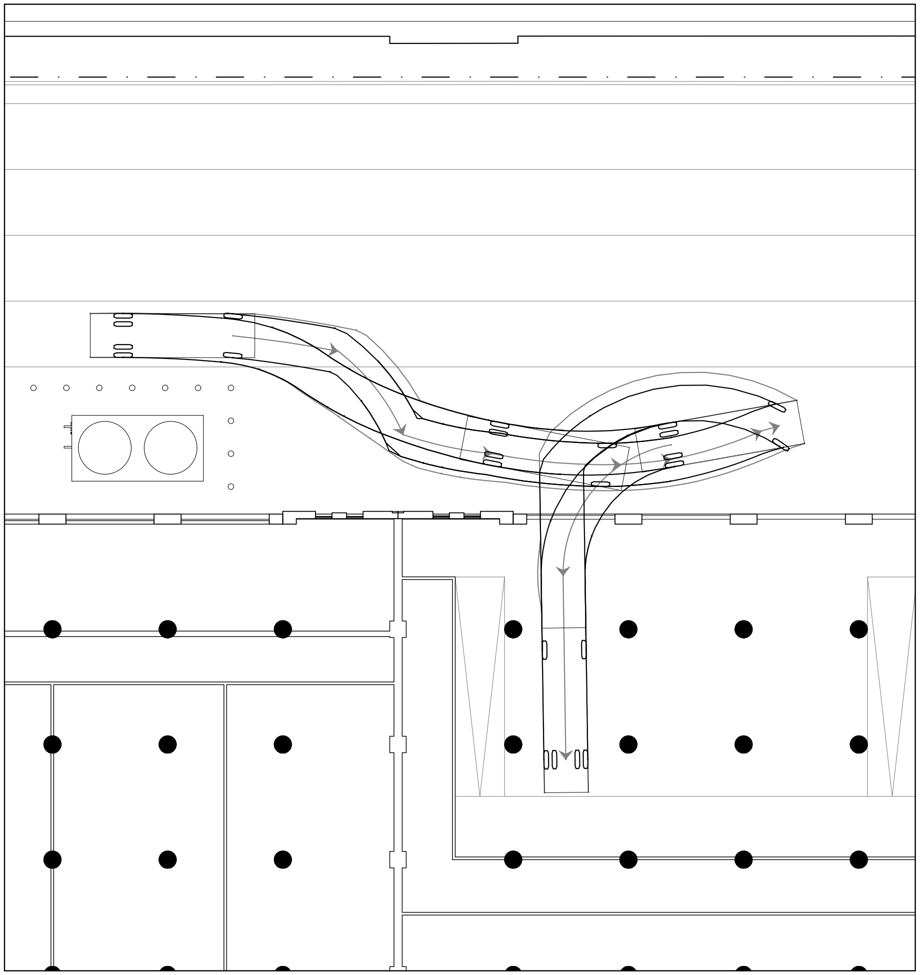
Certain streetscape improvements surrounding the site on Drydock Avenue, a private way, may require Public Improvement Commission (PIC) review and approval and/or the review and approval from EDIC as the fee owner of Drydock Avenue. As is standard practice, the Proponent will work with the City in continuing to develop and obtain approval for these improvements.

2.5.1 Traffic Mitigation

Although the traffic impacts associated with the Project vehicle trips are relatively minor (see Section 2.4.7), the study team assessed changes to signal timings at several signalized intersections in an effort to improve operating conditions. For the signalized locations discussed below, the mitigation results are presented in Table 2-21 and 2-22.

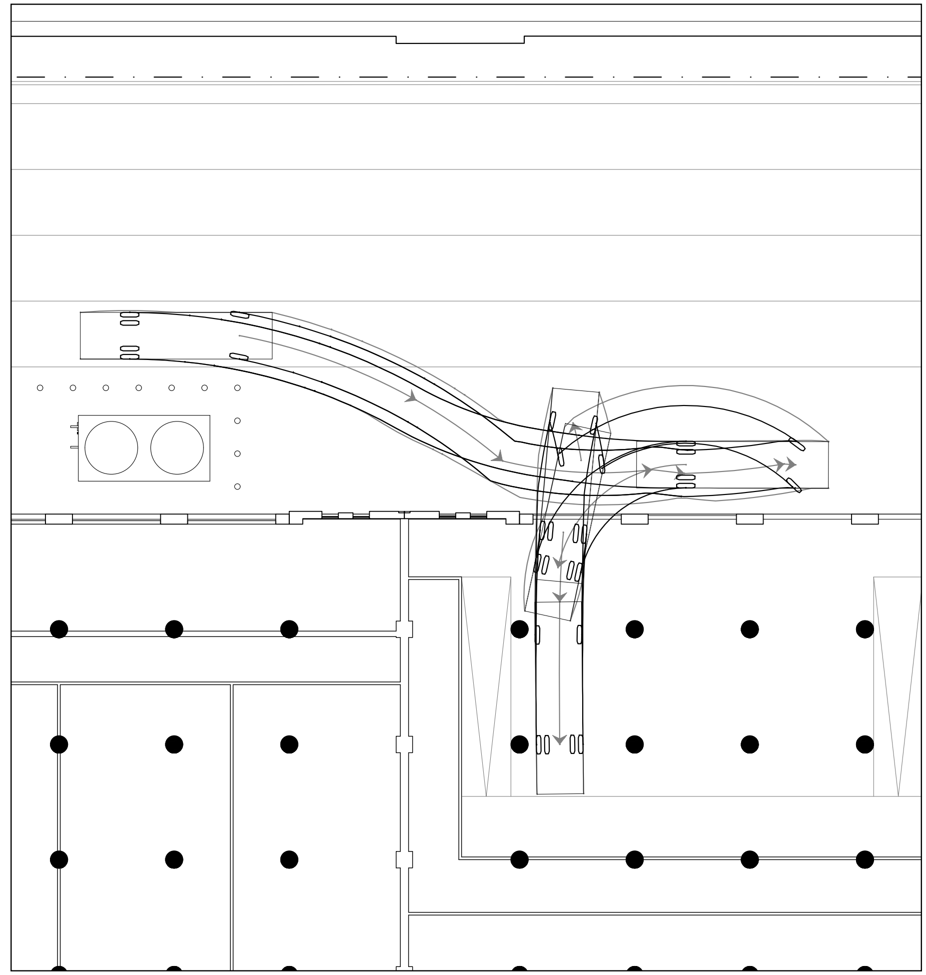
This section also addresses operation at the unsignalized intersections under the Build Conditions.

ntering Building 21 Dock



SU-30 Entering Building 21 Dock

Approximate Scale: 1” = 20’-0”



SU-35 Entering Building 21 Dock

Approximate Scale: 1” = 20’-0”

Figure 2-25

Black Falcon Avenue - Loading Dock Maneuvers

Table 2-21 Build with Mitigation Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Summer Street/Drydock Avenue	**F**	**>80.0**		
Summer EB left	F	>80.0	>1.00	#461
Summer EB thru | thru/right	A	7.1	0.33	139
Summer WB left	D	43.9	0.47	25
Summer WB thru | thru/right	F	>80.0	>1.00	#853
Pappas NB left/thru/right	E	58.8	0.77	#142
Drydock SB left/thru	E	69.6	0.81	#133
Drydock SB right	A	3.0	0.24	23
Signalized Intersections				
Northern Avenue/D Street (northbound)	**B**	**19.5**		
Northern EB thru | thru	A	7.6	0.31	36
Northern WB thru | thru	C	25.3	0.37	#211
D NB left	D	46.6	0.79	m175
D NB right	A	6.6	0.50	6
Congress Street/D Street	**E**	**57.5**		
Congress EB left/thru | thru/right	E	66.8	0.96	#317
Congress EB right	C	27.6	0.93	#282
Congress WB left/thru | thru/right	E	64.7	0.95	102
D NB left	F	>80.0	0.89	#309
D NB left/thru | thru/right	E	58.8	0.87	96
D SB left/thru | thru/right	D	53.2	0.74	m134
Summer Street/D Street	**E**	**68.5**		
Summer EB left	D	46.4	0.83	#196
Summer EB thru | thru/right	B	16.4	0.41	121
Summer WB left/thru | thru	F	>80.0	>1.00dl	#397
Summer WB right	C	32.6	0.85	#540
D NB left	D	43.6	0.58	120
D NB thru | thru/right	D	39.1	0.70	183
D SB left	F	>80.0	>1.00	#313
D SB thru | thru/right	C	25.4	0.69	184

= 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.

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

Light grey shading indicates a decline in LOS from Build Conditions into LOS E or LOS F.

Black shading indicates an improvement in LOS from Build Conditions. Changes from LOS E or LOS F into an LOS D or better are shaded black.

Table 2-22 Build with Mitigation Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (ft)
Signalized Intersections				
Summer Street/Drydock Avenue	**C**	**33.5**		
Summer EB left	C	25.3	0.61	#92
Summer EB thru | thru/right	C	21.6	0.79	#538
Summer WB left	C	35.1	0.32	27
Summer WB thru | thru/right	C	26.0	0.68	260
Pappas NB left/thru/right	C	30.5	0.43	52
Drydock SB left/thru	F	>80.0	>1.00	#360
Drydock SB right	A	6.1	0.58	55
Northern Avenue/D Street (northbound)	**C**	**27.6**		
Northern EB thru | thru	A	7.3	0.23	m25
Northern WB thru | thru	C	28.8	0.61	#388
D NB left	E	60.0	0.85	m201
D NB right	B	11.5	0.29	m18
Congress Street/D Street	**F**	**>80.0**		
Congress EB left/thru | thru/right	E	72.0	1.00	192
Congress EB right	D	40.6	0.98	#364
Congress WB left/thru | thru/right	E	64.3	0.95	145
D NB left	F	>80.0	0.89	#232
D NB left/thru | thru/right	F	>80.0	0.90	#210
D SB left/thru | thru/right	F	>80.0	>1.00	m#378
Summer Street/D Street	**D**	**48.2**		
Summer EB left	E	79.8	>1.00	#310
Summer EB thru | thru/right	C	21.4	0.54	215
Summer WB left/thru | thru	E	71.6	>1.00dl	#225
Summer WB right	C	22.2	0.66	242
D NB left	D	37.6	0.40	96
D NB thru | thru/right	D	51.2	0.86	188
D SB left	E	70.7	0.96	m#393
D SB thru | thru/right	D	51.1	0.96	#335

= 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.

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

Light grey shading indicates a decline in LOS from Build Conditions into LOS E or LOS F.

Black shading indicates an improvement in LOS from Build Conditions. Changes from LOS E or LOS F into an LOS D or better are shaded.

Summer Street/Drydock Avenue

Summer Street/Drydock Avenue is one of the two gateways into the BMIP, the Massport properties at the North Jetty, the International Cargo Port of Boston, and the Cruiseport.

Under the No-Build and Build Conditions, the Summer Street/Drydock Avenue intersection is forecasted to operate at LOS E and LOS F, respectively, during the a.m. peak hour. The study team examined numerous signal/phasing and lane use assignment changes, and concluded that no significant improvement to delays can be achieved without geometric or travel demand changes.

A Better City (ABC), along with the City, Massport, MassDOT, the MBTA, and local developers, is overseeing a comprehensive transportation study of the South Boston Waterfront. The Proponent is a financial contributor to the study and anticipates that the results of the ABC study may offer improvement options for the operation of the Summer Street/Drydock Avenue intersection. The Proponent will continue to work cooperatively with the City and will support an improvement plan for this location.

D Street Corridor

Because Seaport Boulevard/Northern Avenue/D Street (southbound) is forecasted to operate at LOS D or better under the Build Conditions, no mitigation is proposed.

At Northern Avenue/D Street (northbound), a minor timing change would improve the D Street northbound left to LOS D, from LOS E, during the a.m. peak hour.

Under the No-Build Conditions, Congress Street/D Street is already forecasted to operate at LOS E and LOS F during the a.m. and p.m. hour, respectively. The additional traffic under the Build Conditions does not change the overall levels of service. A minor timing change would reduce delays during the a.m. peak hour, but overall operation would remain at LOS E. A similar change during p.m. peak hour would improve one approach, the Congress Street eastbound right lane, to LOS D from LOS F.

Under the No-Build Conditions, Summer Street/D Street is already forecasted to operate at LOS E and LOS D during the a.m. and p.m. hour, respectively. The additional traffic under Build Conditions does not change the overall levels of service. A minor timing change would reduce delays during the a.m. peak hour, but overall operation would remain at LOS E.

As mentioned above, ABC's ongoing comprehensive South Boston Waterfront Transportation study will evaluate major traffic gateways in the area, including D Street. The Proponent anticipates that the study will address traffic operations along this key arterial and propose operational improvements.

Internal BMIP Intersections

At the unsignalized intersections within BMIP, the additional traffic under the Build Conditions would not cause significant traffic impacts over the No-Build Conditions and no mitigation is proposed.

Several minor street approaches, however, are forecasted to operate at LOS E or LOS F. This level of operation is not uncommon for unsignalized side streets (with stop signs) that intersect arterial roadways such as Drydock Avenue. The HCM analysis for unsignalized intersections incorporates more conservative parameters than what is typically experienced in an urban environment, such as critical gap.[4] Given the methodology, it is important to recognize that the forecasted delays/queues under LOS E or LOS F are likely overestimated when compared to real world conditions.

During the a.m. peak hour, only one approach would worsen under the Build Conditions relative to the No-Build Conditions: the Tide Street southbound approach at Drydock Avenue/Tide Street. This approach would worsen from LOS D to LOS E under the Build Conditions. The Proponent understands that a four-way stop control has been proposed by the 6 Tide Street study team to reduce delays for Tide Street traffic. Such a change, however, would increase delay for drivers on Drydock Avenue, as they would now be required to stop at Tide Street. Under the conditions set forth herein, the Proponent will support whatever control change the City ultimately adopts at this location.

During the p.m. peak hour, several minor street approaches, are forecasted to operate at LOS E or LOS F under the Build Conditions, including the Harbor Street southbound approach at Drydock Avenue/Harbor Street, the Design Center Place northbound approach at Drydock Avenue/Design Center Place and the Northern Avenue eastbound approach at Northern Avenue/Tide Street.

Northern Avenue/Massport Haul Road

Because all approaches at the Northern Avenue/Mass Haul Road roundabout would operate at LOS C or better under the Build Conditions, no mitigation is proposed.

2.5.2 Public Transportation

In the fall of 2014, the Proponent will be implementing a new shuttle connection from IDB to South Station to supplement existing transit options. It is anticipated that the shuttle will run every 20 minutes during peak periods and will have seats for approximately 25 passengers.

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[4] The critical gap is the minimum length of time interval in the major street traffic stream that allows intersection entry for one minor street vehicle.

2.5.3 Bicycle Accommodations

BTD has established guidelines for projects subject to a TAPA to provide secure bicycle parking for employees and short-term bicycle racks for visitors. As presented in Section 2.4.10, the Proponent will provide approximately 300 new, secure spaces for IDB employees inside the Bronstein Center and multiple shower/changing facilities. The new entry plazas will incorporate bicycle storage safely away from loading activity, and the Proponent will work with Boston Bikes, BTD, and EDIC to identify the appropriate number of bicycle racks for visitors. All bicycle racks, signs, and parking areas will conform to BTD standards.

The Proponent recently installed two new Hubway stations (for 18 bicycles) at the IDB site. In addition to sponsoring the stations, the Proponent also donated construction of the accompanying concrete pads, access ramps, and safety striping.

The Proponent will continue to encourage bicycling as an alternative means to driving through travel demand management strategies outlined in the next section.

2.5.4 Loading and Service

The Proponent will maintain the IDB's service and loading capabilities along Drydock Avenue and along Black Falcon Avenue. The reconfigured loading and service areas will improve operations that currently occur on Drydock Avenue and Black Falcon Avenue. To prevent overburdening loading areas on either street, the Proponent has developed a Loading and Delivery Operations and Management Plan to disperse deliveries to the IDB. As the IDB's mix of uses evolves, the Proponent and its property management team will continue to work closely with tenants, neighbors (such as Massport), and EDIC to ensure loading and deliveries operate smoothly.

2.5.5 Black Falcon Avenue

The Proponent is in active discussions with Massport regarding coordination of IDB loading activity and activity associated with the Cruiseport terminal along Black Falcon Avenue. Massport has proposed upgrades to Black Falcon Avenue to improve the pick-up/drop-off activity at the Cruiseport. These upgrades may entail converting Black Falcon Avenue to one-way westbound and demarcating four through travel lanes, with the outer lane closest to the IDB being kept open at all times for through travel and the other three lanes used for pick-up and drop-off operations related to the Cruiseport.

2.5.6 Transportation Demand Management

As part of the TAPA, the Proponent will implement Transportation Demand Management (TDM) measures to minimize automobile usage and Project-related traffic impacts.

TDM measures may include the following:

- Orientation Packets: The Proponent will explore providing orientation packets to new tenants containing information on available transportation choices, including transit routes/schedules and nearby Hubway and Zipcar locations. On-site property management staff will work with tenants as they move in to help facilitate transportation for new arrivals.

- Electric Vehicle Charging: As demand mandates, the Proponent will work with BRA and EDIC to provide electric vehicle charging stations at appropriate parking locations.

- The Proponent is already a member of the Seaport Transportation Management Association (TMA) and has recently supported the South Boston Waterfront Transportation Study being managed by A Better City.

Chapter 3.0

Environmental Review Component

3.0 ENVIRONMENTAL REVIEW COMPONENT

3.1 Introduction

The Article 80 Large Project Review Process, with which the Proponent is voluntarily complying, requires the Proponent to conduct those studies necessary to determine the potential for direct or indirect impacts to the environment as a result of Project implementation. The following sections review the Project in light of the potential for environmental impact and include in-depth studies of those resources most likely to be present at or near the Project site.

3.2 Wind, Shadow, Daylight and Solar Glare

The Project proposes limited exterior site work and interior renovation to an existing building as well as restoration work for the structure's historic façade. Because no significant changes are proposed to the building's height or massing, no new wind, shadow, daylight obstruction or solar glare impacts are anticipated in association with the Project.

3.3 Air Quality Analyses

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).

3.3.1 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, Environmental Protection Agency (EPA) promulgated National Ambient Air Quality Standards (NAAQS) for these criteria pollutants: nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter (PM) (PM-10 and PM-2.5), carbon monoxide (CO), ozone (O3), and lead (Pb). The NAAQS are listed in Table 3-1. 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.

Table 3-1 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]	195	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]	235	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 98^{th} 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

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.

The standards were developed by EPA to protect the human health against adverse health effects with a margin of safety.

3.3.2 Background Concentrations

MassDEP guidance directs project proponents to use the three most recent years of available background air quality monitoring data from within 10 km of a project site. Background concentrations were determined from the closest available monitoring stations to the proposed Project from the most recent air quality monitor data reported by the MassDEP as available in its Annual Air Quality Reports for 2010 to 2012. The closest monitors vary by pollutant and are located at Kenmore Square, 174 North Street, and One City Square, all in Boston, and consistent with MassDEP guidance, all are within 10 km of the Project site.

The Clean Air Act allows for one exceedance per year of the CO and SO_2 short-term NAAQS per year. The second-highest monitored 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 is used as the background concentration. A new one-hour NO2 standard was recently promulgated. To attain this standard, the three-year average of the 98th percentile of the maximum daily one-hour concentrations must not exceed 188 $\mu g/m^3$.

A summary of the background air quality concentrations are presented in Table 3-2.

Table 3-2 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	Averaging Time	Form	2010	2011	2012	Background Concentration ($\mu g/m^3$)	Location
SO_2 (1)(5)	1-Hour (4)	99th %	54.9	50.2	34.3	54.9	Kenmore Sq., Boston
	3-Hour (6)	H2H	40.0	39.4	22.1	40.0	Kenmore Sq., Boston
	24-Hour	H2H	20.5	24.4	14.0	24.4	Kenmore Sq., Boston
	Annual	H	5.8	6.1	4.9	6.1	Kenmore Sq., Boston
PM-10	24-Hour	H2H	31.0	34.0	37.0	37.0	One City Sq. Boston
	Annual	H	15.1	15.9	16.8	16.8	One City Sq. Boston
PM-2.5	24-Hour (4)	98th %	24.8	23.9	20.9	23.2	174 North St., Boston
	Annual (4)	H	10.0	10.3	9.5	9.9	174 North St., Boston
NO_2 (3)	1-Hour (4)	98th %	96.8	99.5	92.1	99.5	Kenmore Sq., Boston
	Annual	H	35.9	38.3	35.9	38.3	Kenmore Sq., Boston
CO (2)	1-Hour	H2H	2052	1710	1482	2052.0	Kenmore Sq., Boston
	8-Hour	H2H	1026	1368	1026	1368.0	Kenmore Sq., Boston

Notes:
1 SO_2 reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2600 $\mu g/m^3$.
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 ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1880 $\mu g/m^3$.
4 Background level is the average concentration of the three years.
5 The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.
6 The 2010 - 2012 SO_2 3-hr value is not reported. Per MassDEP, current years' 1-hr Second Highest value is used instead.

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. The corresponding maximum background concentrations in ppm were 1.8 ppm (2,052 $\mu g/m^3$) for one-hour and 1.2 ppm (1,368 $\mu g/m^3$) for eight-hour CO.

3.3.3 Microscale Analysis Methodology

The BRA typically requests an analysis of the effect 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 of carbon monoxide (CO) emissions from vehicles idling at and traveling through both signaled and unsignalized 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 parts per million (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 U.S. EPA's intersection modeling guidance.[5]

The microscale analysis was conducted using the latest versions of EPA's MOBILE6.2 and CAL3QHC programs to estimate CO concentrations at sidewalk receptor locations. Baseline (2013) and future year (2018) emission factor data calculated from the MOBILE6.2 model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersections.

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

Existing background values of CO at the nearest monitor location at Kenmore Square were obtained from MassDEP. CAL3QHC results were then added to background CO values of 1.8 ppm (one-hour) and 1.2 ppm (eight-hour), as provided by MassDEP, to determine total air quality impacts due to 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 Appendix C.

3.3.3.1 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.

Four signalized intersections included in the traffic study meet the above conditions (see Chapter 2). The traffic volumes and LOS calculations provided in Chapter 2 form the basis of evaluating the traffic data versus the microscale thresholds. The intersections that were found to meet the criteria for inclusion in the microscale analysis include:

- The intersection of Summer Street and Drydock Avenue;
- The intersection of Northern Avenue and D Street (northbound);
- The intersection of Congress Street and D Street; and,
- The intersection of Summer Street and D Street.

Microscale modeling was performed for the intersections based on the aforementioned methodology. The 2014 existing conditions, and the 2019 No Action and Build conditions were each evaluated for both morning (a.m.) and afternoon (p.m.) peak.

3.3.3.2 Emissions Calculations (MOBILE6.2)

The EPA MOBILE6.2 computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOBILE6.2 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

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

state specific vehicle age registration distribution. The input files for MOBILE6.2 for the existing (2014) and build year (2019) are provided by MassDEP. As is typical, minor edits to the files were necessary to allow the program to output emission factors for the various speeds used in the analyses.

Idle emission factors are obtained from factors for a vehicle speed of 2.5 miles per hour (mph). The resulting emission rate given in (grams/mile) is then multiplied by 2.5 mph to estimate idle emissions (in grams/hour). Moving emissions are calculated based on actual speeds at which free-flowing vehicles travel through the intersections. 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.

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

3.3.3.3 Receptors & Meteorology Inputs

Sets of up to 200 receptors were placed in the vicinity of each of the modeled intersections. Receptors extended approximately 300 feet on the sidewalks along the roadways approaching the intersection. The roadway links and receptor locations of the modeled intersections are presented in Figures 3-1 through 3-4.

For the CAL3QHC model, limited meteorological inputs are required. Following EPA guidance[7], a wind speed of one meter per second, stability class D (4), and a mixing height of 1,000 meters were used. To account for the intersection geometry, wind directions from 0° to 350°, every 10° were selected. A surface roughness length of 321 centimeters was selected for all four intersections.[8]

3.3.3.4 Impact Calculations (CAL3QHC)

The CAL3QHC model predicts one-hour concentrations using queue-links at intersections, worst-case meteorological conditions, and traffic input data. The one-hour concentrations were scaled by a factor of 0.7 to estimate eight-hour concentrations.[9] The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling outputs. The CAL3QHC input parameters are also described in Appendix C.

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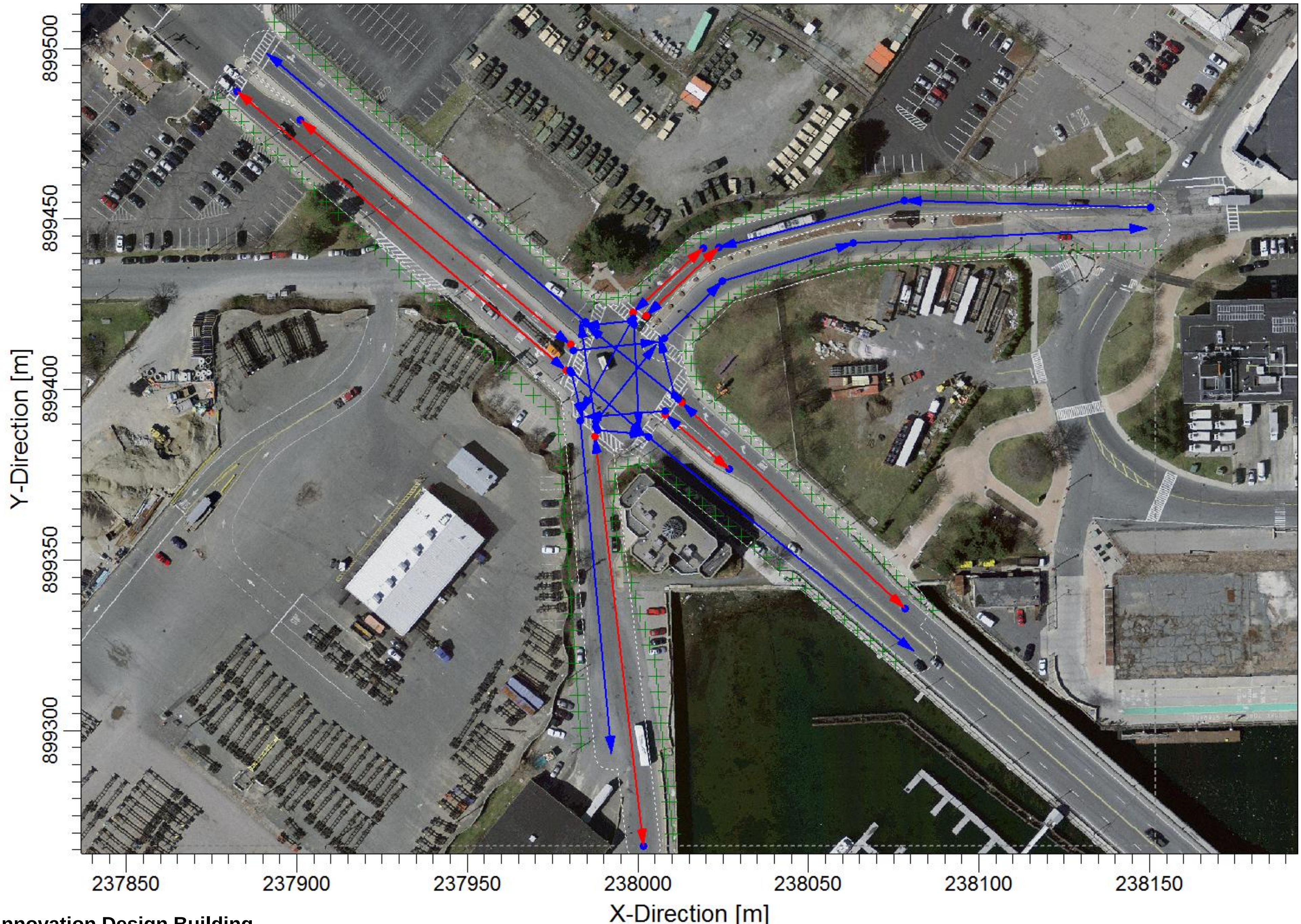
7 U.S. EPA, *Guideline for Modeling Carbon Monoxide from Roadway Intersections*. EPA-454/R-92-005, November 1992.

8 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.

9 U.S. EPA, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources; EPA-454/R-92-019, October 1992.

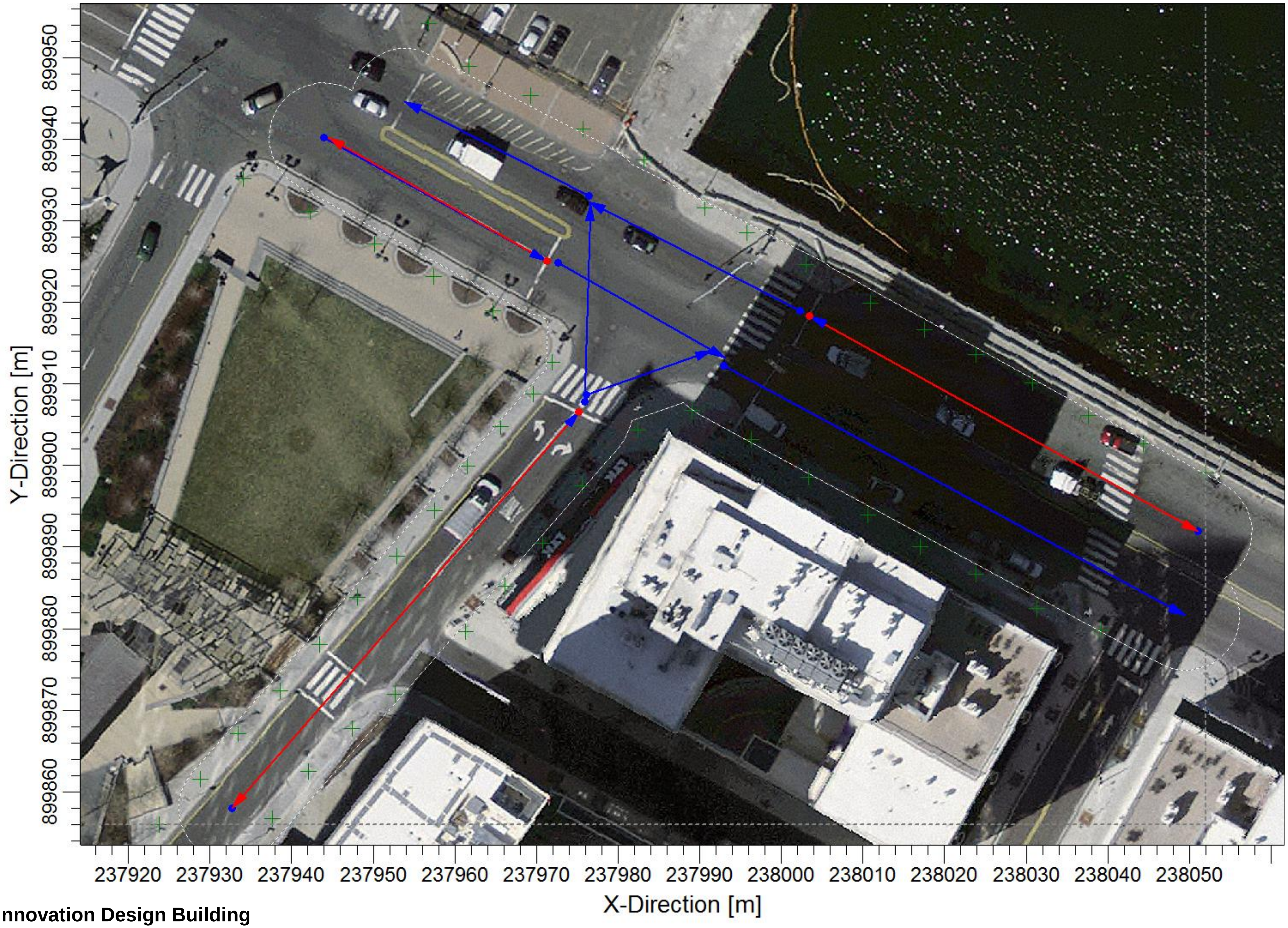


Innovation Design Building

Epsilon ASSOCIATES INC.

Figure 3-1

Link and Receptor Locations for CAL3QHC modeling of Intersection of Summer St. & Drydock Ave..



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Epsilon ASSOCIATES INC.

Figure 3-2

Link and Receptor Locations for CAL3QHC modeling of Intersection of Northern Ave. & D St. (NB).

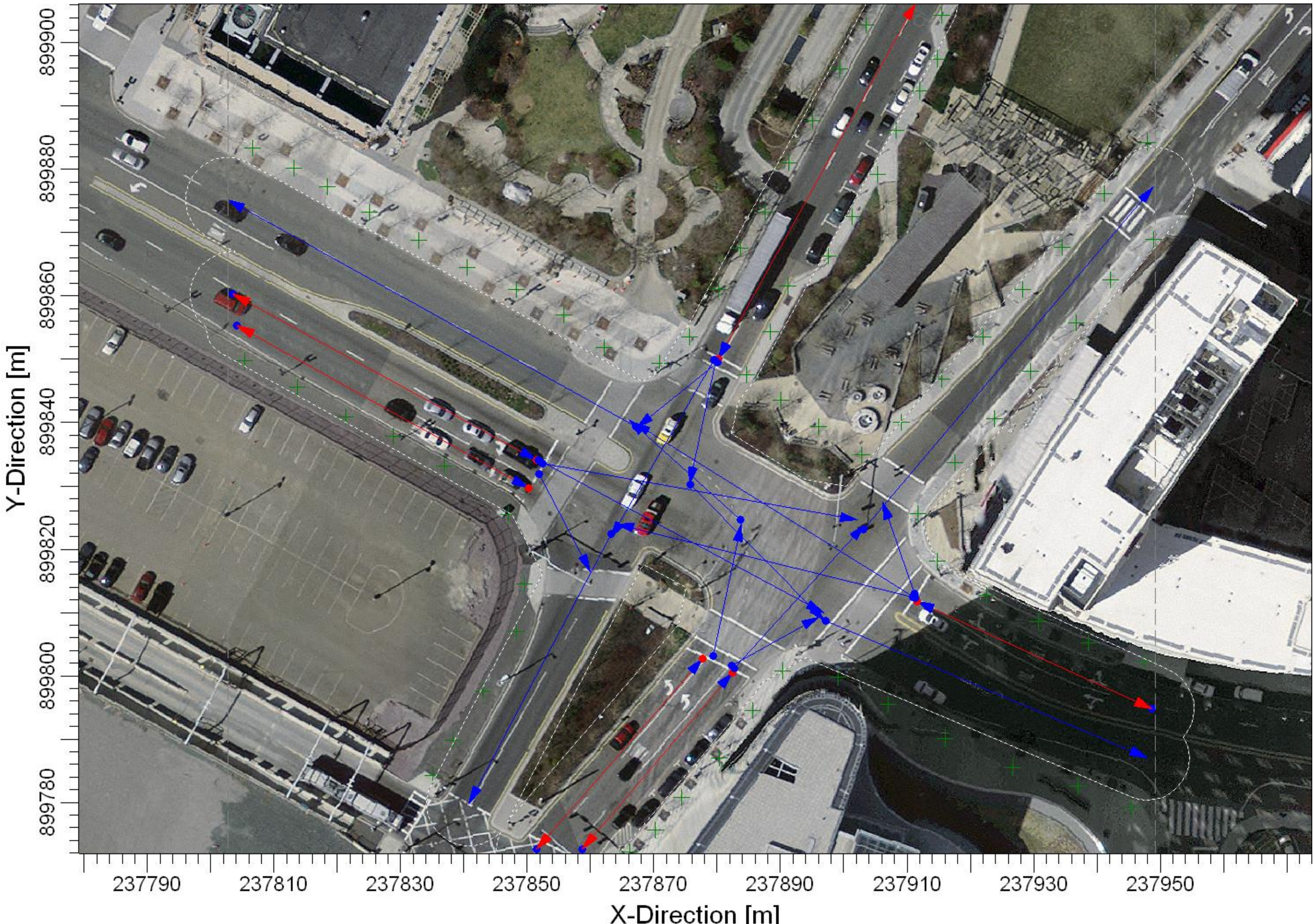

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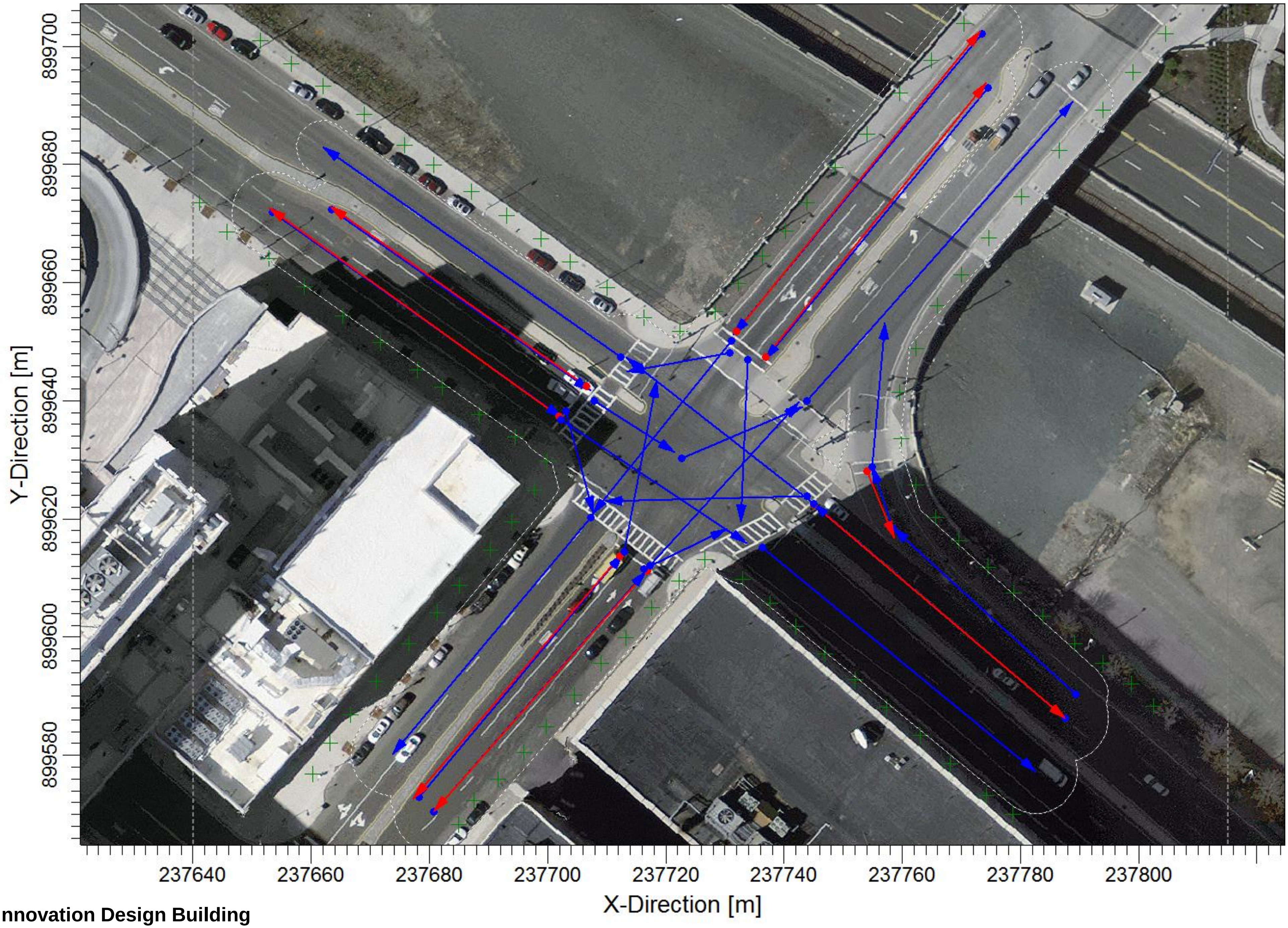
Figure 3-3

Link and Receptor Locations for CAL3QHC modeling of Intersection of Congress St. & D St.



Innovation Design Building

Epsilon ASSOCIATES INC.

Figure 3-4

Link and Receptor Locations for CAL3QHC modeling of Intersection of Summer St. & D St..

3.3.4 Microscale Analysis Results

The results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 3-3 through 3-5 for the 2014 and 2019 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.7.[10]

The 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 area of the Project, for the modeled conditions (2.1 ppm) plus background (1.8 ppm) is 3.9 ppm for all afternoon peak hour cases at the intersection of Summer Street and Drydock Avenue. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (1.5 ppm) plus background (1.2 ppm) is 2.7 ppm for at the same location and scenarios. All concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm.

Any future mitigation measures implemented to improve traffic flow at any of the modeled intersections are likely to result in further improved air quality impacts although no such measures are anticipated to be necessary strictly for the air quality impacts created for the Project.

3.3.5 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.

3.3.6 Stationary Sources

Stationary sources of air pollution are typically units that combust fuel. These sources include heating and hot water units, and emergency electrical generators. Cooling towers, although not a combustion source, are a source of particulate emissions.

Existing stationary sources will be assessed for efficiency during Project due diligence and may require repair and/or replacement. To the degree any such units are repaired or replaced, it is anticipated that the new units will undergo permitting associated with the

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10 U.S. EPA, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources; EPA-454/R-92-019, October 1992

MassDEP Environmental Results Program (ERP). Ultimately, all stationary sources will comply with the ERP, and it is likely that Project improvements will result in improved stationary source conditions.

Table 3-3 Summary of Microscale Modeling Analysis (Existing 2014)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Summer Street and Drydock Ave	AM	1.9	1.8	3.7	35
	PM	1.4	1.8	3.2	35
Northern Avenue and D Street (NB)	AM	0.8	1.8	2.6	35
	PM	0.8	1.8	2.6	35
Congress Street and D Street	AM	1.3	1.8	3.1	35
	PM	1.4	1.8	3.2	35
Summer Street and D Street	AM	1.4	1.8	3.2	35
	PM	1.6	1.8	3.4	35
8-Hour					
Summer Street and Drydock Ave	AM	1.3	1.2	2.5	9
	PM	1.0	1.2	2.2	9
Northern Avenue and D Street (NB)	AM	0.6	1.2	1.8	9
	PM	0.6	1.2	1.8	9
Congress Street and D Street	AM	0.9	1.2	2.1	9
	PM	1.0	1.2	2.2	9
Summer Street and D Street	AM	1.0	1.2	2.2	9
	PM	1.1	1.2	2.3	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.					

Table 3-4 Summary of Microscale Modeling Analysis (No-Build 2019)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Summer Street and Drydock Ave	AM	2.0	1.8	3.8	35
	PM	1.5	1.8	3.3	35
Northern Avenue and D Street (NB)	AM	0.9	1.8	2.7	35
	PM	0.9	1.8	2.7	35
Congress Street and D Street	AM	1.4	1.8	3.2	35
	PM	1.5	1.8	3.3	35
Summer Street and D Street	AM	1.4	1.8	3.2	35
	PM	1.5	1.8	3.3	35
8-Hour					
Summer Street and Drydock Ave	AM	1.4	1.2	2.6	9
	PM	1.1	1.2	2.3	9
Northern Avenue and D Street (NB)	AM	0.6	1.2	1.8	9
	PM	0.6	1.2	1.8	9
Congress Street and D Street	AM	1.0	1.2	2.2	9
	PM	1.1	1.2	2.3	9
Summer Street and D Street	AM	1.0	1.2	2.2	9
	PM	1.1	1.2	2.3	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.

Table 3-5 Summary of Microscale Modeling Analysis (Build 2019)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Summer Street and Drydock Ave	AM	1.9	1.8	3.7	35
	PM	2.1	1.8	3.9	35
Northern Avenue and D Street (NB)	AM	0.9	1.8	2.7	35
	PM	1.0	1.8	2.8	35
Congress Street and D Street	AM	1.5	1.8	3.3	35
	PM	1.5	1.8	3.3	35
Summer Street and D Street	AM	1.4	1.8	3.2	35
	PM	1.6	1.8	3.4	35
8-Hour					
Summer Street and Drydock Ave	AM	1.3	1.2	2.5	9
	PM	1.5	1.2	2.7	9
Northern Avenue and D Street (NB)	AM	0.6	1.2	1.8	9
	PM	0.7	1.2	1.9	9
Congress Street and D Street	AM	1.1	1.2	2.3	9
	PM	1.1	1.2	2.3	9
Summer Street and D Street	AM	1.0	1.2	2.2	9
	PM	1.1	1.2	2.3	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.					

3.4 Water Quality / Stormwater Management

The Project proposes a stormwater management program, designed in compliance with Boston Water and Sewer Commission requirements, which will provide pretreatment and infiltration prior to discharging stormwater to the municipal drainage system. Practices to control pollution during construction will be implemented. The stormwater drainage from the Project will not adversely impact the water quality of nearby surrounding water bodies.

Stormwater pollution prevention measures will include good housekeeping such as properly storing materials, spill prevention and response plans, and proper storage and disposal of solid wastes. Erosion and sediment controls will be used during construction and the construction contractor will be responsible for controlling dust using street sweeping and watering as necessary.

The stormwater management system will include deep sump catch basins, water quality inlets, infiltration where feasible, and the implementation of a long-term operation and maintenance plan.

The protection of site groundwater and nearby surface waters is discussed in Section 3.6, Geotechnical/Groundwater Impacts. Site stormwater management is detailed further in Section 8.3, Stormwater Drainage System.

3.5 Flood Hazard Zones / Wetlands

The existing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Project site indicates that it is located outside of a designated special flood hazard area (FIRM, City of Boston, Community-Panel Numbers 25025C0081G and 25025C0082G, Effective Date September 25, 2009). However, a "preliminary" revised floodplain map for the site area was recently released by FEMA which shows the site as lying within the 100-year special flood hazard area (FIRM, Suffolk County, Massachusetts; Panel 0081J, Map Numbers 25025C0081J and 25025C0082J, Map Revised, Preliminary November 15, 2013). As discussed in Section 4.1, Sustainable Design, and Section 4.2, Climate Adaptability, the design of the site and buildings will recognize and account for the site's location proximate to the harbor and within this newly designated flood zone, as well as the potential impacts of sea level rise.

3.6 Geotechnical / Groundwater Impacts

As summarized above, the existing Project site area includes an eight-story building and associated outdoor open parking and loading areas along the south side of Drydock Avenue in the BMIP. Properties adjacent or proximate to the Project site include warehouse, industrial, and commercial structures. Municipal utilities are present beneath the surrounding streets and sidewalks. Black Falcon Avenue and Design Center Place border the site to the south and west, respectively. The Reserved Channel is located further south of the site.

3.6.1 Subsurface Soil and Bedrock Conditions

A review of historical geotechnical information obtained by others and of information compiled by the Boston Society of Civil Engineers suggests that the subsurface conditions below the buildings will consist of the following (listed from the ground surface down):

- Approximately 5 to 26 feet of loose, urban fill, associated with the filling of the Boston Harbor;
- A natural lacustrine deposit consisting of varying amounts of peat, sand and silt to a depth of approximately 25 to 36 feet below ground surface;
- Approximately 10 to 30 feet of medium stiff to hard, silty clay and clay interbedded with silt and sand seams;
- Approximately 10 to 25 feet of dense to very dense glacial till that consists of a heterogeneous mixture of sand, gravel, silt and boulders; and
- Argillite bedrock at depths of approximately 50 to more than 85 feet below grade.

3.6.2 Groundwater Conditions

A review of historical groundwater levels data indicates that the groundwater surface is located between 5 to 31 feet below existing grade beneath Drydock Avenue. Groundwater levels in the Project vicinity will be influenced by the sea level in the adjacent Reserved Channel, as well as by seasonal variations in temperature and precipitation, and may also be influenced by nearby utilities and other subsurface structures.

Dewatering is not anticipated as part of foundation construction.

The site is not within the City of Boston Groundwater Conservation Overlay District.

3.6.3 Proposed Construction and Foundation Methodology and Considerations

The surficial fill and underlying organic and weak silts and clays are not suitable for foundation support. It is expected that the new portal structures to be constructed at the site will need to be supported on a deep foundation bearing in the inorganic lacustrine deposits, glacial till or argillite bedrock at depth. Given the anticipated loads and the relatively small footprints of the new structures, drilled micropiles (DMPs) are considered the most appropriate system for the Project. DMPs are generally installed with relatively small equipment that limits noise and vibration, and generates limited spoils during installation.

3.6.4 Potential Impacts During Below-Grade Construction

Potential impacts to groundwater levels and ground movement adjacent to existing structures and utilities will be reviewed prior to and during installation of the foundation systems.

Construction activities will generate ground vibrations, dust and noise. Foundation design and selection and construction methods will consider these facets to limit the potential magnitude of these impacts.

3.6.5 Mitigation Measures

The design team will prepare designs and specifications, and review contractor's submittals to ensure conformance to the Project contract documents, with specific attention to protection of nearby structures and facilities. Based on the proposed scope of the Project and the location of adjacent structures and their foundations, significant adjacent building/structure protection issues are not anticipated. As design proceeds, the need for any mitigation measures will be re-evaluated as necessary.

Prior to construction, performance criteria will be established with respect to movements, noise, and ground vibrations. The construction contractor will be required to modify construction methods and take necessary steps during the work to protect nearby buildings and other facilities.

3.7 Solid Waste and Hazardous Materials

Waste generated by the Project will be significantly reduced by the implementation of recycling and other waste management programs to be implemented throughout the Project and tailored to the specifics of the various Project components. Meanwhile, the Project site has been investigated for the presence of hazardous materials and known releases. The following sections include an estimation of the solid waste volumes to be associated with the Project and the status of the Project site under the Massachusetts Contingency Plan (MCP).

3.7.1 Operation Solid and Hazardous Waste

The Project will generate solid waste typical of office and retail uses. Table 3-6 details the anticipated solid waste volume for the IDB at full occupancy. Because office use generally produces less waste than industrial and manufacturing uses (1.3 versus 2.6 tons per 1,000 square feet per year), the proposed conversion of 206,388 square feet from industrial to commercial will likely result in a smaller waste stream than that which would be generated at full occupancy without the conversion. Per Table 3-6, the Project will generate a waste stream of approximately 2,740 year. For comparison, the waste stream at full build out under the existing use conditions would be approximately 3,009 tons/year.

Table 3-6 Solid Waste Generation

Use	Program	Generation Rate	Solid Waste (tons per year)
Industrial/Light Manufacturing	363,608 sf	2.6 tons/1,000 sf/year	945
Office (Commercial)	915,584 sf	1.3 tons/1,000 sf/year	1,190
Retail/Restaurant	110,000 sf	5.5 tons/1,000 sf/year	605
Total Solid Waste Generation			**2,740 tons per year**

3.7.2 Recycling During Operation

Recycling will be required, coordinated, and comprehensive. To encourage recycling, the Proponent will implement a recycling program throughout the Project. This will include blue recycling containers next to all trash receptacles in building-cleaned spaces as well as on the first floor next to the trash compactor. The loading/receiving area will include space for the storage and pick-up of recyclable materials. Recyclable materials will include newspaper, cardboard, glass, cans, and plastics. The Proponent's property management staff will provide tenants with the facilities and services necessary to recycle other office wastes, such as fluorescent light bulbs, batteries, and cleaning fluids.

3.7.3 Hazardous Materials – Compliance with the Massachusetts Contingency Plan

A review of the MassDEP disposal and waste records revealed no records associated with the IDB. As such, soil that is generated during foundation installation will not be subject to management under section 310 CMR 40.0035 of the Massachusetts Contingency Plan (MCP) nor is it expected to require manifest under 310 CMR 30.000 (Hazardous Waste Management Regulations). Further, as stated above, only a limited amount of soil is expected to be generated during foundation installation.

3.8 Noise Assessment

The principal sources of noise associated with the existing Bronstein Center and BDC buildings are rooftop mechanicals and loading dock traffic. Given the location of the buildings well within the BMIP and half way between Logan International Airport to the north and the Massport Conley Terminal and associated industrial areas on the south side of the Reserved Channel (as well as the intervening Black Falcon Cruise Terminal building and piers) to the south, no noise impacts to residential or similar public areas are generally associated with the existing buildings. The proposed conversion of 206,388 square feet of the existing buildings to commercial use will not result in a change to the existing noise environment. Moreover, improvements to the existing mechanical systems associated with the overall building improvements may well result in a decrease in noise levels generated by the roof-top equipment.

As noted above, the existing building generates noise from the operation of rooftop mechanicals and loading dock operations. The latter are well shielded from any residential or similar public open space by the intervening multi-storied buildings. While specific mechanical system improvements have not been fully identified at this point, data from similar mechanical systems has been used to estimate expected sound levels from the IDB. Assuming a worst-case design scenario with mechanicals on the top of the building and nothing blocking the line-of-sight, sound levels from a typical unit would be approximately 49 dBA at 1,000 feet, 40 dBA at 2,000 feet, and 35 dBA at 3,000 feet. The nearest residence is located approximately 2,100 feet to the south of the Project site. At this distance, noise from the rooftop mechanicals would be negligible and indistinguishable from the existing background noise levels. For perspective, the City of Boston limits industrial sources to no more than 50 dBA at a residence during nighttime hours, and nighttime background sound levels are commonly 40 dBA or greater in the City of Boston. Given these factors, it can be concluded that the sound associated with the existing building, as well as any sound associated with the converted use of a portion of the existing building, will be safely in compliance with the City of Boston noise regulations.

For both the existing and proposed use, compliance with City of Boston noise regulations ensures compliance with MassDEP noise policy.

3.9 Construction Impacts

A Construction Management Plan (CMP) in compliance with the City's Construction Management Program will be submitted to the BTD and EDIC once final plans are developed and the construction schedule is fixed. Consistent with the two leases under which the Proponent controls the IDB, the Proponent intends to coordinate its plans with EDIC before submitting a CMP. The construction contractor will be required to comply with the details and conditions of the approved CMP.

Proper pre-planning with the City will be essential to the successful construction of the Project. Construction methodologies that ensure public safety and protect nearby businesses will be employed. Techniques such as barricades, walkways, and signage will be used. The CMP will include routing plans for trucking and deliveries, plans for the protection of existing utilities, and control of noise and dust.

During the construction phase of the Project, the Proponent will provide the name, telephone number and address of a contact person to communicate with on issues related to the construction. The construction contact will be a person whose responsibility it is to respond to the questions/comments/complaints of abutters and residents.

3.9.1 Construction Methodology/Public Safety

Construction methodologies that ensure public safety and protect nearby owners and tenants will be employed. Techniques such as barricades, walkways, painted lines, and signage will be used as necessary. Construction management and scheduling - including plans for construction worker commuting and parking, routing plans and scheduling for trucking and deliveries, protection of existing utilities, maintenance of fire access, and control of noise and dust - will minimize impacts on the surrounding environment.

During construction it may be necessary to occasionally occupy pedestrian walkways and portions of the surrounding streets. As the design of the Project progresses, the Proponent will meet with BTD and EDIC to discuss the specific location of barricades, the need for lane closures, pedestrian walkways, and truck queuing areas. Secure fencing, signage, and covered walkways may be employed to ensure the safety and efficiency of all pedestrian and vehicular traffic flows. In addition, sidewalk areas and walkways near construction activities will be well marked and lighted to protect pedestrians and ensure their safety. Public safety for pedestrians on abutting sidewalks will also include covered pedestrian walkways when appropriate. If required by BTD and/or the Boston Police Department, police details will be provided to facilitate traffic flow. These measures will be incorporated into the CMP which will be submitted for approval prior to the commencement of construction work.

3.9.2 Construction Schedule

It is anticipated that construction will commence in the fourth quarter of 2014, or the first quarter of 2015, and it is anticipated that the Project will be completed within twelve months of the initiation of construction.

Typical construction hours will be from 7:00 a.m. to 6:00 p.m., Monday through Friday. Certain finish work done inside the building may be conducted on Saturdays. No substantial sound-generating activity will occur before 7:00 a.m. If longer hours, additional shifts, or Saturday work is required, the construction manager will place a work permit request to the Boston Air Pollution Control Commission and BTD in advance. It is noted that some activities such as finishing activities could run beyond 6:00 p.m. to ensure the structural integrity of the finished product.

3.9.3 Construction Staging/Access

Access to the site and construction staging areas will be as provided in the CMP. Although specific construction and staging details have not been finalized, the Proponent and its construction management consultant will work to ensure that staging areas will be located to minimize impacts to pedestrian and vehicular flow. Secure fencing and barricades will be used to isolate construction areas from pedestrian traffic adjacent to the site. Construction procedures will be designed to meet all Occupational Safety and Health Administration (OSHA) safety standards for specific site construction activities.

3.9.4 Construction Mitigation

The Proponent will follow City and MassDEP guidelines which will direct the evaluation and mitigation of construction impacts. As part of this process, the Proponent and construction team will evaluate the Commonwealth's Clean Air Construction Initiative.

The CMP will include detailed information on specific construction mitigation measures and construction methodologies to minimize impacts to abutters and the local community. The CMP will also define truck routes which will help in minimizing the impact of trucks on City and neighborhood streets.

"Don't Dump - Drains to Boston Harbor" plaques will be installed at storm drains that are replaced or installed as part of the Project.

3.9.5 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 58 construction jobs will be created over the length of construction. The Proponent will make reasonable good-faith efforts to have at least 50% of the total employee work hours be for Boston residents, at least 25% of total employee work hours be for minorities and at least 10% of the total employee work hours be for women. The Proponent will enter into a jobs agreement with the City of Boston and will comply with the construction employment terms of the leases under which it controls the IDB.

To reduce vehicle trips to and from the construction site, minimal construction worker parking will be available at the site and all workers will be strongly encouraged to use public transportation and ridesharing options. The general contractor will work aggressively to ensure that construction workers are well informed of the public transportation options serving the area. Space will be made available on-site for workers' supplies and tools so they do not have to be brought to the site each day.

3.9.6 Construction Truck Routes and Deliveries

Truck traffic will vary throughout the construction period, depending on the activity. The construction team will manage deliveries to the site so as to avoid morning and afternoon peak hours and thereby minimizes disruption to traffic flow on adjacent streets. Construction truck routes to and from the site for contractor personnel, supplies, materials, and removal of excavations required for the Project will be coordinated with BTD. Traffic logistics and routing will be planned to minimize community impacts. Truck access during construction will be determined by the BTD as part of the CMP. These routes will be mandated as a part of all subcontractors' contracts for the Project. The construction team will provide subcontractors and vendors with Construction Vehicle & Delivery Truck Route Brochures in advance of construction activity.

"No Idling" signs will be included at the loading, delivery, pick-up and drop-off areas.

3.9.7 Construction Air Quality

Short-term air quality impacts from fugitive dust may be expected during demolition, re-paving and the early phases of construction, but are expected to be minimal given that most construction will take place inside the existing building's structure. Plans for controlling fugitive dust include mechanical street sweeping and careful removal of debris by covered trucks. The construction contract will provide for a number of strictly enforced measures to be used by contractors to reduce potential emissions and minimize impacts. These measures are expected to include:

- Using covered trucks;
- Minimizing spoils on the construction site;
- Monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized;
- Minimizing storage of debris on the site; and
- Periodic street and sidewalk cleaning with water to minimize dust accumulations.

3.9.8 Construction Noise

The Proponent is committed to mitigating noise impacts from the construction of the Project. Increased community sound levels, however, are an inherent consequence of construction activities. Construction work will comply with the requirements of the City of Boston Noise Ordinance. Every reasonable effort 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 all equipment and ongoing maintenance of intake and exhaust mufflers;
- 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 alternative items of equipment 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 at locations that protect sensitive locations by shielding or distance.

3.9.9 Construction Vibration

All means and methods for performing work at the site will be evaluated for potential vibration impacts on adjoining property, utilities, and adjacent existing structures. Acceptable vibration criteria will be established prior to construction, and vibration will be monitored, if required, during construction to ensure compliance with the agreed-upon standard and/or pre-construction conditions.

3.9.10 Construction Waste

The Proponent will take an active role with regard to the reprocessing and recycling of construction waste. The disposal contract will include specific requirements that will ensure that construction procedures allow for the necessary segregation, reprocessing, reuse and recycling of materials when possible. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per the MassDEP Regulations for Solid Waste Facilities (310 CMR 16.00). This requirement will be specified in the disposal contract. Construction will be conducted so that materials that may be recycled are segregated from those materials not recyclable to enable disposal at an approved solid waste facility.

3.9.11 Protection of Utilities

Existing public and private infrastructure located within the public right-of-way will be protected during construction. The installation of proposed utilities within the public way will be in accordance with the MWRA, BWSC, Boston Public Works, Dig Safe, and the governing utility company requirements, as applicable. All necessary permits will be obtained before the commencement of the specific utility installation. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer and drain facilities will be reviewed by BWSC as part of its site plan review process.

3.9.12 Rodent Control

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

3.10 Wildlife Habitat

The site is currently developed and, as such, the Project will not impact wildlife or wildlife habitats. The Massachusetts Natural Heritage and Endangered Species Program Natural Heritage Atlas (13th Edition, Effective October 1, 2008) indicates that the site does not lie within a Priority Habitat of Rare Species or within an Estimated Habitat of Rare Wildlife.

Chapter 4.0

Sustainable Design and Climate Change Preparedness

4.0 SUSTAINABLE DESIGN AND CLIMATE CHANGE PREPAREDNESS

This section describes the Proponent's intention to maximize green and sustainable impacts and meet the City's climate change preparedness objectives given the limited scope of the Project's improvements to the existing building, site and infrastructure. Where design changes do occur, the Project will address critical issues of energy, waste, and water and seek to engage new and existing tenants in efforts to reduce natural resource use, conserve energy, and promote reuse and recycling.

4.1 Sustainable Design

The following is a detailed outline of the Project Team's approach to demonstrating LEED for Core and Shell, (LEED CS) v2009 Certifiable compliance for the Project. The scope of work, as set forth more fully in Section 1.3.2, includes renovations to the five contiguous building sections of the IDB, including the two buildings known collectively as the BDC and the adjacent three buildings comprising the Bronstein Center, and the associated site area. Ground floor and site work includes improvements to create defined building entrances and leasable supporting retail space. Additional renovations include new common area building lobbies at each new building entrance.

The Proponent is committed to developing projects that are sustainably designed, energy efficient, environmentally conscious and healthy for employees and visitors. As required under Article 37 of the Boston Zoning Code, projects that are subject to Large Project Review must be Leadership in Energy and Environmental Design (LEED) certifiable. There are seven categories in the LEED certification guidelines: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation in Design Process and the additional Regional Priority Credits. The Project is targeting several credits which span the seven categories and enable the Project to meet the basic requirements to demonstrate compliance with the LEED CS v2009 rating system. A LEED CS v2009 project scorecard is included at the end of this section.

The Project is anticipating compliance at the LEED CS v2009 Certification threshold by complying with the requirements of all of the prerequisites and several credits for a total of 46 credits. Note that these credits, listed in italics below, are currently under consideration and need further investigation for determination as to whether or not the Project may attempt them.

A credit by credit analysis of how the prerequisite and credit compliance will be achieved for the credits being attempted is presented below. The attached LEED CS v2009 Project Scorecard includes further detail regarding each credit.

4.1.1 Sustainable Sites

The Project site is located in a dense urban area on the busy and expanding Boston waterfront. It is also located directly on the MBTA Silver Line route. Proposed site improvements include new landscaped areas, the installation of new bike racks, small retail kiosks and revised parking layouts.

Prerequisite 1: Construction Activity Pollution Prevention - The Construction Manager will submit and implement an Erosion and Sedimentation Control (ESC) Plan for construction activities related to the demolition of existing structures and the construction of the Project specific to this waterfront location. The ESC Plan will conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit and specific municipal requirements for the City of Boston.

Credit 1: Site Selection - The Project scope includes renovations to an existing building located in a well-developed urban area on the Boston waterfront.

Credit 2: Development Density and Community Connectivity - The Project's location is the existing IDB and associated outdoor areas. The surrounding environment is relatively densely developed and includes offices, industrial uses, and other commercial activities.

Credit 3: Brownfield Redevelopment - The Project site is not listed as a hazardous materials release site, but is located in an area with a history of industrial and military uses. An appropriate review and assessment will be undertaken to the extent necessary for any excavation completed as part of the Project.

Credit 4.1: Alternative Transportation, Public Transportation Access - The MBTA Silver Line and two MBTA bus routes stop at the main entrance to the property and travels to and from South Station, a major transit hub with access to MBTA commuter rail, the Red Line subway, and bus routes.

Credit 4.2: Alternative Transportation, Bicycle Storage - New exterior bicycle storage racks will be placed in multiple locations and new interior bicycle storage rooms and new changing rooms and showers for full-time employees will be included in the Project.

Credit 4.3: Alternative Transportation, Low-Emitting and Fuel-Efficient Vehicles - The renovated surface parking lots will have an appropriate number of designated preferred parking spaces for Low Emitting and Fuel-Efficient (LEFE) Vehicles.

Credit 4.4: Alternative Transportation Parking Capacity - The quantity of available parking spaces in the renovated surface parking areas will not exceed the existing quantity. An appropriate number of preferred parking spaces will be designated for vanpool and carpool vehicles, and for LEFE parking spaces.

Credit 8: Light Pollution Reduction - The Project will explore how to minimize exterior light pollution, including limiting parking lot and site lighting. Additionally, the first floor retail exterior lighting is to be installed under a canopy that limits vertical light trespass.

Credit 9: Tenant Design and Construction Guidelines - The Proponent will provide Tenant Design and Construction Guidelines for distribution and review with potential building tenants. The guidelines will outline the sustainable design and energy efficiency measures in the Project and provide detailed guidance for the tenants to design and build in alignment with the Project sustainability goals.

4.1.2 Water Efficiency

The Project will specify low flow and high efficiency plumbing fixtures in the portion of the IDB where new fixtures are being installed and in those portions of the IDB where existing fixtures are being replaced. The plumbing fixture will help to decrease the amount of annual potable water used for sewage conveyance.

Prerequisite 1: Water Use Reduction, 20% Reduction - Through the specification of low flow and high efficiency plumbing fixtures in those portions of the IDB where new plumbing fixtures are being installed, the Project will target water use reduction strategies that use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

Credit 1.1: Water Efficient Landscaping, Reduce by 50% - The Project will include a permanent irrigation system. The landscape plantings design will incorporate drought tolerant native and adaptive plant materials and the design of the irrigation system will target a 50% reduction in potable water use when compared to a mid-summer baseline.

Credit 3: Water Use Reduction - The specified plumbing fixtures will include high efficiency toilets and urinals, low flow lavatory faucets and ultra-low flow shower heads. The Project will target a potable water use savings of 30% above the calculated baseline for those portions of the IDB where new fixtures are being installed and/or existing fixtures are being replaced.

4.1.3 Energy and Atmosphere

The new building systems equipment and the equipment that will replace existing systems will be designed to optimize energy performance and will not use refrigerants that are harmful to the environment. The Proponent will engage a Commissioning Agent (CxA) to confirm the building systems are installed and function as intended and designed.

Prerequisite 1: Fundamental Commissioning of the Building Energy Systems - A third party CxA will be engaged by the Proponent for purposes of providing both basic and enhanced commissioning services for the building energy related systems, including HVAC & R, lighting, and domestic hot water systems. The CxA will verify the building systems are installed, calibrated and perform to the Proponent's Project requirements.

Prerequisite 2: Minimum Energy Performance and Credit 1: Optimize Energy Performance - The building performance rating will demonstrate a minimum of a 10% improvement when compared to the baseline building performance when calculated using the rating method in Appendix G of ANSI/ASHREA/IESNA Standard 90.1-2007. The BDC and the Bronstein Center have separate HVAC systems, both of which will be replaced and/or upgraded. The existing equipment is dated and/or not operational. The Project will incorporate improvements to the central heating and cooling plants for each group of buildings, and will target lighting power densities below code minimums in locations where new lighting is being installed.

The BDC is served by central heating (hot water) and cooling (chilled water) plants, as well as minimum ventilation air units. Ventilation units are inoperable and are being replaced with new ones in kind. Although dated, the heating and cooling plant equipment is still operable. This equipment will be gradually replaced as it approaches the end of its life expectancy.

The Bronstein Center is served by steam boilers which are in the process of being replaced. There is a plan to gradually convert the steam distribution system to hot water and ultimately replace steam boilers with high efficiency condensing hot water boilers. There is no central cooling system in the Bronstein Center. The Proponent plans to install a new cooling plant in multiple phases which will be configured as condenser water loop and will serve floor-by-floor water cooled air handlers with "winter free" cooling coils.

Prerequisite 3: Fundamental Refrigerant Management - The specifications for refrigerants used in the building HVAC & R systems will not permit the use of CFC based refrigerants.

Credit 1: Optimize Energy Performance - The installation of new building equipment will enable the Project to target a performance level which is a minimum of a 20% improvement over a baseline building performance rating. The Project will incorporate improvements to the central heating and cooling plants for each group of buildings and target lighting power densities below code minimums in locations where new lighting is being installed.

Credit 2: On Site Renewable Energy - The Project is investigating installing additional PVs on the available roof areas. It has not been determined how much electricity the PVs will provide and if it will be enough to reach the 1% threshold required for credit achievement.

Credit 3: Enhanced Commissioning - The CxA may be engaged early on in the design process. The CxA's role would include reviewing the Proponent's Project requirements, creating, distributing and implementing a commissioning plan, and performing a design review of the design development and construction documents.

Credit 4: Enhanced Refrigerant Management - Long life high efficiency mechanical equipment will be specified for the HVAC systems and the refrigerants specified for the systems will have low ozone-depletion and global warming potentials. Credit achievement is based on the final calculated amount of refrigerant in the system.

Credit 5.1: Measurement and Verification: Base Building - The Proponent may choose to develop and implement a measurement and verification (M&V) plan consistent with Option D: Calibrated Simulation (Savings Estimation Method 2) as specified by the International Performance Measurement & Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003 for the base Core and Shell building.

Credit 5.2: Measurement and Verification: Tenant Sub metering - The Project will include a centrally monitored electronic metering network in the base building design that is capable of being expanded to accommodate and document the future tenant sub- metering. The Proponent may develop and implement an appropriate tenant measurement and verification (M&V) plan that includes a process for corrective action if the results of the M&V plan indicate that energy savings are not being achieved.

Credit 6: Green Power - The Proponent may purchase 'green power' for a 2-year period renewable energy contract to provide a minimum of 35% of the building's electricity from renewable sources.

4.1.4 Materials and Resources

Throughout the construction phase of the Project the Construction Management team will endeavor to divert construction and demolition waste from area landfills and procure materials that have recycled content and/or are extracted and manufactured within 500 miles of the Project site.

Prerequisite 1: Storage and Collection of Recyclables - Storage of collected recyclables will be accommodated throughout the building. Collection stations will be located in highly visible locations throughout the IDB and will be emptied on a regular basis.

Credit 1.1: Building Reuse - Maintain Existing Walls, Floors and Roof: The Project will meet the 75% threshold for maintaining the majority of the existing walls, floors and roofs.

Credits 2.1 and 2.2: Construction Waste Management - Prior to the start of construction, the Construction Management team will prepare a Construction Waste Management plan and will endeavor to divert as much demolition debris and construction waste from area landfills as possible, with a goal to achieve 75% diversion.

Credits 4.1: Recycled Content 10% (post-consumer & ½ pre-consumer) - The Project specifications will require materials to include pre- and/or post-consumer recycled content. During construction, materials submittals will include a document indicating the percentage of both pre- and post-consumer recycled content. The Construction Manager will track the recycled content for each material with a Project goal to achieve 10% recycled-content materials based on overall Project materials costs.

Credits 4.2: Recycled Content 20% (post-consumer & ½ pre-consumer) - During construction, materials submittals will include a document indicating the percentage of both pre- and post-consumer recycled content. The Construction Manager will track the recycled content for each material with a Project target to achieve 20% recycled-content materials based on overall Project materials costs.

Credit 5.1: Regional Materials, 10% Extracted, Processed and Manufactured Regionally - The Project specifications will indicate materials to be extracted, harvested, recovered and manufactured within a 500-mile radius of the job site. The Proponent has a goal to achieve 10% of the materials specified be regional materials. The Construction Manager will track the source location for each material with a Project target to achieve 10% regional materials based on overall Project materials costs.

Credit 5.2: Recycled Content 20% Extracted, Processed and Manufactured Regionally - During construction, materials submittals will include a document indicating the location of the materials procured. The Construction Manager will track the regional materials with a Project target to achieve 20% regional materials based on overall Project materials costs.

Credit 7: Certified Wood - The Project may use a minimum of 50% FSC certified wood for wood permanently installed inside the building envelope.

4.1.5 Indoor Environmental Quality

Air quality will be monitored during the construction phase of the Project. Low emitting materials will be used throughout construction to maintain and improve air quality. The building occupants will be able to maintain a comfortable environment through access to thermal and lighting controls.

Prerequisite 1: Minimum IAQ Performance - The building mechanical systems are designed to meet or exceed the requirements of ASHRAE Standard 62.1-2007 sections 4 through 7 and/or applicable building codes. New mechanical ventilation systems are being introduced to the Bronstein Center.

Prerequisite 2: Environmental Tobacco Smoke (ETS) Control - The building will be designated as non-smoking and no smoking will be allowed on site or within 25 feet of the building.

Credit 1: Outdoor Air Delivery Monitoring - The Project will incorporate permanent CO2 sensors and measuring devices to provide feedback on the performance of the HVAC system. Devices will be programmed to generate an alarm when the conditions vary by 10% from a set point.

Credit 3.1: Construction IAQ Management Plan (during construction) - The Construction Manager will develop an Indoor Air Quality Management Plan for the construction and pre-occupancy phases of the Project to meet/exceed the recommended Control Measures of the SMACNA IAQ Guidelines for Occupied buildings Under Construction 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter3). Absorptive materials stored on site will be protected from moisture damage.

Credits 4.1: Low-Emitting Materials, Adhesives & Sealants - The specifications will include requirements for adhesives and sealants to meet low VOC criteria for adhesives and sealants.

Credits 4.2: Low-Emitting Materials, Paints and Coatings - The specifications will include requirements for paints and coatings to meet low VOC criteria for paints and coatings.

Credits 4.3: Low-Emitting Materials, Flooring Systems - The specifications will include requirements for hard surface flooring materials to be Floor Score certified and carpet systems to endeavor to comply with the Carpet Institute Green label program.

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.

Credit 5: Indoor Chemical and Pollutant Source Control - The Project Team will seek to design to minimize and control the entry of pollutants into the building and to contain chemical use areas.

Credit 7.1: Thermal Comfort, Design - The Project HVAC design will be in compliance with ASHRAE 55 for all applicable mechanically ventilated regularly occupied spaces.

Credit 8.1: Daylight and Views, Daylight for 75% of the spaces - The Project will be designed to enable daylight to penetrate toward the interior of the floor plate. At this time, the Proponent has not confirmed the estimated light levels provided across the floor plate by daylight alone, using a proposed tenant layout/test fit plan.

Credit 8.2: Daylight and Views, Views for 90% of the spaces - These calculations must be completed on a tenant layout test fit plan. It may be demonstrated that a tenant could locate regularly occupied spaces along the perimeter with ample vision glass to achieve views for 90% of the areas.

4.1.6 Innovation and Design Processes

The Proponent has identified several possible Innovation and Design credits which are listed below (limited to 5 credits total).

ID credits under consideration

Building as an Educational Tool - The Project may choose to implement two public outreach programs to inform the public about the sustainable design features incorporated into the Project.

Green Housekeeping - The Proponent may choose to implement a cleaning program that uses 'green' cleaning products.
Credit 2: LEED Accredited Professional (required ID credit for LEED certification) - A LEED Accredited Professional will provide administrative services to oversee the LEED credit documentation 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. When a project team achieves one of the designated RPCs an additional credit is awarded to the project. RPCs applicable to the Boston area include: SSc3, SSc6.1, SSc7.1, SSc7.2, EAc2 (1%) and MRc1.1 (75%). This Project is targeting three RPCs: EAc2, MRc1.1, and SSc7.2 Heat Island Effect, Roof.

4.2 Climate Adaptability

With increasingly warmer average temperatures and more frequent and intense storm events, the scientific consensus is that climate change is a reality, the effects of which are currently being experienced and that requires preparation and adaptation. The contiguous United States experienced a warmer year in 2013 than the 20th century average while 2012 was the warmest year on record. Superstorm Sandy demonstrated the potential scale of threats and impacts from climate change (NOAA 2013).

This section describes Project-related research into climate change and the measures that have been incorporated into the Project design to ensure it will improve the existing building and site's climate change resiliency.

Most of the mechanical and electrical systems, including all major equipment and critical life safety equipment (e.g., generators, associated switchgear, and distribution) will be located above elevation 19 feet Boston City Base (BCB) to help ensure they are not rendered inoperable by a climate change-related event.

4.2.1 Anticipated Sea Rise and Storm Surge Scenarios

A number of published reports were reviewed while studying climate change and its implications for the Project. While no report can definitely estimate the impacts of climate change, perhaps the most quantifiable measure of climate change is sea level rise. Scientific literature contains reports with a wide range of sea level rise predictions, usually carrying those predictions through the middle and end of the century. Despite the variability in predictions, one noticeable trend in the literature over the past decade or more is that estimated sea level rise appears to be trending higher as more studies and analyses are performed. Reports reviewed and consulted during ongoing Project design include:

- Intergovernmental Panel on Climate Change (IPCC). 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.

- Pfeffer, et al. 2008. *Kinematic Constraints on Glacier Contributions to 21st–Century Sea Level Rise*. Science. Vol. 321, no. 5894. pp. 1340-1343.

- Massachusetts Executive Office of Energy and Environmental Affairs and the Adaptation Advisory Committee. 2011. *Massachusetts Climate Change Adaptation Report, September 2011.*

- Douglas, Ellen M.; Kirshen, Paul H.; Paolisso, Michael; Watson, Chris; Wiggin, Jack; Enrici, Ashley; and Ruth, Mathias. 2011. *Coastal flooding, climate change and environmental Justice: Identifying obstacles and incentives for adaptation in two Boston Metropolitan communities*. Published in “Mitigation and Adaptation Strategies for Global Change,” October 21.

- Douglas, Ellen; Kirshen, Paul; Li, Vivien, Watson, Chris; and Wormser, Julie. 2013. *Preparing for the Rising Tide*. Published by The Boston Harbor Association, February.

As mentioned above, there is no consensus on the rate or magnitude of future sea level rise. For example, the Intergovernmental Panel on Climate Change (IPCC) report estimates that global average sea level will rise on average by 0.6 to 2.0 feet by the year 2100, and acknowledges there may be substantial variability in sea level rise depending on geographic location. The Pfeffer report concludes that the most likely range of sea level rise by 2100 is

2.5 feet to 6.6 feet, but also acknowledges that "substantial uncertainties" exist regarding this estimate. The most current thinking is that sea level will rise between 0.5 and 1.3 feet by 2050, and between two and six feet by the year 2100.

The most recent report, published by The Boston Harbor Association (TBHA) in 2013 ("Preparing for the Rising Tide") assesses impacts of sea level rise with storm surge throughout the City of Boston in three scenarios:

1. The first scenario estimates flooding impacts by adding 2.5 feet to the elevation of Mean Higher High Water (MHHW); this scenario essentially mimics the flooding that was experienced in the City of Boston at high tide five hours before Superstorm Sandy's maximum storm surge hit.

2. The second scenario adds 5 feet to MHHW, thus estimating the impact that Superstorm Sandy would have had if the storm surge had hit during high tide.

3. The third scenario approximates the 100-year coastal storm surge at high tide when sea levels are approximately 2.5 feet higher than current levels. Scenario 3 effectively adds 7.5 feet to existing MHHW to estimate flooding impacts that could occur at projected mid-century sea levels during a 100-year coastal storm surge at high tide.

The third scenario in the TBHA report has the most profound flooding impacts throughout the City of Boston, and it is the scenario that is considered for this Project. Adding 7.5 feet to the existing MHHW elevation on the Project site (11.2 feet BCB) yields a potential 100-year coastal storm flood elevation of 18.7 feet at high tide. This elevation provides an important design benchmark for the Project design as regards providing resiliency for sea level rise and storm surge.

When considering climate change and sea level rise, there is no standard accepted practice or regulatory standards associated with site and building design. Absent any standards or regulations regarding climate change preparation and adaptation, the Project has relied primarily on recent scientific literature as well as solid engineering judgment and common sense.

Currently, the Project site is not within the 100-year floodplain, however, if new preliminary FEMA maps are adopted, it will be in flood plain Zone AE El-12 feet NAVD88. Note that the EL-12 signifies a Base Flood Elevation (BFE) of 12 feet using the NAVD88 datum. Floodplain elevations are based on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Numbers 25025C0081J, 25025C0082J and 25025C0084J; effective November 15, 2013; floodplain areas on the Project site are described as Zone AE.

4.2.2 Building Design

The Project will use a limited number of design measures to improve the adaptability of the existing building and site to climate change and its effects, including sea level rise and storm surges.

4.2.2.1 Ground Floor Uses and Finish Floor Elevations

First floor elevations for the IDB vary between elevation 18.19 and 19.37. The 12 foot FEMA BFE in NAVD88 for this site converts to 18.7 BCB. As a nonresidential structure, each building would be required to be flood proofed if being constructed as a new building under the preliminary FIRMs under consideration. Flood zone retrofitting requirements are less clear. First floor areas will be used exclusively for supporting retail, food services, loading and service spaces.

4.2.2.2 Minimizing Water Flow/Seepage Pathways

Small pumps will be located in the first floor and basement levels to evacuate stormwater from these areas during storm surge scenarios. In addition, all storefronts and ground floor glazing will be placed on a minimum 4-inch curb. Flood barriers will be provided at loading dock doors along Black Falcon Avenue as needed.

4.2.2.3 Site Design

A large part of the Project aims to improve the immediate site and landscape around the IDB. This includes installation of new, green landscaped plazas at each of the four new building entries. These plazas will incorporate extensive planting of native and adaptive plant species, and natural landscaping design to improve the on-site absorption of rainwater and reduce runoff. Permeable hardscapes (unit pavement/wood metal grating) will be used in select locations to aid in capturing surface run-off prior to entering standard storm systems. The Project will also provide numerous shade trees and structures to reduce the urban heat effect on the new surface parking lots replacing the existing loading areas.

4.2.2.4 Elevation of Communication and Electrical Equipment and Feeds to Outlets

Most of the mechanical and electrical systems, including all major equipment and critical life safety equipment (e.g., generators, associated switchgear, and distribution) will be raised above elevation 19 feet BCB where the floor level lies below the BFE to help ensure they are not rendered inoperable by a climate change-related local flooding event.

4.2.2.5 Use of Water Resistant Building Materials

The Project will utilize water resistant materials in all alterations to the existing IDB envelope, first floor spaces and surrounding site. In each exterior entry plaza, resistant materials such as composite wood lumber, concrete, natural stone and corrosion-resistant metals will be used. In addition, the Project will utilize a large number of recycled, weather-resistant, shipping containers for entryways, kiosks and bike storage areas.

Interior first floor spaces will be directed to use a combination of unfinished concrete surfaces and moisture-resistant wall and floor materials. Extra emphasis will be given to selecting interior finishes that are not coated and/or waterproofed on both sides, thereby allowing such finishes to dry in at least one direction following a flooding event.

Furnishings in first floor spaces will have the following characteristics: light weight in order to be easily moved to higher levels if necessary, and rust/corrosion resistant metal, plastic, concrete, reinforced glass, and natural and/or artificial non-absorbent stone finishes. Laminated surfaces will be avoided because such surfaces may separate once wetted. Cellulose based furnishings such as paper, cotton, linen and wood will also be avoided as such materials readily mold after being submerged.

4.2.2.6 Critical Equipment Connected to Emergency Generator

Critical equipment and loads of the Project that will be connected to emergency power will include stair pressurization and elevators.

4.2.2.7 Essential Safety

Essential life safety equipment connected to emergency power will include fire alarms, fire pumps, and egress lighting.

4.2.3 Climate Change Preparedness Checklist

The BRA recently began asking project proponents to complete a Climate Change Preparedness and Resiliency Checklist. A copy of the completed Checklist is included as Appendix D. Given the preliminary level of design, the responses are also preliminary and may be updated as the Project design progresses.

Chapter 5.0

Urban Design

5.0 URBAN DESIGN

The BMIP is a distinct subdistrict of the larger Boston Seaport area, and the BMIP has a unique history, identity, and character. Created largely through landfill projects throughout the 19th century, the Seaport and BMIP became the hub for Boston's shipping, docks, wharves and rail facilities. In 1920, the U.S. Government purchased land in South Boston to create the South Boston Naval Annex, including Dry Dock No. 3, which is located just north of the Project site. At the same time, the U.S. Government purchased the adjacent land for the South Boston Army Base, which included a concrete-frame, waterside storehouse structure which would later become known as Building 114 and includes the BDC and Bronstein Center. Most of the buildings on the two parcels that make up the majority of today's BMIP were built between 1914 and the mid 1940s. These buildings were robust, concrete frame warehouses and processing centers capable of supporting military equipment, vehicles and ammunition for deployment around the world. From the 1940s until the 1970s, business and shipping declined in the area until the U.S. Government closed the annex in 1974. Shortly thereafter, in 1977, EDIC acquired the former Naval Annex to promote economic growth and maritime industrial development. In 1983, EDIC acquired the former Army Base, completing the acquisition of the parcels that are now collectively known as the BMIP. Starting in 1959, the Seaport and BMIP were largely cut off from the rest of downtown Boston by the construction of the Central Artery. In the 1990s, this obstacle began to diminish following the major infrastructure projects associated with the Big Dig and the development of the Silver Line connecting downtown Boston to the Reserved Channel, the Airport and South Boston. These projects, along with the presence of the BCEC have provided the Seaport area with a tremendous capacity for growth, and over the last 25 years numerous residential, hotel, entertainment and civic projects have changed the character of the Boston Seaport district although the BMIP remains a hub of economic activity.

5.1 Site Context

The BMIP today provides space for a wide array of marine-related industrial and light industrial businesses, including ship repair, seafood shipping and processing and cruise port operations. The New Boston Seafood Center, opened in 1997, is one of a handful of buildings on site that continue to make the BMIP the center of Boston's seafood processing operations.

In recent years, many new commercial businesses have relocated to the area due to the availability of large parcels of open land, low-cost industrial building space, and the positioning of the site between Boston Logan Airport and highway systems, along with its unique maritime infrastructure. These businesses include many creative and technology companies as well as design center showrooms featuring fabric, furniture, lighting, antiques and kitchen and bath fixtures.

Additional uses in the BMIP include research and development laboratory space, general office, parking structures, and transportation infrastructure. The existing buildings of the BMIP include a collection of concrete and masonry structures for industrial shipping and processing operations, as well as a handful of newer steel framed glass and precast office buildings with a maximum building height of 150 feet. A new glass and steel, four-story building is currently planned for Tide Street and Northern Avenue that will houselab, R&D and bio-pharma manufacturing beginning in 2015. The majority of new buildings and projects in the BMIP will be affected by flight paths from Logan Airport and therefore need to coordinate overall height, glare mitigation and warning devices with the Federal Aviation Administration (FAA).

The BMIP also contains a series of open spaces intended to give the public the opportunity to see the working port in operation. A public viewing platform was erected in 1996 to provide a view of the operations of Dry Dock No. 3. In 1997, Parcel A was improved with benches and landscaping and provides views towards the Reserved Channel.

Approximately 300,000 visitors pass through the the Cruiseport as part of cruise ship tour operations, embarking on journeys to the Caribbean, Canada and other points. With so many people converging on the site at specific times, the design and function of Black Falcon Avenue, Drydock Avenue, Design Center Place and the site's various parking lots and garages will be important to the proposed Project.

While alterations to the building's exterior will be minimal, each intervention in the façade, entries and surrounding site will respect and enhance the established character of the maritime industrial area and recognize its historic relevance to the City of Boston.

The Project's position in the BMIP and proximity to the Cruiseport presents an opportunity to energize the area for the people who work there and visit, as well as to streamline the vehicular and pedestrian movements on site to create a more inviting and efficient neighborhood.

5.2 Urban Design Objectives

Urban design objectives include:

- Recognize, respect, and reinforce the scale and character of the surrounding BMIP;
- Improve pedestrian and vehicular access into, through and around the site;
- Develop the IDB as a vibrant multi-use building with a wide variety of companies and services;
- Develop an active pedestrian friendly edge; and
- Create new urban open space.

5.3 Façade Design, Fenestration, and Building Materials

The proposed exterior modifications to the building are minimal with respect to new construction and will retain the overall historic appearance; however, the rebranding of the north facade will have considerable impact to the building's image and response to the urban context. Re-used shipping containers will signal four new north side entry plazas and the pedestrian promenade, and will reinforce the building's connection to the surrounding maritime park and harbor operations. Vacant ground floor spaces will be programmed with support retail and food and beverage uses and oriented to the exterior, and glass storefronts will replace some of the unused overhead doors along the north side of the building. Additionally, seating areas, freestanding kiosks and temporary food trucks will be distributed along the raised platform creating an inviting, active pedestrian promenade along the length of the building. In addition to the new retail storefronts along the northern side, the building's upper floor windows will continue to be replaced over time with more energy efficient systems that will maintain the character and aesthetic of the originals, subject to specification approval by EDIC under the Proponent's leases via a proposal separate from this Expanded PNF.

New signage reinforcing the building's new identity as "The Innovation and Design Building" will be placed on the existing canopy over the loading platform on the north side of the building and on the pediment at the west end of the building. New signage above the BDC entry will reflect the refreshed visual identity and will replace the existing BDC signage that is currently located on the western façade. To assist wayfinding, four of the five individual buildings that make up the IDB will incorporate signage identifying building number (19, 21, 23, and 25) using the storage containers that will make up the new entry plazas.

In addition to the new building signage described above, wayfinding opportunities will be established for both upper floor and promenade tenants. Upper floor tenant wayfinding will most likely gravitate toward the new entry plazas and lobbies in the form of directories, while the promenade tenant signage will likely be in the form of blade signage and storefront signage within the promenade, as well as overall promenade directories between building entries.

New lighting along the promenade will activate the space and create a more inviting pedestrian path. Each of the four new building entrance plazas will incorporate overhead, catenary lighting that will draw visitors and tenants into the buildings and retail promenade.

Handrails and free-standing kiosks will provide edge protection along the converted loading dock with the opportunity for seating areas and benches. The improvements will comply with accessibility requirements, and as noted elsewhere, the Project will maintain the appropriate clearances for future rail activity to occur along the now-inactive Track 61 that runs parallel to Drydock Avenue on the north side of the IDB.

The existing glass solarium at each Bronstein Center entry will be replaced with new building entries leading to new entry lobbies. New signage will signal building entries along the promenade in conjunction with the placement of new shipping container entryways at the four building entrances along Drydock Avenue.

Loading areas will be consolidated and internalized along Black Falcon Avenue, and outdoor equipment will be screened to provide a neater appearance from the Cruiseport to the south of IDB.

5.4 Open Spaces, Pedestrian Ways, and Public Amenities

The Project will create four new building entrances fronting Drydock Avenue. The new entry portals will be constructed out of shipping containers and are intended to better define and celebrate the entrance to each building. The sloping entry plazas will transition pedestrian and handicap access from the parking areas and Drydock Avenue sidewalk to newly configured stairs and handicap accessible lifts to the raised promenade at the existing loading dock level. The entry plazas will provide areas for bike storage, sitting and relaxing during the day. The shipping containers along the promenade will house retail kiosks and other programs to help activate the pedestrian experience.

In addition to the four entry plazas, the areas in front of the building will be reshaped with new sidewalks, reconfigured vehicular parking, street lights and signage, trees and other plantings to replace the relatively undefined loading and parking which exists today. Relocated crosswalks will provide added access to: the existing and/or consolidated MBTA stops, Hubway stations, parking lots, and existing EDIC parking and garage.

5.5 Vehicular Circulation, Parking and Loading

Managing vehicular circulation on site will be an important part of the Project, particularly given the location of the Cruiseport directly to the south of the Project site. Ensuring automobiles, taxis, buses, trucks, and Silver Line buses enter and exit the site quickly and efficiently will be a priority. Today, the majority of vehicular traffic enters the site from two locations: (1) vehicles approach from the Tide Street/Northern Avenue intersection to the north and then turn east onto Drydock Avenue, or (2) vehicles approach from Summer Street to the west and continue east onto Drydock Avenue. The Cruiseport uses Black Falcon Avenue for the majority of its drop-off and pick-up operations. The IDB’s tenants and visitors also use this space for parking, and have rights to approximately 170 vehicle parking spaces on the roadway. On cruise days, Massport requests that some or all parking on Black Falcon Avenue be prohibited. The Proponent has agreed to relocate parking spaces for the IDB from Black Falcon Avenue to Parcel C-2 and to the EDIC parking garage as needed, to alleviate congestion on the roadway during cruise days throughout the 2014 cruise season. The Proponent will work with Massport and EDIC to develop a mutually agreeable long-term parking solution for Black Falcon Avenue.

In the event parking is permanently removed from Black Falcon Avenue, the space between the Cruiseport and the IDB may be re-striped to include a 10 foot wide sidewalk along the face of the Cruiseport building and four travel lanes for bus, taxi and car drop-off. Loading for the IDB will continue to occur on both the north and south sides of the building, including along Black Falcon Avenue. However, loading on the Black Falcon Avenue side of the IDB is intended to be reconfigured into new internal loading docks, as addressed in Section 2.0. The Proponent will employ ann, on-site Loading Dock Manager to coordinate activities and traffic between the Cruiseport and IDB to ensure smooth and successful operations on Black Falcon Avenue. The proposed loading and roadway reconfiguration is anticipated to alleviate congestion and improve access by tenants of the IDB and Cruiseport visitors.

Major pedestrian access and entry for the IDB will occur at the new building entrances on the north and will continue at the BDC entrance on the west, with secondary entry and egress from the building to the south. Existing and/or slightly modified crosswalks will connect the north side of Drydock Avenue, the two Hubway stations and additional parking near the site to the four new IDB entryways. On-site parking will be reconfigured to accommodate the new pedestrian access points into the IDB, but the Project will not result in any net new parking spaces.

5.6 Preservation of Rail Access

Rail access to the BMIP is provided by the Boston Terminal Running Track and Track 61. The Boston Terminal Running Track runs from South Bay Rail Yard and connects to Terminal Yard (also known as West First Street Yard), which is adjacent to the BCEC. Beginning at Summer Street and heading southeast, the Boston Terminal Running Track becomes Track 61, runs adjacent to the BCEC and the Massachusetts Turnpike, and then turns nearly due east, terminating in the BMIP. This single line industrial terminal track is the last remnant in the BMIP of the rail yards that once covered much of the South Boston waterfront. CSX Transportation (CSXT) controls freight operation rights along the Boston Terminal Running Track, but does not currently provide any service along either the Boston Terminal Running Track or Track 61.

Track 61 at the IDB has a long history of freight use, but became dormant during the 1990s and remains out-of-use today. A portion of Track 61 was constructed in 1855 and became part of the New York and New England Railroad. Additional sections were constructed from 1880 to 1920 as South Boston became a freight center. During the second half of the twentieth century, use of the line declined. Two tracks remained on the Boston Terminal Running Track for a once-daily local freight train until the 1980s when the construction of the South Boston Haul Road as part of the Central Artery /Tunnel (CA/T) Project reduced the Boston Terminal Running Track to a single track.

In 1997, the federal Surface Transportation Board allowed CSXT to temporarily discontinue service over the Boston Terminal Running Track because of the construction of the CA/T Project. This discontinuance of service was subsequently extended until 2006. Additionally, in 2006, CSXT evicted Boston Railway Terminal Corporation, the short line operator, from use of the line. Trains do not currently operate along Track 61; however, one section of the track was rebuilt in 2005 as part of the CA/T Project, and MassDOT, Massport and EDIC may eventually resume freight service to the BMIP.

Plans to resume use of Track 61 have developed over the past several years. In 2009, EDIC and Massport proposed to rehabilitate the out-of-service Track 61, but were unsuccessful when federal transportation grant funding for the line was not approved. The grant application for $14 million included rehabilitation of 2,810 linear feet of existing track and construction of 5,910 linear feet of new track that would have extended rail service to the North Jetty area of the BMIP. Also in 2009, MassDOT filed a verified notice of exemption under 49 CFR 1150.31 which allowed MassDOT to acquire a portion of the Boston Terminal Running Track from CSXT, and authorized CSXT to maintain exclusive rights to conduct common carrier freight operations on the line.

MassDOT's acquisition of the Boston Terminal Running Track is part of a larger strategy of avoiding conflicts between freight and passenger rail in the Boston area. As part of a 2009 operating agreement between MassDOT and CSXT, MassDOT obtained the right to increase commuter service east of Worchester while assisting CSXT in relocating its operations out of Beacon Park Yard in Allston. This agreement will allow passenger and freight trains to operate, as much as possible, in exclusive "windows" of time to reduce possible conflicts. As noted in MassDOT's GreenDOT Policy Directive June 2, 2010 P-10-002, CSXT would concentrate its freight rail operations to the western portion of the Greater Boston area and reduce freight rail traffic east of Worchester. This reduction of freight traffic east of Worchester will allow for expanded passenger service including connection from Back Bay station to BCEC on the Boston Terminal Running Track. MassDOT's Back Bay to BCEC service is not currently anticipated to extend to the BMIP. This service is planned to be operated by MassDOT with Diesel Multiple Unit (DMU) trains as part of the proposed Indigo Line.

5.6.1 Existing Conditions

A number of obstacles exist with respect to the reactivation of freight rail service to the BMIP. These include: shared use of portions of the applicable tracks with passenger service, limitations imposed by track junctions, the lack of key rail links to the area, and competition from trucking operations. For instance, the Fairmount Line, CSXT's access to the Boston Terminal Running Track, will experience increased passenger traffic with the arrival of DMUs and expanded commuter rail service. As for track limitations, access the Boston Terminal Running Track currently requires a reverse movement at the Bay Junction switch to the west of BCEC. This movement limits the train length to just a few cars. As for the competitiveness of freight rail, local and regional markets are the primary destination of container freight from the Conley Container Terminal, which is across the Reserved Channel from the IDB. As a result roadway infrastructure takes priority over direct on-dock rail access and makes trucking operations more economically viable than rail. In 2013, Massport filed a MEPA Environmental Notification Form for Conley Terminal Improvements which included a proposed dedicated truck haul road that would allow Massport to remove all container truck traffic from East First Street and portions of Summer Street.

Although Track 61 is currently dormant, it may become more widely used in the future. The development of a bulk cargo handling and cold storage facility at the BMIP North Jetty may create demand for on-dock rail through the extension and reactivation of Track 61. In addition, the Massachusetts Freight Plan includes the Track 61 project as part of the Boston Core Multi-Modal Freight Improvements Scenario.

5.6.2 Proposed Conditions

The Proponent is committed to preserving rail access to BMIP facilities, and the Project will not interrupt rail access. The Proponent and its consultants will, consistent with the existing rail right-of-way-easements, ensure that proposed Project structures, clearances, operational procedures, safety measures and signage do not interfere with rail access on Track 61. Additionally these improvements will be compatible with the future rail initiative identified in the Master Plan for BMIP Parcels I, F and F-1.

A significant Project objective is to improve the immediate landscaping around pedestrian pathways leading to the IDB. The Project will create four new building entrance plazas with portals fronting Drydock Avenue on the IDB's north side, which is adjacent to Track 61. Each of the four new building entrance plazas will incorporate overhead lighting, stairs and accessibility-compliant lifts and will not touch or obstruct the existing rail. These new entry plazas will provide pedestrian and handicap access from the parking areas up to the new promenade at the existing raised loading dock level. The proposed new entry portals will be constructed out of re-used shipping containers and are intended to better define the entrance to each section of the IDB and pedestrian promenade. These plazas and portals will comply with the requirements of the Architectural Access Board, Commission for Persons with Disabilities, and the Americans with Disabilities Act.

The proposed landscaping and entries will not impede the ability to re-establish rail access through the site. The Proponent's proposed structures are outside clearance envelopes allowing freight traffic to operate along Track 61 without obstruction. Clearance requirements established by CSXT, Department of Defense, and EDIC will be evaluated and the most stringent envelope will be applied during the design.

As the Project's design advances, the Proponent will consider applicable rail operation requirements, coordinate design standards, identify required modifications to existing agreements between the various authorities having jurisdiction, and establish an operational plan for track clearing procedures required by EDIC and its tenants.

5.6.3 Proposed Operation Plan

The proposed operating plan for the movement of CSXT trains through the portion of Track 61 where the IDB's entry plazas will be located is as follows:

- Prior to moving through the area at 1 Design Center Place and 21-25 Drydock Avenue, CSXT would notify MassDOT, Massport and EDIC to obtain permission to occupy Track 61;
- At that time, IDB property management staff would verify that no obstructions were present along the track to ensure the CSXT train could move past the IDB unimpeded;
- The IDB property management staff would ensure a facility management representative was present during the movement of the CSXT trains; and
- CSXT trains would approach the BMIP/IDB at a restricted speed (e.g., 15 MPH) and would be prepared to stop for any pedestrians or other obstructions on the track in the parking areas, driveways and roadways.

The requirement to provide a facility management representative would include movement to the uses at the end of Track 61 and the return movement of the CSXT train as it departs the BMIP along Drydock Avenue. The Proponent will continue to coordinate with MassDOT, EDIC, Massport and CSXT as it refines this operating plan.

Chapter 6.0

Tidelands

6.0 TIDELANDS

The Public Waterfront Act, Mass. Gen. Laws, ch. 91 (Chapter 91) and regulations at 310 CMR 9.00-9.55, require that on filled former tidelands, a license be obtained for (i) the placement of structures and fill, or (ii) changes in use of or structural alterations to existing licensed structures and fill [see 310 CMR 9.04(2) and 9.05(1)].

Most of the BMIP, including the IDB, is subject to the Chapter 91 Master License, as affected by any existing licenses applicable to individual buildings or parcels within the BMIP (Master License), which authorizes certain activities in the BMIP for a term of 65 years. All of the Master License Area is also located in a DPA, as defined under 301 CMR 25.00. The IDB is located within the Master License Area and the DPA.

The Master License was issued in coordination with the Master Plan for the BMIP, which comprises a Final Environmental Impact Report (FEIR), approved under MEPA. The Master Plan coordinates land use in the BMIP and contemplates flexibility for licensing under Chapter 91.

The Master License applies to (i) "all existing unauthorized structures and uses [in the BMIP] as of the date of license issuance" and (ii) "any future structural alterations and changes in use, except structural alterations and changes of use authorized as a Minor Project Modification" (see Master License Special Condition 1). Individual building licenses under Chapter 91 for the IDB are not required, per Special Condition 1.

6.1 Tidelands History

The Project site and surrounding lands are located over former tidelands filled in accordance with various legislative authorizations and Chapter 91 licenses issued in the 19th and early 20th century. That the Project site is located entirely over filled tidelands is well established by these earlier authorizations, as well as the above referenced Chapter 91 Master License for the BMIP.

6.2 Consistency with Chapter 91 Master License for the Boston Marine Industrial Park

6.2.1 Proposed Uses

The Master License, Master Plan, and applicable regulations place a strong policy emphasis on ensuring general industrial and water-dependent industrial uses remain a prominent part of the BMIP. The Master License imposes certain restrictions on use (i) within the Master License Area generally and (ii) for each individual parcel specifically. However, the Master License affords flexibility to accommodate non-water-dependent commercial uses, and the Master Plan expressly notes that the IDB is poorly-suited to "maritime industrial" uses.

BRA/EDIC is seeking a Minor Revision of the Master License consistent with the process outlined in the Master License to authorize the amount and mix of the Project's proposed uses.

6.2.1.1 DPA-Wide Use Restrictions

Under the Master License, general use restrictions throughout the Master License Area establish the following conditions:

- A minimum of 67% of the Master License Area must comprise water-dependent industrial uses (the "Water-Dependent Use Minimum"), and 67% of the Water-Dependent Use Minimum (or approximately 45% of the Master License Area in total) may be comprised of so-called "Infrastructure Facilities" (e.g., parking lots, roads, and open spaces) accessory to water-dependent industrial uses, per Special Condition 2(a);

- No more than 5% of the filled tidelands in the Master License Area can be dedicated to commercial uses (Commercial Use Limit), per Special Condition 5(c)(ii);

- No residential or hotel uses are allowed in the Master License Area, and new buildings in the Master License Area may not be devoted primarily to general office use, per Special Condition 4 (see also Section 8.1 of the Master Plan);

- All "flowed tidelands" (i.e., those submerged or partially submerged lands subject to ongoing tidal action) must be used exclusively for water-dependent industrial uses, per Special Condition 2(c); and

- The Master License Area may otherwise be used for non-water-dependent, general industrial, commercial uses or uses accessory thereto.

Special Condition 7 of the Master License and Section 8.1 of the Master Plan establish the method for determining the Water-Dependent Use Minimum and Commercial Use Limit. The "Total Land Use" for each of (a) Marine Industrial[11], (b) General Industrial, and (c) Commercial use is calculated for each parcel in the Master License Area. Total Land Use comprises the percentage of total interior floor area of each building in the Master License

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[11] Table 7 of the Master License uses the term "Marine Industrial," Appendix B of the Master License, excerpting from the Master Plan, uses the term "Maritime-dependent Industrial," and the Master Plan itself occasionally uses the term "Maritime Industrial" whereas the DPA regulations, Chapter 91 regulations, and other portions of the Master License generally employ the term "water-dependent industrial." The terms "Marine Industrial," "Maritime-dependent Industrial," and "Maritime Industrial" should be understood as largely synonymous with "water-dependent" industrial. The latter term is used throughout this document except where taken as a direct quote or as context otherwise requires.

Area devoted to each use, multiplied by the building footprint area (Building Footprint Use) the total exterior site area of each parcel devoted to each of those three types of uses. EDIC must certify compliance with these use restrictions bi-annually, per Special Condition 7.

6.2.1.2 Table 7 Use Restrictions for the IDB

The Master License sets specific use limits for each parcel in the Master License Area to ensure compliance with the Water-Dependent Use Minimum and the Commercial Use Limit. The limits are set forth on the "Future Build Out Land Usage Matrix" (Table 7) attached to the Master License at Appendix A. Table 7 sets forth the total square footage of each parcel; the total square footage of the building footprint on each parcel; the Building Footprint Use as described above; the area of uses outside the building footprint; and the Total Land Use for the parcel, as defined above. While Table 7 addresses Marine Industrial, General Industrial (Gen. Ind.), and Commercial (Comm.) use, because no new Marine Industrial uses are presently contemplated under the Project, for simplicity only General Industrial and Commercial are shown in the following excerpt from Table 7, reproduced here as Table 6-1.

Table 6-1 Table 7 Land and Building Use Limits[1]

Parcel	Parcel Area (sf)	Building Footprint (sf)	Total Land Use		Building Footprint Use		Area Outside Building Footprint	
			Gen. Ind.	Comm.	Gen. Ind.	Comm.	Gen. Ind.	Comm.
F	164,010sf	70,454	123,008	41,003	52,841	17,614	70,167	23,389
I	225,374	103,194	202,837	0	92,876	0	109,962	0
TOTAL	389,774	173,648	325,845	41,003	145,717	17,614	180,129	23,389

[1] As Excerpt from Appendix A, Table 7, *Future Build Out Land Usage Matrix*, of the BMIP Master License"

The Building Footprint Use does not provide the *total* amount of General Industrial or Commercial use allowed in the IDB. Rather, to calculate the total General Industrial and Commercial use allowed at the IDB under Table 7, the Building Footprint Use must be scaled by eight, which represents the number of stories in the IDB. Therefore, Table 7 currently contemplates up to 140,912 square feet of interior Commercial use in the IDB, derived by multiplying 17,614 by a factor of eight.

In March 2014, BRA/EDIC submitted a revised Table 7 to MassDEP requesting 206,388 square feet of Commercial use allocation for the Parcel I Building Footprint Use and 30,545 square feet of new Commercial use allocation in the Area Outside the Building Footprint on

Parcel I (the Table 7 Revision). The Table 7 Revision would allow for General Industrial and Commercial uses consistent with the amounts as shown in Table 6-2 (changed cells shown in bold):

Table 6-2 Table 7 Revision

Parcel	Parcel Area (sf)	Building Footprint (sf)	Total Land Use		Building Footprint Use		Area Outside Building Footprint	
			Gen. Ind.	Comm.	Gen. Ind.	Comm.	Gen. Ind.	Comm.
F	164,010sf	70,454	**123,008**	**41,003**	**52,841**	**17,614**	**70,167**	**23,389**
I	225,374	103,194	146,491	56,342	67,077	25,798	79,417	30,545
TOTAL	389,774	173,648	269,499	**97,345**	**119,918**	**43,406***	**149,584**	**53,934***

6.2.1.3 Use Definitions

The Master License and Master Plan, read together, define "General Industrial" uses as those allowed in a proposed Waterfront Manufacturing zoning district (WM), and "Commercial" uses are those allowed in a proposed Waterfront Commercial district (WC). Although neither proposed zoning district has been adopted, these definitions are included in an exhibit attached to the Master License and provide that:

- "General industrial" uses include:
  - General Manufacturing,
  - Industrial Office,
  - Light Manufacturing,
  - Maritime-dependent Industrial,
  - Motor Freight Terminal, and
  - Warehousing; and
- "Commercial" uses include the above uses as well as:
  - Banking and Postal Uses,
  - General Office,
  - Local Retail Business, and
  - Restaurant.

All of the Project's proposed uses fall within this Commercial use definition.

6.2.2 Project Height

Chapter 91 provides that the maximum building height for non-water dependent uses is 55 feet within 100 feet of the high water mark, with an additional one-half foot in height allowed for every foot of separation from the high water mark beyond 100 feet. The Master Plan at Section 8.3 identifies the height of the IDB as 115 feet. Assuming this height is correct, the IDB exceeds the allowable height limit, but is grandfathered under Chapter 91 because it precedes the effective date of the Chapter 91 regulations.

6.2.3 Public Benefits of the Proposed Use

As regards Chapter 91, the Project creates and/or enhances a number of public benefits. Key among these is the support, maintenance and enhancement of the maritime and industrial character of the BMIP and the South Boston waterfront. The proximity of the IDB to the waters of the Boston Harbor and to the existing marine and roadway transportation infrastructure serving the Port of Boston make it an ideal location for established and start-up companies to conduct research and move physical products to production and distribution at a single site. In addition, companies engaged in the production of digital products are increasingly drawn to IDB for its large, light-filled floor plates, affordable rents, and creative community. The Project intends to support such business activity through site and building improvements, as well as through the conversion or reclassification of interior space from its current industrial or vacant use to a commercial use. In addition to allowing additional commercial office use in the building, the Project will allow ground level bays to be leased to much-needed accessory retail and food businesses serving the IDB and the BMIP in general. These uses are consistent with the Master License and Master Plan.

In addition to preserving the maritime and industrial character of the BMIP, the Project will introduce a number of Chapter 91-related public access and public transportation improvements. Of particular note, the Project proposes an organized pedestrian accessway system for the entire site, in contrast to the current undefined, wide-open area of continuous pavement. More specifically, the areas in front of the IDB along Drydock Avenue will be reshaped with new sidewalks, reconfigured vehicular parking, street lights and signage, trees and other plantings to replace the relatively undefined loading and parking which exists today. New crosswalks will provide added access to MBTA stops, Hubway stations, parking lots and garages throughout the site. They will also allow a direct link from the IDB to the Harborwalk located on Tide Street, thereby linking the heart of the BMIP to the broader, City-wide Harborwalk system.

Public access to the IDB will be through the existing BDC entrance on the western end of the building, and through four new building entrances fronting Drydock Avenue. Each of the new Drydock Avenue entranceways will be fronted by a public plaza and walkways that will transition pedestrian and handicap access from the parking areas and sidewalks up to the raised promenade at the existing loading level. Outdoor seating and guardrails will be added to the plazas and promenade platforms, along with steps to parking for additional access. Bicycle storage will be available in both outdoor kiosks and in lockers within the building. The promenade will in and of itself create a new public amenity, offering a 1,350-foot-long covered outdoor walkway, lined with retail outlets, restaurants, and similar facilities of public accommodation serving employees and visitors at the IDB and the surrounding area.

Finally, the Project offers the ability to preserve the largest and most prominent structure in the BMIP, a significant historic structure dating to the late years of World War I and representing America's ability to respond quickly and with determination to crisis. Built in one year, this nearly 100-year-old, 8-story, 1.6 million square-foot edifice is structurally sound and can continue to play a significant role in Boston's economic history. The Project offers the chance to revitalize the building for the benefit of the BMIP and the City and Port of Boston.

6.2.4 Management and Maintenance Plan for Public Open Spaces and Facilities

As noted above, the Project requires a minor revision to the existing Master License, and the Project implicates Chapter 91 only insofar as to require a MassDEP determination of consistency for a revision to the Master License authorizing the Project's proposed changes in use. The Project will continue to comply with all of the public open space and facilities of public accommodation management and maintenance provisions of the Master License.

Chapter 7.0

Historic and Archaeological Resources

7.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The IDB Project site encompasses approximately ten acres within the 160-acre BMIP and is bound by Drydock Avenue to the north, Black Falcon Avenue to the east and south, and Design Center Place to the west.

The BMIP was largely created through landfill projects in the 19th and 20th centuries, and has been and continues to be an important maritime facility in Boston with docks, wharves, and rail access. The majority of the buildings and structures within the BMIP were built between 1914 and the mid-1940s as part of the South Boston Naval Annex and South Boston Army Base, which operated here between 1920 and 1974. These buildings were robust warehouses and processing centers capable of supporting military equipment, vehicles, and ammunition for deployment around the world. By the 1970s, shipping had declined and the United States government closed the annex in 1974. The EDIC acquired the BMIP in two transactions between 1977 and 1983 with the intent to promote economic growth and maritime industrial development. In the 1990s, following the completion of the Central Artery project and the establishment of the MBTA Silver Line connecting downtown Boston to the Reserved Channel, new growth began in this area. Numerous projects over the last 25 years, including residential, hotel, entertainment, and civic projects, have changed the character of the BMIP and the surrounding area. The BMIP today contains a variety of marine-related, industrial, and light industrial businesses, as well as new commercial enterprises and design showrooms.

7.1 Historic Resources in the Project Vicinity

7.1.1 Historic Resources of the Project Site

The Project site is located within the former Boston Army Supply Base, an area included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory). The Project site includes one building, formerly known as the Army Marine Terminal Storehouse (Building 114), which is a contributing structure to the Boston Army Supply Base Area (MHC # BOS.RT). The building is located at the south edge of the former base, between Drydock Avenue to the north and Black Falcon Avenue to the south. The 1,600-foot long building was originally built as one of the storage buildings for the base and has been converted for a variety of uses, including show rooms for several different businesses. The building is divided into six equal sized eight-story sections. The BDC is located at 1 Design Center Place and comprises the two westerly sections of the building. The Bronstein Center is located at 21, 23, and 25 Drydock Avenue and occupies the next three sections of the building. Together these five sections comprise the IDB. The sixth section at the east end of the building is not part of the IDB.

7.1.2 Historic Resources in the Vicinity of the Project Site

The Project site is located in the immediate vicinity of several buildings associated with the World War II development phase of the Boston Army Supply Base. Additionally, review of Massachusetts Historical Commission (MHC) files indicates there are two other inventoried historic resources located within one-quarter mile of the Project site; specifically, the Summer (L) Street Bridge over the Reserved Channel and the Boston Edison L Street Power Station (Note: the Summer (L) Street Bridge was replaced by MassDOT in 2003). The historic resources within one-quarter mile of the Project site are shown in Figure 7-1, Historic Resources, and listed in Table 7-1.

Table 7-1: Historic Resources within and in the Vicinity of the Project Site

Map Number	Resource Name	Designation
1	Boston Army Supply Base Area	MHC Inventory
2	Summer (L) Street Bridge over Reserved Channel (no longer extant)	MHC Inventory
3	Boston Edison L Street Power Station	MHC Inventory

7.2 Impacts to Historic Resources

The proposed Project combines the existing BDC and the Bronstein Center into a single facility rebranded as "The Innovation and Design Building," or IDB. The IDB will consist of five physically connected, eight-story building sections. The proposed Project includes reusing the existing structure to revitalize the waterfront area through lease-up of commercial and industrial space. The Project will involve interior changes, including new building lobbies, as well as exterior alterations to the building and upgrades to the surrounding site. The scope of work includes renovations to the BDC and the Bronstein Center as well as improvements to the associated site area. Ground floor and site work include improvements to create defined building entrances and retail space.

Alterations to the building exterior will be minimal and will respect the historic character of the building and surrounding BMIP. This Project maintains exterior loading positions on the north elevation (Drydock Avenue) of the building and reconfigures existing loading doors on the south elevation (Black Falcon Avenue), as well as creates new, interior loading docks on the south side. All loading docks and doors will be connected to a new continuous service corridor running through the first floor of the building.

7.2.1 Building Façade Changes

Signage reinforcing the building's new identity as "The Innovation and Design Building" will be placed on the existing canopy over the loading platform on the north side of the building and on the pediment at the west end of the building. New signage above the

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Innovation and Design Building **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 7-1
Historic Resources

BDC entry will reflect the refreshed visual identity and will replace the existing BDC signage that is currently located on the western façade. In addition to the new building signage, each retail tenant will have signage and canopy opportunities along the pedestrian promenade. New blade signage will signal building entries along the promenade in conjunction with the placement of new shipping container entryways at four of the five buildings.

In addition to the new glass storefronts along the north elevation, the building's upper floor windows will be replaced over time with more energy efficient units that will maintain the character and aesthetic of the original windows, which will be subject to specification approval by EDIC under the Proponent's leases via a proposal separate from this Expanded PNF. Any windows proposed for removal will be replaced in accordance with the "Window Replacement Standards and Required Submissions for Building 114 Army Base Storehouse" developed by the BRA/EDIC 2001. The window standard was developed to ensure that the installation of windows throughout the building would have continuity in design and visual appearance, and would maintain the architectural and structural integrity of the building by requiring the size, shape, proportions, and finish be identical with no visual discrepancy.

7.2.2 Site Changes

The Project will include improvements to the surrounding site. Parking areas and loading docks will be reconfigured, but the Project will result in no net new car parking spaces. New lighting will be installed along the promenade. Each of the four new building entrance plazas will incorporate overhead, catenary lighting. Minimal handrails and free standing kiosks will provide edge protection along the converted loading dock with the opportunity for seating areas and benches. In addition to the four new entry plazas, the areas in front of the building will be reshaped with new sidewalks, vehicular parking, street lights and signage, trees, and other plantings.

The Project will create four new building entrances fronting Drydock Avenue. The proposed new free-standing entry portals will be constructed of shipping containers intended to define the entrance to each building and to reinforce the building's connection to the surrounding maritime industrial park and harbor operations. The shipping containers along the promenade will potentially house retail kiosks and other programs. The entry plazas will transition pedestrian and handicap access from the parking areas up to the new retail promenade at the existing loading level. Existing loading areas along the north and south elevations are anticipated to be reconfigured.

7.2.3 Visual Impacts

Redevelopment of the IDB is not anticipated to have adverse visual impacts to the existing building and surrounding former Boston Army Supply Base. Exterior modifications proposed for the building are minimal and will retain the overall historic appearance of the structure. Each of the building's four new north elevation entries will incorporate new landscaped areas, benches and trees to enhance the experience of visitors and tenants. Windows in the building will be replaced consistent with the BRA/EDIC window standards.

7.2.4 Archaeological Resources within the Project Site

The Project site is located on filled land which has been previously disturbed by the construction of Boston Army Supply Base. No previously identified archaeological resources are located within the Project site. No impacts to archaeological resources are anticipated.

7.3 Status of Project Reviews with Historical Agencies

The Project will potentially be subject to State Register Review (950 CMR 71) as a result of the need for a state permit(s) or other state actions. A Project Notification Form will be filed with the MHC to initiate the State Register Review process.

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Chapter 8.0

Infrastructure

8.0 INFRASTRUCTURE

This section provides a description of the existing utility systems in the vicinity of the Project site and evaluates potential impacts to those systems. Appropriate mitigation measures are discussed to address Project-related impacts. The Project is in the design stage and as the design evolves the Proponent will coordinate with the various utility companies to ensure full services for the new Project.

Required Permits/Approvals for the Project may include approvals from the Massachusetts Water Resources Authority (MWRA), Massachusetts Department of Environmental Protection (MassDEP), the U.S. Environmental Protection Agency (USEPA) and the Boston Conservation Commission. A Boston Water and Sewer Commission (BWSC) Site Plan and General Service Application will be required for the proposed new water and sewer connections. In addition, a Stormwater Pollution Prevention Plan (SWPPP) will be submitted specifying best management practices (BMPs) for protecting the existing stormwater drainage system during construction.

8.1 Sanitary Sewer System

8.1.1 Existing Sanitary Sewer System

The BWSC record drawings indicate that the sanitary sewer system in the Project area is owned and maintained by BWSC (see Figure 8-1, Existing Sanitary Sewer System). The record drawings indicate an existing 10-inch sanitary sewer line enlarging to 12-inch downstream runs west along Black Falcon Avenue. A 12-inch sanitary sewer line and an 18-inch sanitary sewer line runs west along Drydock Avenue. The 12-inch sanitary sewer eventually connects into the 18-inch sanitary sewer. Both of these lines change from sanitary sewers to combined sewers.

Based on existing building uses and occupancy, and design sewer flows as provided in 310 CMR 15.000, The State Environmental Code, Title 5: “Standard Requirements for the Siting, Construction, Inspection, Upgrade and Expansion of On-Site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage,” (Title 5) the current existing wastewater flow from the IDB is estimated at 49,632 gallons per day (gpd) (see Table 8-1).

8.1.2 Estimated Project Wastewater Generation

Based on the proposed existing building uses and occupancy, and design flows presented in Title 5, the Project will generate an estimated 60,200 gpd (see Table 8-2). This is a net increase of 10,568 gpd over the existing condition.

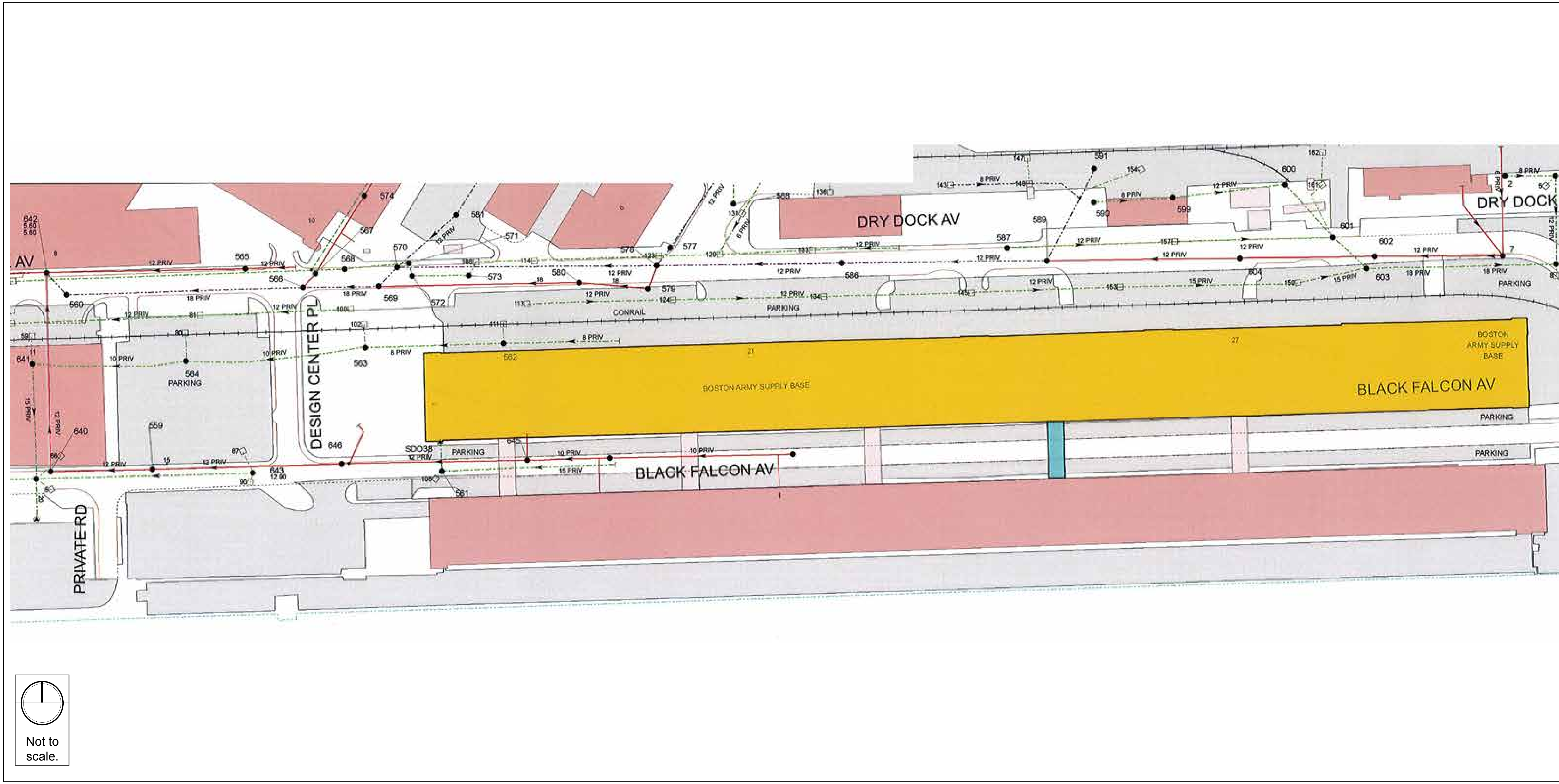


Figure 8-1
Existing Sewer System

Table 8-1 Existing Wastewater Generation

Use	Number	Sewage Generation Rate	Total gpd
Industrial[1]	90 people[2]	15 gpd per person[3]	1,350
Retail	6,343 square feet	50 gpd per 1,000 square feet	317
Office	604,534 square feet	75 gpd per 1,000 square feet	45,340
Restaurant(s)	75 seats[4]	35 gpd seat	2,625
Total Estimated Existing Sewage Generation			**49,632 gpd**

[1] Based on the Existing Building Program, Industrial use includes Light Manufacturing, Research and Development, and Warehousing.
[2] Number of people based on 2,500 sf/person for Industrial use and Existing Building Program square footage.
[3] Title 5: Factory, Industrial Plant, Warehouse or Dry Storage space without cafeteria sewage generation rate.
[4] Number of people based on 50 square feet of Existing Building Program gross square footage per seat.

Table 8-2 Project Wastewater Generation

Use	Number	Sewage Generation Rate	Total gpd
Industrial[1]	315 people[2]	15 gpd per person[3]	4,725
Retail	90,000 square feet	50 gpd per 1,000 square feet	4,500
Office	493,000 square feet	75 gpd per 1,000 square feet	36,975
Restaurant(s)	400 seats[4]	35 gpd seat	14,000
Total Estimated Project Sewage Generation			**60,200 gpd**

[1] Based on the Project Program Industrial use includes Light Manufacturing, Research and Development, Warehousing, and Trade Showroom.
[2] Number of people based on 2,500 sf/person for Industrial use and Project Program square footage.
[3] Title 5: Factory, Industrial Plant, Warehouse or Dry Storage space without cafeteria sewage generation rate.
[4] Number of people based on 50 square feet of Project Program gross square footage per seat.

8.1.3 Sanitary Sewer Connections

The Proponent will submit a General Service Application and Site Plan for BWSC review and approval as the Project progresses. Based on the proposed estimated sanitary flow, a Compliance Certification will be required. This Certification will be submitted to BWSC for review and approval prior to submitting to the MassDEP.

8.1.4 Wastewater Flow Mitigation

To help conserve water and reduce the amount of wastewater generated by the Project, the Proponent will investigate the use of water conservation devices such as low-flow toilets and flow-restricting faucets, consistent with the Proponent's compliance at the LEED CS v2009 Certification threshold and in compliance with all pertinent Code requirements.

8.2 Water Supply System

8.2.1 Existing Water Service

The water distribution system in the Project area is owned and maintained BWSC (see Figure 8-2, Existing Water Supply System). BWSC record drawings indicate there are an existing 12-inch ductile iron cement-lined (DICL) water main in Drydock Avenue and a 16-inch DICL water main in Black Falcon Avenue. The 16-inch water main continues north along Design Center Place and west along Drydock Avenue away from the Project area. The 12-inch DICL main is part of the Southern Low service network and was installed in 1980. The 16-inch main is part of the Southern High service network and was installed in 1984.

Fire hydrants are located in both Drydock Avenue and Black Falcon Avenue to the north and south of the Project area. It appears that these hydrants will provide sufficient coverage for the Project. The Proponent will design appropriate domestic and fire protection lines and confirm the fire hydrant coverage for the Project in consultation with BWSC and the Boston Fire Department (BFD) during the detailed design phase.

8.2.2 Proposed Water Service

It is anticipated that the Project will be serviced via the existing 16-inch DICL water main in Black Falcon Avenue. Separate new domestic water and fire protection services will be required. The fire protection service will be provided with a backflow prevention device that will be approved through BWSC Enforcement Section. The location of hydrants and siamese connections will be reviewed by BWSC and BFD during the design development phase of the Project. Water meters will be of a type approved by BWSC and tied into the BWSC Automatic Meter Reading (AMR) System. Fixture counts and water meter sizing information will be provided and services will be designed and coordinated with the BWSC as part of the Site Plan review process and General Service Application.

8.2.3 Anticipated Water Consumption

The water for the Project will be supplied by BWSC. Existing water consumption at the IDB is estimated to be approximately 54,600 gpd. Water consumption for the Project as proposed is estimated to be approximately 66,220 gpd, based upon the Project's estimated

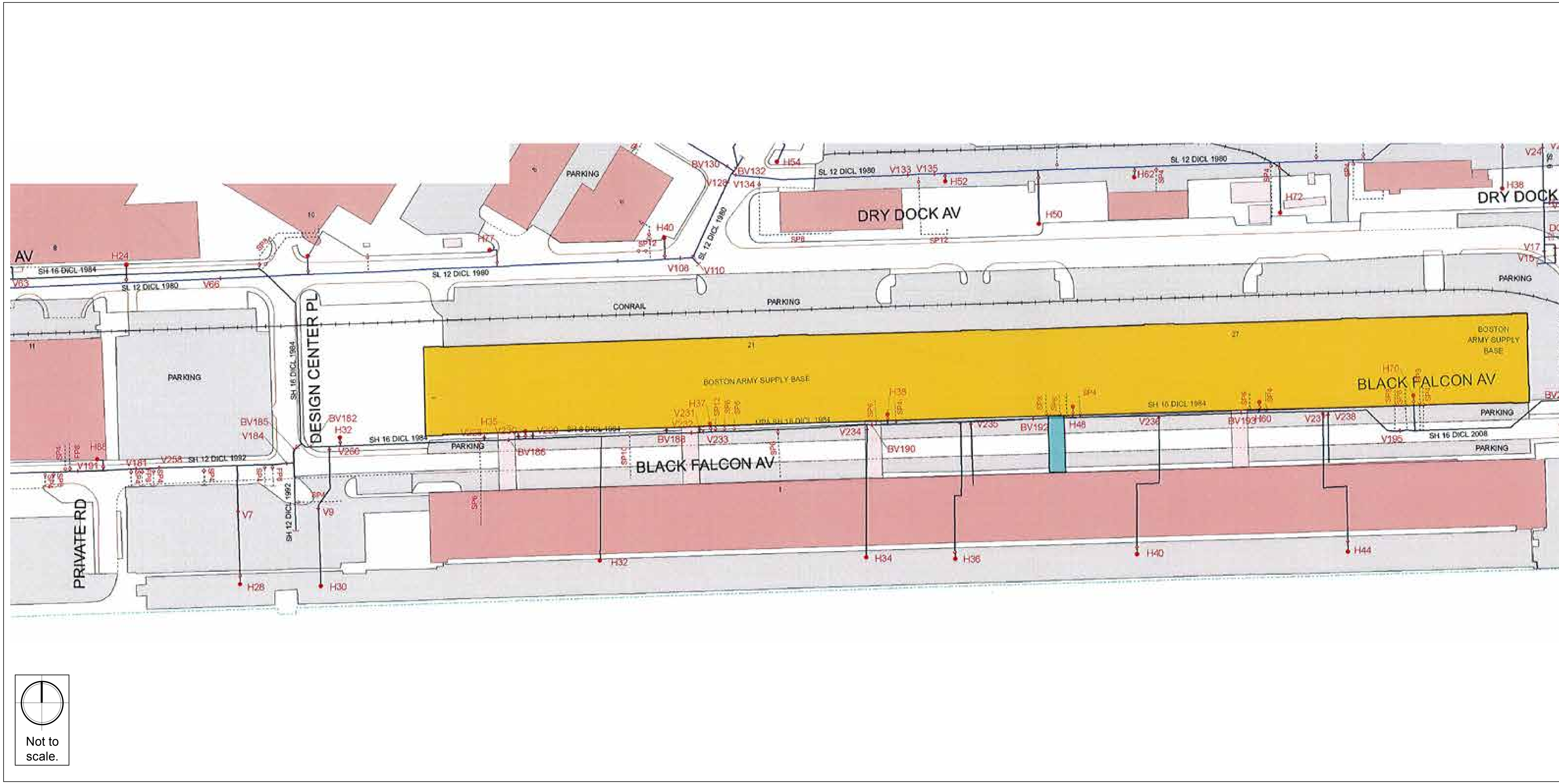


Figure 8-2
Existing Water System

wastewater generation, plus a 10% factor to account for consumption, system losses, and other usages. More detailed water use and meter sizing calculations will be submitted to BWSC as part of the Site Plan approval process.

8.3 Stormwater Drainage System

8.3.1 Existing Stormwater Drainage System

The Project site consists of two existing, physically connected, eight-story buildings with paved parking and loading areas to the north and south of the buildings. An existing paved surface parking lot to the west and an existing courtyard to the east of Design Center Place are also part of the Project. According to record drawings, the storm drainage system in the Project area is privately owned and maintained by EDIC. Existing on-site storm drainage systems connect to the existing EDIC storm drainage systems in Drydock Avenue and Black Falcon Avenue, which conveys storm runoff to the Reserved Channel and Boston Harbor (see Figure 8-1).

8.3.2 Proposed Stormwater Drainage System

The proposed stormwater drainage system design will include measures to treat pollutants including deep sump catch basins with hooded outlets and water quality treatment devices. The Proponent will incorporate sustainable design features such as permeable hardscapes and landscape areas planted with native and adaptive plant species into the design. The Project is expected to decrease the amount of impervious area at the site compared to the existing condition; therefore, decreasing the amount of site stormwater runoff from the site.

The storm drain system will be designed in accordance with BWSC design standards and requirements. BWSC Site Plan requirements state that the first one inch of rainfall falling on the impervious area of a site must be infiltrated prior to discharge to a storm drain or combined sewer. Because of the location of the Project site and the proximity to sea level, it may not be possible to infiltrate the required amount of stormwater runoff into the surrounding ground. A site plan will be submitted for BWSC approval and a General Service Application will be completed prior to any off-site drain work. The Project will also be designed to comply with all requirements of the MassDEP Stormwater Policy.

8.3.3 Water Quality and Construction Stormwater Management

The Project will not impact the water quality of nearby water bodies. The Project proposes a stormwater management program, designed in compliance with BWSC requirements, which will provide pretreatment and infiltration, if feasible, prior to discharging stormwater to the drainage system. An operation and maintenance plan will be developed to support the long-term functionality of the proposed stormwater management system.

A pollution prevention plan will be prepared for use during construction, including during demolition activity, although such activity is anticipated to be minor. Stormwater pollution prevention measures will include good housekeeping measures such as proper storage of materials, spill prevention and response plans, and proper storage and disposal of solid wastes. Erosion and sediment controls will be used during construction to protect adjacent properties, the storm drain system, and the nearby surface waters. The construction contractor will be responsible for controlling dust, likely through the use of street sweeping and, if deemed necessary, watering.

8.3.4 MassDEP Stormwater Management Policy Standards

The MassDEP Stormwater Management Standards, originally adopted as Policy, are, as of January of 2008, included in the Massachusetts Wetland Protection Act regulations and Massachusetts-administered federal Water Quality Certification regulations. These regulations prescribe 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 regulations are administered locally pursuant to MGL Ch. 131, s. 40. Under these regulations, the IDB Project is characterized as a redevelopment project and, as such, will comply with all of the stormwater management standards to the maximum extent practicable.

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 Project will comply with this standard. Site stormwater discharges will be treated prior to connection to the existing drainage systems. There are no wetland resource areas on the Project site.

Standard #2: Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

Compliance: The Project will comply with this standard. The proposed design will not result in an increase in peak discharge rates under any storm conditions. The Project is expected to decrease the amount of impervious area at the site compared to the existing condition; therefore, the amount of site stormwater runoff is expected to decrease.

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 will comply with Standard #3 to the maximum extent practicable. The site is currently paved and impervious with minimal vegetation. The Proponent will increase the green landscape space as part of the Project design.

<u>Standard #4:</u> For new development, stormwater management systems must be designed to remove 80% of the site's average annual post-construction load of Total Suspended Solids (TSS).

Compliance: The Project's stormwater management system will be designed to remove the post development average annual TSS load to the extent practicable.

<u>Standard #5:</u> Stormwater discharges from areas with higher potential pollutant loads will require the use of specific stormwater management BMPs. The use of infiltration without pretreatment is prohibited.

Compliance: The Project has a land use with higher potential pollutant loads as defined by Standard #5 and will meet the Standard to the maximum extent practicable.

<u>Standard #6:</u> Stormwater discharges to critical areas must utilize certain approved stormwater management BMPs. Critical areas are defined to include Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold-water fisheries and recharge areas for public water supplies.

Compliance: Standard #6 is not applicable to the Project.

<u>Standard #7:</u> Redevelopment of previously developed sites must meet the Stormwater Management Regulations to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new stormwater management systems must be designed to improve existing conditions.

Compliance: The Project is being developed within a previously developed area and will improve existing conditions. The Project will meet the Stormwater Standards to the maximum extent practicable.

<u>Standard #8:</u> 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 Standard #8 and will install erosion and sediment controls prior to any major earthwork activity. Construction activities are not anticipated to disturb one or more acres of land, but should such disturbance be anticipated, a Storm Water Pollution Prevention Plan (SWPPP) will be prepared in conjunction with a Notice of Intent (NOI) filing with the EPA for coverage under the National Pollution Discharge Elimination System (NPDES) Construction General Permit (CGP).

<u>Standard #9:</u> A long term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Compliance: A Long-Term O&M Plan will be developed and implemented for the Project's stormwater management system. The O&M Plan will provide for the inspection and maintenance of structural BMPs. The general maintenance procedures for each BMP as follows will ensure proper functionality as designed.

<u>Standard #10:</u> All illicit discharges to the stormwater management system are prohibited.

Compliance: The Project will construct and operate a stormwater management system in compliance with all applicable regulatory stormwater standards. An illicit discharge compliance statement will be provided with the filing of the Notice of Intent under the Wetlands Protection Act.

8.3.5 City of Boston Groundwater Overlay District

A review of City of Boston Zoning maps indicates that the Project site is not located within a City of Boston Groundwater Conservation Overlay District.

8.3.6 Flood Zones

The existing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Project site indicates that it is located outside of any designated special flood hazard area (FIRM, City of Boston, Community-Panel Numbers 25025C0081G and 25025C0082G, Effective Date September 25, 2009). However, a "preliminary" revised floodplain map for the site area was recently released by FEMA which shows the site as lying within the 100-year special flood hazard area (FIRM, Suffolk County, Massachusetts; Panel 0081J, Map Numbers 25025C0081J and 25025C0082J, Map Revised, Preliminary November 15, 2013). As discussed in Section 4.1, Sustainable Design, and Section 4.2, Climate Adaptability, the design of the site and buildings will recognize and account for the site's location proximate to the harbor and within this newly designated flood zone, as well as the potential impacts of sea level rise.

8.4 Electrical Systems

NSTAR owns and maintains the electrical transmission system in the Project area. The electrical power supply design and loads for the building will be coordinated with NSTAR during the design phase. The Proponent is investigating energy conservation measures, including energy efficient lighting and heating and cooling systems for the Project.

8.5 Telephone and Cable Systems

Verizon, Comcast, and RCN provide cable and telephone services in the Project area. It is anticipated that cable service to the proposed buildings will be underground from Drydock Avenue.

8.6 Natural Gas System

The National Grid owns and maintains gas mains in Drydock Avenue and Black Falcon Avenue. The actual size, location, and demand of the building gas services will be coordinated with National Grid during the design phase of the Project.

8.7 Utility Protection During Construction

The Contractor will notify utility companies and call "Dig Safe" prior to excavation. During construction, infrastructure will be protected using sheeting and shoring, temporary relocations, and construction staging as required. The Construction Contractor will be required to coordinate all protection measures, temporary supports, and temporary shutdowns of all utilities with the appropriate utility owners and/or agencies. The Construction Contractor will also be required to provide adequate notification to the utility owner prior to any work commencing on their utility. In addition, in the event a utility cannot be maintained in service during switch over to a temporary or permanent system, the Construction Contractor will be required to coordinate the shutdown with the utility owners and Project abutters to minimize impacts and inconveniences.

Chapter 9.0

Coordination with Other Agencies

9.0 COORDINATION WITH OTHER AGENCIES

9.1 Architectural Access Board Requirements

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

9.2 Boston Civic Design Commission

The Project will comply with the applicable provisions of the Boston Zoning Code. The Expanded PNF will be submitted to the Boston Civic Design Commission as part of the Article 80 process.

9.3 Massachusetts Environmental Policy Act (MEPA)

The Proponent does not anticipate that the Project will require review by MEPA Office of the Massachusetts Executive Office of Energy and Environmental Affairs. The Project does not exceed any of the review thresholds for the filing of an Environmental Notification Form under MEPA.

9.4 Massachusetts Historical Commission

The Project will be subject to State Register Review (950 CMR 71) because it will require a state permit in the form of the revision to the Chapter 91 license. A Project Notification Form will be filed with the Massachusetts Historical Commission to initiate the State Register Review process. This process is normally coordinated with review by the Boston Landmarks Commission.

9.5 Massachusetts Bay Transportation Authority (MBTA)

The Project will seek to consolidate two Drydock Avenue MBTA Silver Line stops, which are approximately 550 feet apart, into a single stop with improved landscaping and curbside amenities. The newly consolidated stop will be integrated into the Project's exterior site and landscaping improvements and will eliminate a stop that today is largely redundant given the two existing stops' proximity to each other. The Proponent will coordinate with the MBTA to comply with the MBTA's Silver Line stop design and accessibility requirements and to schedule the timing of this stop consolidation.

9.6 Other Permits and Approvals

Section 1.9, Regulatory Controls and Permits, of this Expanded PNF provides an anticipated list of agencies from which permits and approvals for the Project will be sought.

Chapter 10.0

Project Certification

10.0 PROJECT CERTIFICATION

This form has been circulated to the Boston Redevelopment Authority as required by the Boston Zoning Code, Article 80.

Signature of Proponent's Representative

Dana Griffin

Jamestown, L.P.
25 Drydock Avenue, 4th Floor
Boston, MA 02210

5/12/14
Date

Signature of Preparer

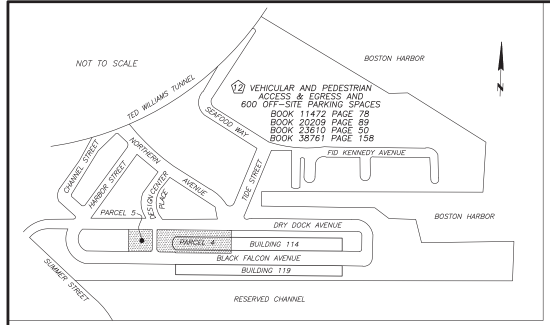
Andrew D. Magee

Epsilon Associates, Inc.
3 Clock Tower Place, Suite 250
Maynard, MA 01754
(978) 897-7100

14 May 2014
Date

Appendix A

Site Survey



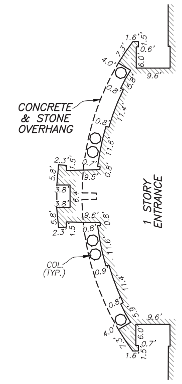
LOCUS MAP & SKETCH OF VEHICULAR AND PEDESTRIAN ACCESS AND EGRESS

REFERENCES

SUFFOLK COUNTY REGISTRY OF DEEDS
BOOK 10440 PAGE 80

PLAN OF PROPERTY OWNED BY UNITED STATES OF AMERICA
BOOK 10440 PAGE 80

MASSACHUSETTS PORT AUTHORITY
PLAN OF MARINE TERMINAL DEVELOPMENT, LLC
GROUND LEASE PARCEL
FID KENNEDY AVENUE
SOUTH BOSTON, MA DATED 10/26/05



BUILDING ENTRANCE DETAIL
SCALE 1"–20'

TITLE EXCEPTIONS PER SCHEDULE B – SECTION 2 OF CHICAGO TITLE INSURANCE COMPANY, COMMITMENT FOR TITLE INSURANCE NUMBER 12–0366MA, EFFECTIVE DATE, OCTOBER 5, 2012.

6. ANY AND ALL RIGHTS OF THE UNITED STATES OF AMERICA IN AND TO FILLED–IN LAND FORMERLY WITHIN NAVIGABLE WATERS. (NOT PLOTTABLE)

7. RIGHTS OF THE COMMONWEALTH OF MASSACHUSETTS AND THE PUBLIC IN AND TO ANY PART OF THE INSURED PREMISES AS LIES BELOW THE HISTORIC MEAN HIGH WATER MARK OF BOSTON HARBOR. (NOT PLOTTABLE)

8. TERMS AND PROVISIONS OF PERMIT NO. 346 BY THE COMMISSION OF WATERWAYS AND PUBLIC LANDS TO THE UNITED STATES OF AMERICA, DATED APRIL 23, 1918, FOR THE LAYING AND MAINTENANCE OF PIPES AND CONDUITS IN DRY DOCK AVENUE. (AFFECTS ENTIRE LOCUS)

9. NON–DISCRIMINATION COVENANT CONTAINED IN DEED DATED JULY 19, 1983 RECORDED IN BOOK 10440, PAGE 80. (NOT PLOTTABLE)

10. EASEMENT AGREEMENT BETWEEN ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON AND THE UNITED STATES OF AMERICA DATED JULY 19, 1983 RECORDED IN BOOK 10440, PAGE 84 AND RE–RECORDED IN BOOK 10512,PAGE 285 TO JOIN THE MASSACHUSETTS PORT AUTHORITY AS A PARTY IN INTEREST. (AS SHOWN HEREON)

11. COMMON LAW PARTY WALL RIGHTS IN THE WALL BETWEEN SECTION D AND E OF BUILDING 114. (AS SHOWN HEREON)

12. LEASE TO NEW ENGLAND DESIGN CENTER, AS TENANT DATED MARCH 21, 1985, NOTICE OF WHICH IS RECORDED IN BOOK11472, PAGE 78; AS AFFECTED BY ASSIGNMENT AND ASSUMPTION OF LONG TERM LEASE TO NEW ENGLAND DESIGN CENTER LIMITED PARTNERSHIP DATED JULY 26, 1995 RECORDED IN BOOK 20209, PAGE 89; AS AFFECTED BY ASSIGNMENT AND ASSUMPTION OF GROUND LEASE TO DIV DESIGN, LLC DATED APRIL 1, 1999 RECORDED IN BOOK 23610, PAGE 50; AS AFFECTED BY ASSIGNMENT AND ASSUMPTION OF GROUND LEASE DATED DECEMBER 28, 2005 RECORDED IN BOOK 38761, PAGE 158 (AS SHOWN HEREON); AS FURTHER AFFECTED BY THE FOLLOWING OFF–RECORD DOCUMENTS:
   A. LONG TERM LEASE BETWEEN ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON ("LANDLORD") AND THE NEW ENGLAND DESIGN CENTER ("TENANT") DATED MARCH 21, 1985;
   B. SIDE LETTER AGREEMENT DATED MARCH 21, 1985 BY LANDLORD, AND AGREED TO AND ACCEPTED BY TENANT AND BDC CO., CONCERNING, INTER ALIA, REASONABLE MODIFICATIONS TO THE LEASE NECESSARY TO OBTAIN PERMITTED LEASEHOLD FINANCING;
   C. AGREEMENT FOR ACCEPTANCE OF ADDITIONAL PARKING LOT DATED JUNE 12, 1987 BETWEEN LANDLORD AND TENANT;
   D. AGREEMENT DATED MAY 26, 1993 BETWEEN LANDLORD AND TENANT;
   E. FIRST AMENDMENT OF LONG TERM LEASE DATED MARCH 21, 1985 BETWEEN LANDLORD AND TENANT;
   F. SECOND AMENDMENT TO LEASE DATED DECEMBER 14, 2000 BETWEEN LANDLORD AND TENANT;
   G. THIRD AMENDMENT TO LEASE DATED JUNE 30, 2004 BETWEEN LANDLORD AND TENANT.
   H. ESTOPPEL CERTIFICATE DATED DECEMBER 7, 2005, EXECUTED BY LANDLORD AND TENANT.

13. NOTICE OF LEASE TO FORTRESS CORPORATION RECORDED ON JANUARY 26, 1996 IN BOOK 20313, PAGE 39. (EXPIRED)

14. NOTICE OF LEASE TO FITCH, INC. DATED MARCH 19, 1996 RECORDED IN BOOK 20953, PAGE 1; AS AFFECTED BY SUBLEASE TO INGALLS INC., NOTICE OF SUBLEASE OF WHICH IS DATED MARCH 17, 1998 RECORDED IN BOOK 22275, PAGE 213. (EXPIRED)

15. LEASES TO DALIA KITCHEN DESIGN, INC., NOTICES OF WHICH IS DATED MARCH 14, 2001 RECORDED IN BOOK 26133, PAGES 234, 236 AND 238. (EXPIRED)

16. NOTICE OF LEASE TO GEORGE B.H. MACOMBER COMPANY DATED AUGUST 25, 1995 RECORDED IN BOOK 19998, PAGE 154. (EXPIRED)

17. LICENSE (CHAPTER 91) RECORDED IN BOOK 20355, PAGE 297; AS AFFECTED BY CERTIFICATE OF COMPLIANCE RECORDED IN BOOK 21620, PAGE 291. (AFFECTS ENTIRE LOCUS)

18. GRANT OF EASEMENT AND EASEMENT AGREEMENT BY AND BETWEEN ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON AND BOSTON WATER AND SEWER COMMISSION, DATED AUGUST 23, 2012, RECORDED WITH SAID DEEDS, BOOK 50164, PAGE 98. (AS SHOWN HEREON)

PARKING SUMMARY

PARCEL 4

77 REGULAR PARKING SPACES
40 REGULAR PARKING SPACES WITHIN APPURTENANT PARKING AREA
3 HANDICAPPED PARKING SPACES
5 HANDICAPPED PARKING SPACES WITHIN APPURTENANT PARKING AREA
125 TOTAL PARKING SPACES

PARCEL 5

134 REGULAR PARKING SPACES
6 HANDICAPPED PARKING SPACES
140 TOTAL PARKING SPACES

OFF–SITE PARKING

600 PARKING SPACES WITHIN BOSTON MARINE INDUSTRIAL PARK
30 PARKING SPACES (32 COUNTED) ON SOUTHERLY SIDE OF BLACK FALCON AVENUE

ZONING CLASSIFICATION – "SOUTH BOSTON GENERAL INDUSTRIAL DISTRICT" (I–2)

DIMENSIONAL REQUIREMENTS	NONE
MINIMUM LOT SIZE	NONE
MINIMUM LOT WIDTH	2.0
MAXIMUM FLOOR AREA RATIO	NONE
MAXIMUM BUILDING HEIGHT	NONE
MINIMUM FRONT YARD	NONE
MINIMUM SIDE YARD	NONE
MINIMUM REAR YARD	NONE

PARKING REQUIREMENT REFERENCE
VOLUME I–ENABLING ACT, ARTICLE 23, SECTION 23–4 RETAIL AND OFFICE USES
VOLUME I–ENABLING ACT, ARTICLE 23, SECTION 23–5 FACTORY AND WAREHOUSE USES
THE PROPERTY LIES WITHIN THE RESTRICTED PARKING OVERLAY DISTRICT.

BOUNDARY DESCRIPTION–BASED ON SURVEY

PARCEL 4

A CERTAIN PARCEL OF LAND LOCATED IN THE CITY OF BOSTON, SOUTH BOSTON, SUFFOLK COUNTY, COMMONWEALTH OF MASSACHUSETTS, BEING BOUNDED AND DESCRIBED AS FOLLOWS:

COMMENCING AT THE POINT OF INTERSECTION OF THE FORMER SOUTHEASTERLY SIDELINE OF HARBOR STREET AND THE SOUTHERLY SIDELINE OF DRY DOCK AVENUE; THENCE RUNNING N 88°23'36" E, ALONG SAID DRY DOCK AVENUE, A DISTANCE OF ABOUT 733 FEET TO THE POINT OF BEGINNING;

THENCE RUNNING N 88°23'36" E, ALONG SAID DRY DOCK AVENUE A DISTANCE OF 731.94 FEET TO A POINT;

THENCE TURNING AND RUNNING S 01°36'24" E BY PARCEL 2 AND PARTLY ALONG THE CENTER OF A BRICK WALL, A DISTANCE OF 226.16 FEET TO A POINT;

THENCE TURNING AND RUNNING S 88°23'36" W A DISTANCE OF 546.94 FEET TO A POINT;

THENCE TURNING AND RUNNING N 01°36'24" W A DISTANCE OF 7.00 FEET TO A POINT;

THENCE TURNING AND RUNNING S 88°23'36" W A DISTANCE OF 152.00 FEET TO A POINT OF CURVATURE;

THENCE RUNNING ALONG A CURVE TO THE RIGHT, HAVING A RADIUS OF 33.00 FEET AND LENGTH OF 51.84 FEET, TO A POINT OF TANGENCY ON THE EASTERLY SIDELINE OF DESIGN CENTER PLACE (AKA CONNECTOR ROAD A);

THENCE RUNNING N 01°36'24" W ALONG SAID DESIGN CENTER PLACE A DISTANCE OF 186.16 FEET TO THE POINT OF BEGINNING.

CONTAINING 164,007 SQUARE FEET, MORE OR LESS, OR 3.765 ACRES, MORE OR LESS.

BEARINGS BASED ON NORTH AMERICAN DATUM OF 1983

BOUNDARY DESCRIPTION CONTINUED:

PARCEL 5

A CERTAIN PARCEL OF LAND LOCATED IN THE CITY OF BOSTON, SOUTH BOSTON, SUFFOLK COUNTY, COMMONWEALTH OF MASSACHUSETTS, BEING BOUNDED AND DESCRIBED AS FOLLOWS:

COMMENCING AT THE POINT OF INTERSECTION OF THE FORMER SOUTHEASTERLY SIDELINE OF HARBOR STREET AND THE SOUTHERLY SIDELINE OF DRY DOCK AVENUE; THENCE RUNNING N 88°23'36" E, ALONG SAID DRY DOCK AVENUE, A DISTANCE OF ABOUT 454 FEET TO THE POINT OF BEGINNING;

THENCE RUNNING N 88°23'36" E, ALONG SAID DRY DOCK AVENUE A DISTANCE OF 232.93 FEET TO A POINT;

THENCE TURNING AND RUNNING S 01°36'24" E BY THE WESTERLY SIDELINE OF DESIGN CENTER PLACE (AKA CONNECTOR ROAD A), A DISTANCE OF 198.00 FEET TO A POINT OF CURVATURE;

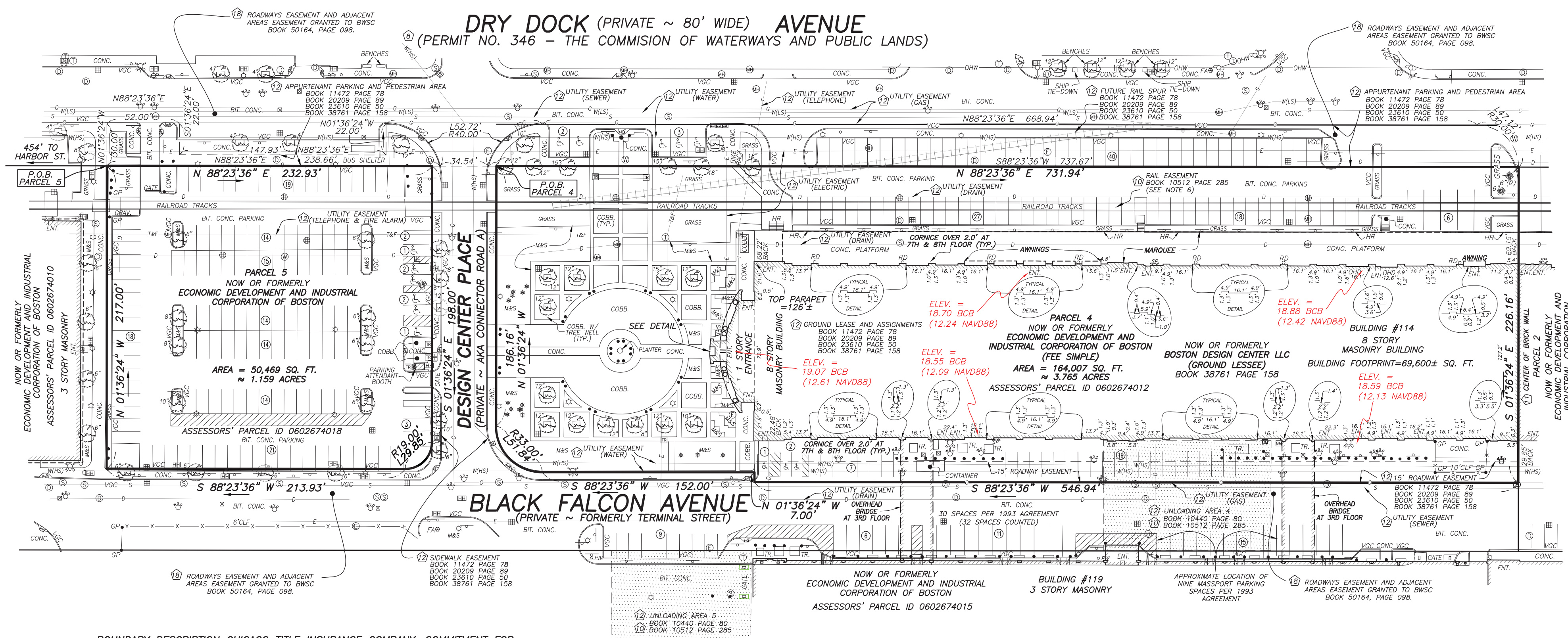
THENCE RUNNING ALONG A CURVE TO THE RIGHT, HAVING A RADIUS OF 19.00 FEET AND LENGTH OF 29.85 FEET, TO A POINT OF TANGENCY ON THE NORTHERLY SIDELINE OF BLACK FALCON AVENUE;

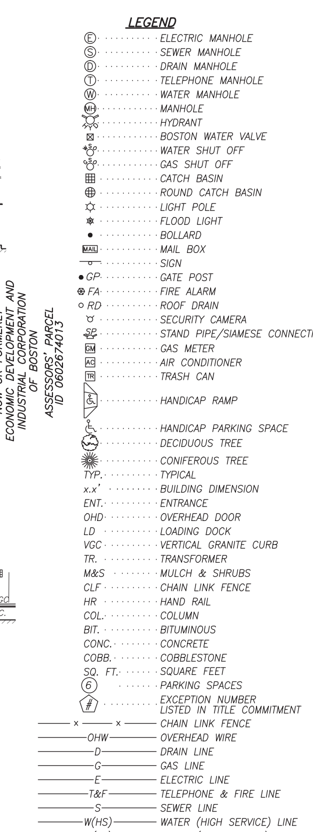
THENCE RUNNING S 88°23'36" W ALONG SAID BLACK FALCON AVENUE, A DISTANCE OF 213.93 FEET TO A POINT;

THENCE TURNING AND RUNNING N 01°36'24" W A DISTANCE OF 217.00 FEET TO THE POINT OF BEGINNING;

CONTAINING 50,469 SQUARE FEET, MORE OR LESS, OR 1.159 ACRES, MORE OR LESS.

BEARINGS BASED ON NORTH AMERICAN DATUM OF 1983





BOUNDARY DESCRIPTION CHICAGO TITLE INSURANCE COMPANY, COMMITMENT FOR TITLE INSURANCE NUMBER 12–0366MA, EFFECTIVE DATE, OCTOBER 5, 2012

TWO PARCELS OF LAND WITH THE BUILDINGS SITUATED IN THE SOUTH BOSTON DISTRICT OF THE CITY OF BOSTON, COUNTY OF SUFFOLK, COMMONWEALTH OF MASSACHUSETTS, WITHIN THE BOSTON MARINE INDUSTRIAL PARK ("BMIP"),AND BEING PARCEL 4 AND A PORTION OF PARCEL 5 ON A PLAN ENTITLED "PLAN SHOWING PROPOSED LEASE LINES OF PROPERTY OWNED BY ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON, BOSTON (SOUTH) MASSACHUSETTS" DATED OCTOBER 31, 1984 REVISED FEBRUARY 15, 1985 BY CULLINAN ENGINEERING CO., INC., RECORDED WITH SUFFOLK COUNTY REGISTRY OF DEEDS, TOGETHER WITH THE NOTICE OF LEASE EXECUTED BY ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION ("LANDLORD") AND NEW ENGLAND DESIGN CENTER ("TENANT") RECORDED IN BOOK 11472, PAGE 78 WITH THE SUFFOLK COUNTY REGISTRY OF DEEDS (THE "1984 PLAN"), THE SAME BEING A PORTION OF PARCEL 3 SHOWN ON A PLAN ENTITLED "PLAN O PROPERTY OWNED BY UNITED STATES OF AMERICA, DEPARTMENT OF THE ARMY, DRY DOCK AVENUE, HARBOR STREET, SUMMER STREET, BOSTON (SOUTH), MASSACHUSETTS DATED MAY 1983, BY CULLINAN ENGINEERING CO., INC., RECORDED WITH SAID DEEDS BOOK 10440, PAGE 80 (THE "1983 PLAN"):

SAID PARCEL 4 BEING MORE PARTICULARLY DESCRIBED ACCORDING TO THE 1984 PLAN AS FOLLOWS:

PARCEL 4

BEGINNING AT A POINT ON THE SOUTHERLY SIDELINE OF DRY DOCK AVENUE AT THE MOST NORTHWESTERLY CORNER OF THE PARCEL HEREIN DESCRIBED, SAID POINT BEING N 88–23–39E, AND 733.20 FEET FROM THE INTERSECTION OF SAID SOUTHERLY SIDELINE OF DRY DOCK AVENUE AND THE SOUTHWESTERLY SIDELINE OF HARBOR STREET: THENCE

N 88–23–39 E ALONG SAID SOUTHERLY SIDELINE OF DRY DOCK AVENUE, A DISTANCE OF 731.94 FEET TO A POINT;

THENCE THROUGH LAND OF SAID LANDLORD, ON THE FOLLOWING SIX (6) COURSES:

S 01–36–21 E IN PART THROUGH THE MIDDLE OF A BRICK WALL, A DISTANCE OF 226.16 FEET TO A POINT;

S 88–23–39 W A DISTANCE OF 546.94 FEET, TO A POINT;

N 01–36–21 W A DISTANCE OF 7.00 FEET, TO A POINT;

S 88–23–39 W A DISTANCE OF 152.00 FEET, TO A POINT;

NORTHWESTERLY ON A CURVE TO THE RIGHT, HAVING A RADIUS OF 33.00 FEET, AN ARC LENGTH OF 51.84 FEET, TO A POINT OF TANGENCY; AND

N 01–36–21 W ALONG THE BACK OF THE EXISTING SIDEWALK, A DISTANCE OF 186.16 FEET, TO THE POINT OF BEGINNING.

BOUNDARY DESCRIPTION CONTINUED:

PARCEL 5

BEGINNING AT A POINT ON THE SOUTHERLY SIDELINE OF DRY DOCK AVENUE AT THE MOST NORTHWESTERLY CORNER OF THE PARCEL DESCRIBED HEREIN, SAID POINT BEING N 88–23–39 E AND 454.27 FEET FROM THE INTERSECTION OF SAID SOUTHERLY SIDELINE OF DRY DOCK AVENUE WITH THE SOUTHWESTERLY SIDELINE OF HARBOR STREET; THENCE

N 88–23–3 E ALONG SAID SOUTHERLY SIDELINE OF DRY DOCK AVENUE, A DISTANCE OF 232.93 FEET, TO A POINT

THENCE THROUGH LAND OF LANDLORD ON THE FOLLOWING FOUR COURSES:

S 01–36–21 E A DISTANCE OF 198 FEET, TO A POINT OF CURVATURE;
SOUTHWESTERLY ON A CURVE TO THE RIGHT, HAVING A RADIUS OF 19.00 FEET, AN ARC LENGTH OF 29.85 FEET, TO A POINT OF TANGENCY;

S 88–23–39 W A DISTANCE OF 213.93 FEET, TO A POINT; AND

N 01–36–21 W A DISTANCE OF 217 FEET, TO THE POINT OF BEGINNING.

PARCEL 5 IS SUBJECT TO AN ORDER OF TAKING OF 18,947SF, LEAVING PARCEL 5 WITH AN AREA OF 50,468SF, SAID TAKING IS RECORDED WITH SAID DEEDS IN BOOK 18160 PAGE 168, AND PLAN RECORDED THEREIN. THE DESCRIPTION ABOVE FOR PARCEL 5 ABOVE REFLECTS THIS TAKING.

NOTES:

1) ZONING INFORMATION WAS NOT PROVIDED BY THE INSURER, AS REQUIRED IN ITEM 6(a) OF TABLE A. ZONING DISTRICTS SHOWN HEREON ARE COPIED FROM THE CITY OF BOSTON ZONING CODE BY HARRY R. FELDMAN, INC.

2) BY GRAPHICAL PLOTTING ONLY, THE PROPERTY SHOWN HEREON LIES WITHIN A ZONE "X" (UNSHADED), AN AREA OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD, AS SHOWN ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY (F.E.M.A.) FLOOD INSURANCE RATE MAP (F.I.R.M.) FOR SUFFOLK COUNTY, MASSACHUSETTS, MAP NUMBER 25025C0081G HAVING AN EFFECTIVE DATE OF SEPTEMBER 25, 2009.

3) AT THE TIME OF SURVEY, THERE WAS NO OBSERVABLE EVIDENCE ON THE SURFACE OF SITE USE AS A SOLID WASTE DUMP, SUMP OR SANITARY LANDFILL.

4) AT THE TIME OF SURVEY, THERE WAS NO EVIDENCE OF CONSTRUCTION DEBRIS OR EARTH MOVING WORK.

5) THE PROPERTY SHOWN HEREON IS THE SAME PROPERTY DESCRIBED IN THE TITLE COMMITMENT.

6) RAILROAD ACCESS SIGNS, "TOW ZONE, NO PARKING, 5:15p.m. TO 6:00a.m., ACTIVE RAIL."

7) UNDERGROUND UTILITIES SHOWN WERE TAKEN FROM PLAN ENTITLED "PLAN SHOWING PROPOSED LEASE LINES OF PROPERTY OWNED BY ECONOMIC DEVELOPMENT & INDUSTRIAL CORPORATION OF BOSTON, BOSTON (SOUTH), MASSACHUSETTS", DATED OCTOBER 31, 1984, AND LAST REVISED FEBRUARY 15, 1985, BY CULLINAN ENGINEERING CO., INC. AND RECORDED WITH SUFFOLK COUNTY REGISTRY OF DEEDS IN BOOK 11472 PAGE 78.

TO: FIDELITY NATIONAL TITLE INSURANCE COMPANY

THIS IS TO CERTIFY THAT THIS PLAN AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4, 7(A), 7(B)(1), 7(C), 8, 9, 10(A), 11(A), 13, 14, 16, 17, 18 & 21 OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON OCTOBER 19, 2012.

PAUL R. FOLEY, PLS (MA #48355)
pfoley@harryrfeldman.com

DATE

ALTA/ACSM LAND TITLE SURVEY
ONE DESIGN CENTER PLACE (PARCELS 4&5)
BOSTON (BOSTON SOUTH), MASS.

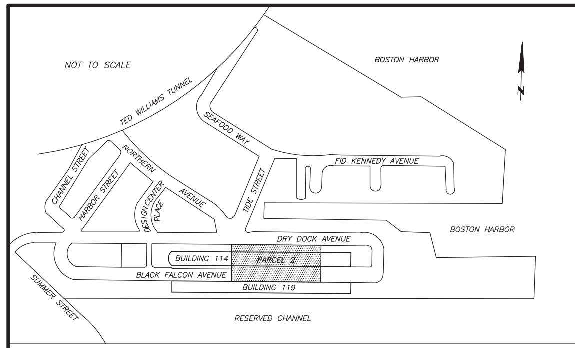
SCALE: 1"=40'
OCTOBER 19, 2012

HARRY R. FELDMAN, INC.
LAND SURVEYORS
112 SHAWMUT AVENUE
PHONE: (617)357–9740
BOSTON, MASS. 02118
WWW.HARRYRFELDMAN.COM

FELDMAN
Professional Land Surveyors

GRAPHIC SCALE
40 0 20 40 80 160

RESEARCH JC	FIELD CHIEF FS	CHECKED PRF	APPROVED	FILE NAME 14056_1
CALC PRF	CADD RJP	FIELD CHECKED CB	CRD FILE 13456	JOB NO. 13613



LOCUS MAP

LEGEND

- ELECTRIC MANHOLE
- SEWER MANHOLE
- DRAIN MANHOLE
- TELEPHONE MANHOLE
- WATER MANHOLE
- MANHOLE
- HYDRANT
- BOSTON WATER VALVE
- WATER SHUT OFF
- GAS SHUT OFF
- CATCH BASIN
- ROUND CATCH BASIN
- LIGHT POLE
- FLOOD LIGHT
- BOLLARD
- MAIL BOX
- SIGN
- GP — GATE POST
- RD — ROOF DRAIN
- FA — FIRE ALARM
- PIV — POST INDICATOR VALVE
- STAND PIPE/SIAMESE CONNECTION
- GAS METER
- AC — AIR CONDITIONER
- HANDICAP RAMP
- HANDICAP PARKING SPACE
- DECIDUOUS TREE
- CONIFEROUS TREE
- TYP. — TYPICAL
- x.x' — BUILDING DIMENSION
- ENT. — ENTRANCE
- OHD — OVERHEAD DOOR
- LD — LOADING DOCK
- VGC — VERTICAL GRANITE CURB
- SW — SIDEWALK
- TR. — TRANSFORMER
- P.O.B. — POINT OF BEGINNING
- M — MULCH
- CLF — CHAIN LINK FENCE
- HR — HAND RAIL
- HCR — HANDICAP RAMP
- BIT. — BITUMINOUS
- CONC. — CONCRETE
- SQ. FT. — SQUARE FEET
- N.T.S. — NOT TO SCALE
- PARKING SPACES
- EXCEPTION NUMBER LISTED IN TITLE COMMITMENT
- CHAIN LINK FENCE
- UNLOADING AREAS
- EASEMENTS: 1, 2 AND 3
- EXCEPTION 6 BOOK 10440 PAGE 084
- BOOK 10512 PAGE 285

BOUNDARY DESCRIPTION–BASED ON SURVEY

A CERTAIN PARCEL OF LAND LOCATED IN THE CITY OF BOSTON, SOUTH BOSTON, SUFFOLK COUNTY, COMMONWEALTH OF MASSACHUSETTS, BEING BOUNDED AND DESCRIBED AS FOLLOWS:

COMMENCING AT THE POINT OF INTERSECTION OF THE FORMER SOUTHEASTERLY SIDELINE OF HARBOR STREET AND THE SOUTHERLY SIDELINE OF DRY DOCK AVENUE; THENCE RUNNING N 88°23'36" E, ALONG SAID DRY DOCK AVENUE, A DISTANCE OF 1464.65 FEET TO THE POINT OF BEGINNING;

THENCE RUNNING N 88°23'36" E, ALONG SAID DRY DOCK AVENUE A DISTANCE OF 818.90 FEET TO A POINT;

THENCE TURNING AND RUNNING S 01°36'24" E BY PARCEL 1 AND PARTLY ALONG THE CENTER OF A BRICK WALL, A DISTANCE OF 275.22 FEET TO A POINT;

THENCE TURNING AND RUNNING S 88°23'36" W A DISTANCE OF 818.90 FEET TO A POINT;

THENCE TURNING AND RUNNING N 01°36'24" W BY PARCEL 4 AND PARTLY ALONG THE CENTER OF A BRICK WALL, A DISTANCE OF 275.22 FEET TO THE POINT OF BEGINNING.

CONTAINING 225,378 SQUARE FEET, OR 5.174 ACRES, MORE OR LESS.

BEARINGS BASED ON NORTH AMERICAN DATUM OF 1983.

BOUNDARY DESCRIPTION CHICAGO TITLE INSURANCE COMPANY, COMMITMENT FOR TITLE INSURANCE NUMBER 1251-25138: EFFECTIVE DATE: JUNE 1, 2012

ALL THAT TRACT OR PARCEL OF LAND WITH THE BUILDINGS THEREON SITUATED IN THE CITY OF BOSTON, COUNTY OF SUFFOLK, COMMONWEALTH OF MASSACHUSETTS, BEING A PORTION OF THE SOUTH BOSTON SUPPORT ACTIVITY, AND SHOWN AS PARCEL 2 ON A PLAN ENTITLED "PLAN OF PROPERTY OWNED BY UNITED STATES OF AMERICA, DEPARTMENT OF THE ARMY, DRY DOCK AVENUE, HARBOR STREET, SUMMER STREET, BOSTON (SOUTH), MASSACHUSETTS" DATED MAY 1983, BY CULLINAN ENGINEERING CO., INC., RECORDED WITH SUFFOLK COUNTY REGISTRY OF DEEDS BOOK 10440, PAGE 80, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE SOUTHERLY SIDELINE OF DRY DOCK AVENUE, WHICH POINT IS THE NORTHWESTERLY CORNER OF PARCEL 1 AS SHOWN ON SAID PLAN AND THE NORTHEASTERLY CORNER OF THE PARCEL DESCRIBED HEREIN; THENCE

SOUTH 01°36'21" EAST BY PARCEL 1,275.22 FEET; THENCE

SOUTH 88°23'39" WEST 818.90 FEET; THENCE

NORTH 01°36'21" WEST BY PARCEL 3 AS SHOWN ON SAID PLAN, 275.22 FEET; THENCE

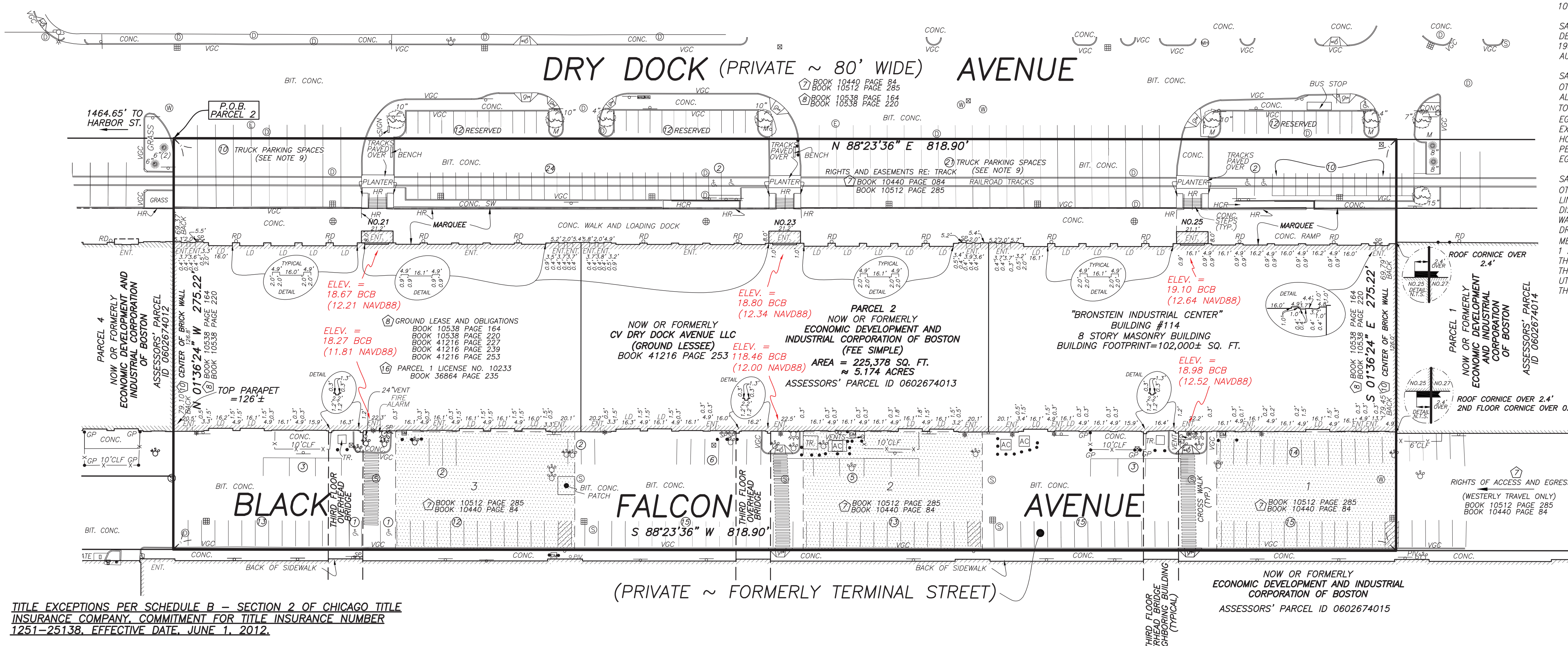
NORTH 88°23'39" EAST 818.90 FEET TO THE POINT OF BEGINNING.

BEING A PORTION OF THE PREMISES CONVEYED TO ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON BY UNITED STATES OF AMERICA BY DEED DATED JULY 19, 1983 RECORDED WITH SAID DEEDS BOOK 10440, PAGE 80.

SAID PREMISES ARE DEMISED TOGETHER WITH THE BENEFIT OF AN EASEMENT AGREEMENT BETWEEN ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON AND THE UNITED STATES OF AMERICA DATED JULY 19, 1983 RECORDED WITH SAID DEEDS BOOK 10440, PAGE 84, AND RECORDED WITH MASSACHUSETTS PORT AUTHORITY'S JOINDER IN BOOK 10512, PAGE 285.

SAID PREMISES ARE DEMISED TOGETHER WITH THE RIGHT AND EASEMENT IN COMMON WITH LANDLORD AND OTHERS ENTITLED THERETO (A) TO USE DRY DOCK AVENUE AND HARBOR STREET OUT TO SUMMER STREET FOR ALL PURPOSES FOR WHICH STREETS AND WAYS MAY BE USED IN THE CITY OF BOSTON, INCLUDING THE RIGHT TO LAY AND MAINTAIN UTILITIES THERE-IN AND (B) TO USE FOR PEDESTRIAN AND VEHICULAR ACCESS AND EGRESS TO THE PREMISES (I) DRY DOCK AVENUE AND HARBOR STREET OUT TO SUMMER STREET AND (II) THE EXISTING ROADWAYS LOCATED ON PARCELS 1 AND 3 SHOWN ON THE ABOVE MENTIONED PLAN; PROVIDED HOWEVER, THE LANDLORD RESERVES THE RIGHT, AT ITS OWN EXPENSE, TO DESIGNATE ALTERNATE ROUTES FOR PEDESTRIAN AND VEHICULAR ACCESS AND EGRESS, WHICH ALTERNATE ROUTES SHALL AFFORD ACCESS AND EGRESS SUBSTANTIALLY AS CONVENIENT AND USEFUL AS THOSE THEY REPLACE.

SAID PREMISES ARE CONVEYED TOGETHER WITH THE RIGHT AND EASEMENT IN COMMON WITH LANDLORD AND OTHERS ENTITLED THERETO (A) TO CONNECT TO, USE, OPERATE, MAINTAIN, REPAIR AND REPLACE ALL OF THE LINES, PIPES, WIRES, CONDUITS, MAINS, CABLES AND OTHER APPURTENANT EQUIPMENT AND STRUCTURES FOR DISTRIBUTION AND TRANSMISSION THROUGH THE SANITARY SEWER, STORM DRAIN, FRESH WATER, STEAM AND HOT WATER, GAS AND FUEL OIL, TELEPHONE AND ELECTRICAL DISTRIBUTION SYSTEMS NOW OR HEREAFTER LOCATED IN DRY DOCK AVENUE, HARBOR STREET, SUMMER STREET, PARCEL 1 AND PARCEL 3 SHOWN ON THE ABOVE MENTIONED PLAN AND (B) TO PASS AND REPASS ON FOOT OR BY VEHICLE OVER SUCH PORTIONS OF PARCELS 1 AND 3, DRY DOCK AVENUE AND HARBOR STREET AS IS REASONABLY REQUIRED TO PERMIT THE EXERCISE OF THE FOREGOING RIGHT AND EASEMENT; PROVIDED HOWEVER, UPON COMPLETION OF PROPOSED IMPROVEMENTS TO THE PREMISES WHICH WOULD ELIMINATE THE NEED TO USE ANY OTHER PORTION OF LANDLORD'S PROPERTY FOR UTILITIES TO SERVICE THE PREMISES, SUCH RIGHT AND EASEMENT SHALL TERMINATE AS TO SUCH PORTION OF THE LANDLORD'S OTHER PROPERTY NOT NEEDED TO SERVICE THE PREMISES.



NOTES:

1) ZONING INFORMATION WAS NOT PROVIDED BY THE INSURER, AS REQUIRED IN ITEM 6(b) OF TABLE A. ZONING DISTRICTS SHOWN HEREON ARE COPIED FROM THE CITY OF BOSTON ZONING CODE BY HARRY R. FELDMAN, INC.

2) BY GRAPHICAL PLOTTING ONLY, THE PROPERTY SHOWN HEREON LIES WITHIN A ZONE "X" (UNSHADED), AN AREA OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD, AS SHOWN ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY (F.E.M.A.) FLOOD INSURANCE RATE MAP (F.I.R.M.) FOR SUFFOLK COUNTY, MASSACHUSETTS, MAP NUMBER 25025C0081G HAVING AN EFFECTIVE DATE OF SEPTEMBER 25, 2009.

3) AT THE TIME OF SURVEY, THERE WAS NO OBSERVABLE EVIDENCE ON THE SURFACE OF SITE USE AS A SOLID WASTE DUMP, SUMP OR SANITARY LANDFILL.

4) AT THE TIME OF SURVEY, THERE WAS NO EVIDENCE OF CONSTRUCTION DEBRIS OR EARTH MOVING WORK.

5) THE PROPERTY SHOWN HEREON IS THE SAME PROPERTY DESCRIBED IN THE TITLE COMMITMENT.

6) RAILROAD ACCESS SIGNS, "TOW ZONE, NO PARKING, 5:15p.m. TO 6:00a.m., ACTIVE RAIL."

7) PLAN OF LAND 21-25 DRY DOCK AVENUE, BOSTON, MASS. BY OTTE & DWYER LAND SURVEYORS DATED JUNE 14, 2000 PLAN DEPICTS 15' ROADWAY EASEMENT.

8) RESERVED PARKING SIGNS: "PARKING ALL RESERVED, BRONSTEIN CENTER PARKING ONLY, NO TRESPASSING, PER ORDER EDIC."

9) TRUCK SPACES EXTEND BEYOND RECORD STREET LINE.

TITLE EXCEPTIONS PER SCHEDULE B – SECTION 2 OF CHICAGO TITLE INSURANCE COMPANY, COMMITMENT FOR TITLE INSURANCE NUMBER 1251-25138, EFFECTIVE DATE, JUNE 1, 2012.

7. EASEMENTS, RESTRICTIONS AND CONDITIONS CONTAINED IN AN EASEMENT AGREEMENT MADE BY AND BETWEEN THE ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON AND THE UNITED STATES OF AMERICA, ACTING BY AND THROUGH THE ADMINISTRATOR OF GENERAL SERVICES DATED JULY 19, 1983 RECORDED IN BOOK 10440, PAGE 84 AND RECORDED WITH MASSACHUSETTS PORT AUTHORITY'S JOINDER DATED JULY 19, 1983 IN BOOK 10512, PAGE 285. (AS SHOWN ON HEREON) (UTILITY EASEMENTS ARE BLANKET)
8. TENANT'S OBLIGATIONS CONTAINED IN A NOTICE OF LEASE MADE BY AND BETWEEN ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON, AS LANDLORD, AND DLJ-HOFFMAN, INC., AS TENANT DATED SEPTEMBER 15, 1983 RECORDED IN BOOK 10538, PAGE 164; AS AFFECTED BY A NOTICE OF LEASE ASSIGNMENT MADE BY AND BETWEEN ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON, AS LANDLORD, DLJHOFFMAN, INC., AS ASSIGNOR, AND BOSTON HARBOR PARTNERS LIMITED PARTNERSHIP, AS ASSIGNEE DATED SEPTEMBER 15, 1983 RECORDED IN BOOK 10538, PAGE 220; AS AFFECTED BY AN ASSIGNMENT OF LONG TERM LEASE TO CV DRY DOCK AVENUE LLC DATED JANUARY 30, 2007 RECORDED IN BOOK 41216, PAGE 227; AS AFFECTED BY NOTICE OF AMENDED AND RESTATED LEASE DATED JANUARY 30, 2007 RECORDED IN BOOK 41216, PAGE 239; AS AFFECTED BY GROUND LESSOR'S ESTOPPEL, CONSENT AND RECOGNITION AGREEMENT DATED JANUARY 30, 2007 RECORDED IN BOOK 41216, PAGE 253. (AS SHOWN ON HEREON) (UTILITY EASEMENTS ARE BLANKET)
9. EASEMENTS, RESTRICTIONS, CONDITIONS AND NOTICE OF LEASE REFERRED TO OR CONTAINED IN A DEED FROM THE UNITED STATES OF AMERICA, ACTING BY AND THROUGH THE ADMINISTRATOR OF GENERAL SERVICES, TO ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON DATED JULY 19, 1983 RECORDED IN BOOK 10440, PAGE 80. (NOT PLOTTABLE) (LEASE HAS EXPIRED)
10. COMMON LAW PARTY WALL RIGHTS. (AS SHOWN HEREON)
11. TERMS AND PROVISIONS CONTAINED IN A NOTICE OF LEASE MADE BY AND BETWEEN BOSTON HARBOR PARTNERS LIMITED PARTNERSHIP, AS SUBLANDLORD, AND GRAND CIRCLE LLC, AS SUBTENANT DATED DECEMBER 21, 2000 RECORDED IN BOOK 25749, PAGE 143. (NOT PLOTTABLE)
12. MORTGAGE FROM ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON TO CITIZENS BANK OF MASSACHUSETTS DATED DECEMBER 19, 2003 RECORDED IN BOOK 33497, PAGE 337; AS AFFECTED BY SUBORDINATION AGREEMENT DATED JANUARY 25, 2007 RECORDED IN BOOK 41216, PAGE 249. AFFECTS FEE INTEREST. (NOT PLOTTABLE)
13. CONDITIONAL ASSIGNMENT OF LEASES AND RENTS BY ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON TO CITIZENS BANK OF MASSACHUSETTS DATED DECEMBER 19, 2003 RECORDED IN BOOK 33498, PAGE 1; AS AFFECTED BY SUBORDINATE DATED JANUARY 25, 2007 RECORDED IN BOOK 41216, PAGE 249. AFFECTS FEE INTEREST. (NOT PLOTTABLE)
14. UCC FINANCING STATEMENT NAMING ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON, DEBTOR AND CITIZENS BANK OF MASSACHUSETTS, SECURED PARTY, RECORDED ON DECEMBER 22, 2003 IN BOOK 33498, PAGE 8; AS AFFECTED BY SUBORDINATION AGREEMENT DATED JANUARY 25, 2007 RECORDED IN BOOK 41216, PAGE 249; AS AFFECTED BY CONTINUATION STATEMENT RECORDED IN BOOK 43809, PAGE 67. AFFECTS FEE INTEREST. (NOT PLOTTABLE)
15. NON-RECOURSE MORTGAGE AND SECURITY AGREEMENT FROM ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON TO THE CITY OF BOSTON DATED AUGUST 1, 1983 RECORDED IN BOOK 10538, PAGE 136. AFFECTS FEE INTEREST. (NOT PLOTTABLE)
16. TERMS AND PROVISIONS CONTAINED IN LICENSE NO. 10233, BOSTON REDEVELOPMENT AUTHORITY AND ECONOMIC DEVELOPMENT AND INDUSTRIAL CORPORATION OF BOSTON RECORDED IN BOOK 36864, PAGE 235. (ENCOMPASSES ENTIRE PARCEL)
17. TERMS AND CONDITIONS OF UNRECORDED URBAN DEVELOPMENT ACTION GRANT AGREEMENT DATED JULY 6, 1983. (NOT PLOTTABLE, DOCUMENT NOT FURNISHED)
18. TERMS AND PROVISIONS CONTAINED IN A NOTICE OF LEASE TO BAKER DESIGN GROUP, INC. NOTICE OF WHICH IS DATED MAY 1, 2006 RECORDED IN BOOK 39663, PAGE 225. (NOT PLOTTABLE)
19. TERMS AND PROVISIONS OF LEASE TO SATCON TECHNOLOGY CORPORATION, NOTICE OF LEASE OF WHICH IS DATED MARCH 2, 2010 RECORDED IN BOOK 46187, PAGE 85; AS AFFECTED BY FIRST AMENDMENT TO NOTICE OF LEASE DATED JULY 30, 2010 RECORDED IN BOOK 46895, PAGE 319; AS AFFECTED BY AMENDED AND RESTATED NOTICE OF LEASE DATED JANUARY 25, 2012 RECORDED IN BOOK 47605, PAGE 142. (NOT PLOTTABLE)
20. RIGHTS OF BROADWAY RENEWABLE STRATEGIES DRY DOCK I LLC TO SOLAR PHOTOVOLTIAC INSTALLATIONS BY UNRECORDED POWER PURCHASE AGREEMENT DATED AUGUST 3, 2011; AS AFFECTED BY SUBORDINATION, NON-DISTURBANCE AND ATTORNMENT AGREEMENT DATED AUGUST 3, 2011 RECORDED IN BOOK 48391, PAGE 117 (NOT PLOTTABLE)
21. TERMS AND PROVISIONS OF AN UNRECORDED LEASE TO STRAUB COLLABORATIVE, INC. DATED AUGUST 11, 2011; AS AFFECTED BY NON-DISTURBANCE RECOGNITION AND ATTORNMENT AGREEMENT DATED AUGUST 29, 2011 RECORDED IN BOOK 48448, PAGE 77. (NOT PLOTTABLE)

ZONING CLASSIFICATION – "SOUTH BOSTON GENERAL INDUSTRIAL DISTRICT" (I-2)

DIMENSIONAL REQUIREMENTS

MINIMUM LOT SIZE	NONE
MINIMUM LOT WIDTH	NONE
MAXIMUM FLOOR AREA RATIO	2.0
MAXIMUM BUILDING HEIGHT	NONE
MINIMUM FRONT YARD	NONE
MINIMUM SIDE YARD	NONE
MINIMUM REAR YARD	NONE

PARKING REQUIREMENT REFERENCE
VOLUME I-ENABLING ACT, ARTICLE 23, SECTION 23-4 RETAIL AND OFFICE USES
VOLUME I-ENABLING ACT, ARTICLE 23, SECTION 23-5 FACTORY AND WAREHOUSE USES

THE PROPERTY LIES WITHIN THE RESTRICTED PARKING OVERLAY DISTRICT.

PARKING SUMMARY

152 REGULAR PARKING SPACES
36 RESERVED PARKING SPACES (OFFSITE)
31 TRUCK PARKING SPACES
6 HANDICAPPED PARKING SPACES
225 TOTAL PARKING SPACES

REFERENCES

SUFFOLK COUNTY REGISTRY OF DEEDS
BOOK 10440 PAGE 80

PLAN OF PROPERTY OWNED BY UNITED STATES OF AMERICA
BOOK 10440 PAGE 80

MASSACHUSETTS PORT AUTHORITY
PLAN OF MARINE TERMINAL DEVELOPMENT, LLC
GROUND LEASE PARCEL
FID KENNEDY AVENUE
SOUTH BOSTON, MA DATED 10/26/05

TO: CHICAGO TITLE INSURANCE COMPANY

THIS IS TO CERTIFY THAT THIS PLAN AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4, 7(A), 7(B)(1), 7(C), 8, 9, 10(A), 11(A), 13, 14, 16, 17, 18 & 21 OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON MAY 18, 2012.

PAUL R. FOLEY, PLS (MA #48355)
pfoley@harryrfeldman.com

DATE

UPDATED	MAY 18, 2012
UPDATED	JANUARY 30, 2009
REVISED	15' ROADWAY EASEMENT REVISED JULY 24, 2007
REVISED	01/10/2007 PARKING UPDATED AND BUILDING DIMENSIONS ADDED

ALTA/ACSM LAND TITLE SURVEY
21, 23 & 25 DRY DOCK AVENUE
BOSTON (SOUTH BOSTON), MASS.

SCALE: 1"=40'
DECEMBER 1, 2006

HARRY R. FELDMAN, INC.
LAND SURVEYORS
112 SHAWMUT AVENUE
PHONE: (617)357-9740
BOSTON, MASS. 02118
WWW.HARRYRFELDMAN.COM

FELDMAN
Professional Land Surveyors

GRAPHIC SCALE
40 0 20 40 80 160

RESEARCH JC	FIELD CHIEF FS	CHECKED PRF	APPROVED	FILE NAME 13456.DWG
CALC TMT	CADD RJP	FIELD CHECKED FS	CRD FILE 13456	JOB NO. 13456

Appendix B

Transportation

Appendix B

- Count Data
- Intersection LOS/Synchro Reports
  - Year 2014 Existing Conditions
  - Year 2019 No-Build Conditions
  - Year 2019 Build Conditions
  - Year 2019 Build with Mitigation Conditions
- Trip Generation

Count Data

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 A.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: Drydock Ave/ Pappas Way
Comment 2: E/W: Summer Street
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Drydock Avenue From North				Summer Street From East				Pappas Way From South				Summer Street From West					
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn		
07:00 AM	26	3	17	0	39	228	2	1	3	3	6	0	16	86	23	0	7:00-8:00	2121
07:15 AM	15	1	24	0	40	250	0	3	0	9	10	0	13	76	27	1	7:15-8:15	2219
07:30 AM	24	5	13	1	63	299	2	0	2	10	15	0	15	86	27	0	7:30-8:30	2293
07:45 AM	23	6	12	0	72	323	6	0	2	10	18	0	15	92	57	1	7:45-8:45	2249
08:00 AM	19	5	13	0	69	258	8	0	1	6	12	0	16	100	43	1	8:00-9:00	2152
08:15 AM	22	2	23	0	52	270	2	0	2	12	12	0	26	84	35	1		
08:30 AM	28	3	13	0	65	222	0	0	1	16	11	0	9	102	48	0		
08:45 AM	19	3	12	0	77	260	2	0	2	10	20	0	6	86	42	1		

4:00-5:00
4:15-5:15
4:30-5:30
4:45-5:45
5:00-6:00

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 A.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: Drydock Ave/ Pappas Way
Comment 2: E/W: Summer Street
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Drydock Avenue From North				Summer Street From East				Pappas Way From South				Summer Street From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
07:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
07:30 AM	0	0	0	2	0	0	0	1	0	0	0	1	0	0	0	3
07:45 AM	0	0	0	2	0	0	0	2	0	0	0	1	0	0	0	3
08:00 AM	0	0	0	4	0	1	0	0	0	0	0	0	0	1	1	4
08:15 AM	0	0	0	1	0	0	0	2	0	0	0	0	0	0	1	3
08:30 AM	0	0	0	0	0	1	0	6	0	0	0	1	0	0	2	4
08:45 AM	0	0	0	2	0	0	0	3	0	1	0	3	0	0	2	1
AM peak	0	0	0	7	0	2	0	10	0	0	0	2	0	1	4	14

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 AA.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: Drydock Ave/ Pappas Way
Comment 2: E/W: Summer Street
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Drydock Avenue From North				Summer Street From East				Pappas Way From South				Summer Street From West			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
04:00 PM	57	11	58	0	12	117	3	2	3	3	7	0	19	186	14	2
04:15 PM	55	7	56	0	15	106	4	0	1	2	8	0	17	192	19	0
04:30 PM	47	6	59	0	26	112	0	1	2	1	9	0	13	201	16	0
04:45 PM	57	5	44	0	18	96	4	0	3	0	9	0	18	214	13	0
05:00 PM	90	14	82	0	15	99	4	1	4	2	11	0	26	229	12	0
05:15 PM	78	16	74	0	16	73	5	0	3	2	4	0	28	240	8	0
05:30 PM	43	9	54	0	19	100	3	0	4	1	7	0	17	235	11	0
05:45 PM	54	11	56	0	14	83	3	0	1	1	7	0	17	226	10	0

04:30 PM
04:45 PM
05:00 PM
05:15 PM

4:00-5:00	1950	1950
4:15-5:15	2045	2045
4:30-5:30	2110	2110
4:45-5:45	2120	2120
5:00-6:00	2122	2122

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 AA.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: Drydock Ave/ Pappas Way
Comment 2: E/W: Summer Street
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Drydock Avenue From North				Summer Street From East				Pappas Way From South				Summer Street From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
04:00 PM	0	0	0	3	1	0	0	1	0	0	0	5	0	0	0	1
04:15 PM	0	0	0	3	0	0	0	0	0	0	1	4	0	0	0	1
04:30 PM	0	0	0	2	1	0	0	0	0	0	0	3	1	1	0	1
04:45 PM	0	0	0	1	0	0	0	0	0	0	0	5	0	0	2	0
05:00 PM	1	0	0	4	0	0	0	1	0	0	0	0	0	1	0	1
05:15 PM	0	0	0	1	0	0	0	1	0	0	0	2	1	1	0	0
05:30 PM	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	1
05:45 PM	0	0	1	2	0	0	0	1	0	0	0	0	0	0	0	2
	1	0	0	8	1	0	0	2	0	0	0	10	2	3	2	2

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 B.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S/NW: Harbor Street/ Channel Street
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Harbor Street From North					Drydock Avenue From East					Harbor Street From South					Drydock Avenue From West					Channel Street From Northwest					
Start Time	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	U-Turn	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	
07:00 AM	3	10	0	6	0	1	1	30	0	0	3	2	0	2	0	3	34	25	4	0	5	0	2	0	0	625
07:15 AM	1	12	1	11	0	2	0	21	1	1	3	1	0	3	0	4	46	19	5	0	2	0	1	0	0	682
07:30 AM	0	12	1	11	0	7	0	23	0	0	4	1	0	3	0	5	56	35	4	0	4	0	2	0	0	716
07:45 AM	2	11	0	6	0	4	0	22	1	0	3	0	0	1	0	4	92	36	3	0	7	0	0	0	0	757
08:00 AM	0	11	5	8	0	7	0	26	0	0	2	0	0	4	0	6	82	27	6	1	2	0	0	1	0	759
08:15 AM	0	15	3	2	0	6	2	25	1	0	3	1	0	2	0	2	78	23	2	0	2	0	0	1	0	
08:30 AM	1	6	3	11	0	3	0	33	4	0	7	0	0	4	0	3	87	40	2	0	3	0	0	2	0	
08:45 AM	1	12	1	9	0	8	0	20	0	1	3	2	0	2	0	10	83	35	2	0	4	0	0	1	0	

745
800
815
830

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 B.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S/NW: Harbor Street/ Channel Street
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Harbor Street From North					Drydock Avenue From East					Harbor Street From South					Drydock Avenue From West					Channel Street From Northwest				
Start Time	Hard Right	Right	Thru	Left	Peds	Right	Bear Right	Thru	Left	Peds	Right	Thru	Bear Left	Left	Peds	Right	Thru	Left	Hard Left	Peds	Hard Right	Bear Right	Bear Left	Hard Left	Peds
07:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	3	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	4	0	0	0	0	2	0	2	1	0	1	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	0	8	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	7	0	0	0	0	8	0	3	1	0	6	0	0	0	0	0

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 BB.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S/NW: Harbor Street/ Channel Street
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Harbor Street From North					Drydock Avenue From East					Harbor Street From South					Drydock Avenue From West					Channel Street From Northwest					
Start Time	Hard Right	Right	Thru	Left	U-Turn	Right	Bear Right	Thru	Left	U-Turn	Right	Thru	Bear Left	Left	U-Turn	Right	Thru	Left	Hard Left	U-Turn	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	
04:00 PM	0	34	1	2	0	6	3	83	1	0	3	2	0	1	0	4	15	9	1	0	3	1	1	0	0	670
04:15 PM	1	23	0	4	0	7	2	75	0	0	1	1	1	5	0	1	18	12	2	0	5	0	0	1	0	732
04:30 PM	0	26	3	4	0	4	1	83	2	0	1	1	0	2	0	5	17	22	1	1	5	0	1	0	0	771
04:45 PM	1	27	0	1	0	7	0	78	0	0	3	0	0	4	0	2	20	9	2	0	7	0	1	0	0	744
05:00 PM	0	42	0	0	0	8	1	141	2	0	2	0	0	4	0	2	16	10	1	0	3	0	0	0	0	736
05:15 PM	0	29	0	2	0	3	6	117	2	0	4	0	0	5	0	1	14	10	1	0	4	0	0	0	0	
05:30 PM	1	42	0	4	0	4	2	65	1	0	1	0	0	0	0	1	15	14	1	0	1	0	0	0	0	
05:45 PM	1	38	1	3	0	3	0	72	0	0	1	1	0	1	0	0	14	12	0	0	7	0	0	0	0	

04:30 PM
04:45 PM
05:00 PM
05:15 PM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 BB.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S/NW: Harbor Street/ Channel Street
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Harbor Street From North					Drydock Avenue From East					Harbor Street From South					Drydock Avenue From West					Channel Street From Northwest					
Start Time	Hard Right	Right	Thru	Left	Peds	Right	Bear Right	Thru	Left	Peds	Right	Thru	Bear Left	Left	Peds	Right	Thru	Left	Hard Left	Peds	Hard Right	Bear Right	Bear Left	Hard Left	Peds
04:00 PM	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	1	0	4	0	0	0	0	3
04:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	2	0	2	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	1	0	0	1	0	1	0	0	0	0	2	0	0	0	0	1	0	0	0	0	1
	0	0	0	0	3	0	0	2	0	2	0	0	0	0	5	0	0	3	0	5	0	0	0	0	4

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 C.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: 6th Street/ Design Center Place
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	6th Street From North				Drydock Avenue From East				Design Center Place From South				Drydock Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
07:00 AM	4	0	0	0	2	19	2	0	0	0	4	0	4	22	7	1	349
07:15 AM	1	0	0	0	2	18	0	0	0	1	3	0	7	27	13	1	392
07:30 AM	5	0	3	0	2	18	1	0	0	2	1	0	6	32	18	1	430
07:45 AM	2	0	2	0	3	19	0	0	0	1	3	0	2	49	40	1	471
08:00 AM	2	0	1	0	1	26	1	0	1	0	3	0	5	46	21	1	464
08:15 AM	1	0	1	0	3	27	0	0	1	0	3	0	4	48	22	1	
08:30 AM	2	0	1	0	0	28	2	0	2	1	5	0	11	54	24	0	
08:45 AM	1	0	1	0	3	19	1	0	5	0	0	0	10	52	23	0	

745
800
815
830

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 C.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: 6th Street/ Design Center Place
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	6th Street From North				Drydock Avenue From East				Design Center Place From South				Drydock Avenue From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
07:00 AM	0	0	0	6	0	0	0	9	0	0	0	0	0	1	0	0
07:15 AM	0	0	0	3	0	0	0	14	0	0	0	1	0	0	0	0
07:30 AM	0	0	0	5	0	0	0	24	0	0	0	3	0	0	0	0
07:45 AM	0	0	0	5	0	0	0	40	0	0	0	2	0	0	0	0
08:00 AM	0	0	0	4	0	0	0	12	0	0	0	5	0	1	0	0
08:15 AM	0	0	0	7	0	0	0	17	0	0	0	7	0	1	0	0
08:30 AM	0	0	0	10	0	0	0	16	0	0	0	5	0	2	0	0
08:45 AM	0	0	0	5	0	0	0	21	0	0	0	1	0	7	0	0
	0	0	0	26	0	0	0	85	0	0	0	19	0	4	0	0

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 CC.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: 6th Street/ Design Center Place
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	6th Street From North				Drydock Avenue From East				Design Center Place From South				Drydock Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
04:00 PM	30	0	1	0	1	45	3	0	2	1	13	0	4	14	1	0	447
04:15 PM	20	0	2	0	1	48	0	0	8	0	15	0	3	20	3	0	511
04:30 PM	28	0	0	0	1	46	2	0	6	0	8	0	2	14	0	0	537
04:45 PM	15	0	3	0	0	48	3	0	3	0	12	0	2	18	1	0	527
05:00 PM	35	1	1	0	2	85	5	0	5	0	28	0	2	15	0	0	519
05:15 PM	46	0	0	0	1	55	3	0	8	0	19	0	2	10	2	0	
05:30 PM	23	1	1	0	1	32	3	0	4	0	16	0	3	10	0	3	
05:45 PM	26	0	1	0	0	33	1	0	5	0	12	0	0	15	3	1	

04:30 PM
04:45 PM
05:00 PM
05:15 PM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 CC.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: 6th Street/ Design Center Place
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	6th Street From North				Drydock Avenue From East				Design Center Place From South				Drydock Avenue From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
04:00 PM	0	0	0	5	0	0	0	15	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	4	0	1	0	11	0	0	0	1	0	0	0	0
04:30 PM	0	0	0	4	0	0	0	5	0	0	0	2	0	0	0	0
04:45 PM	0	0	0	1	0	0	0	4	0	0	0	1	0	0	0	0
05:00 PM	0	0	0	11	0	2	0	4	0	0	0	3	0	0	0	1
05:15 PM	0	0	0	8	0	0	0	2	0	0	0	1	0	0	0	0
05:30 PM	0	0	0	5	0	0	0	0	0	0	0	3	0	0	0	0
05:45 PM	0	0	0	7	0	1	0	3	0	0	0	1	0	0	0	0
	0	0	0	24	0	2	0	15	0	0	0	7	0	0	0	1

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 D.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: Tide Street/ Diveway
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA

	Tide Street From North				Drydock Avenue From East				Driveway From South				Drydock Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
07:00 AM	14	1	24	0	4	9	0	0	0	0	0	0	0	15	8	1	392
07:15 AM	13	1	32	0	14	7	0	0	2	0	1	0	1	18	6	0	453
07:30 AM	11	1	20	0	10	8	0	0	0	0	1	0	3	24	7	0	496
07:45 AM	13	3	45	0	14	8	0	0	2	0	2	0	1	34	14	0	547
08:00 AM	16	3	46	0	12	8	0	1	2	0	2	0	5	28	14	0	548
08:15 AM	12	4	38	1	18	17	0	0	0	4	1	0	2	28	13	0	
08:30 AM	12	4	34	0	12	14	0	0	0	2	2	0	1	42	13	0	
08:45 AM	7	4	49	0	14	14	0	0	1	1	1	0	4	34	8	0	

07:45 AM
08:00 AM
08:15 AM
08:30 AM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 D.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: Tide Street/ Diveway
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Tide Street From North				Drydock Avenue From East				Driveway From South				Drydock Avenue From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
07:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
07:15 AM	0	0	1	1	0	0	0	8	0	0	0	0	0	0	0	1
07:30 AM	0	0	3	1	0	0	0	4	0	0	0	0	0	0	0	0
07:45 AM	0	0	1	0	0	0	0	12	0	0	0	0	0	0	0	4
08:00 AM	0	0	0	0	0	0	0	6	0	0	0	0	0	1	0	1
08:15 AM	0	0	0	1	0	0	0	12	0	0	0	0	0	1	0	1
08:30 AM	0	0	0	1	0	0	0	21	0	0	0	0	0	2	0	2
08:45 AM	0	0	0	0	0	0	0	24	0	0	0	0	0	5	0	3
	0	0	1	2	0	0	0	51	0	0	0	0	0	4	0	8

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 DD.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: Tide Street/ Diveway
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Tide Street From North				Drydock Avenue From East				Driveway From South				Drydock Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
04:00 PM	17	0	13	0	23	27	0	0	0	0	1	0	1	9	6	0	435
04:15 PM	10	3	10	0	26	33	0	0	2	1	3	0	1	16	7	0	487
04:30 PM	14	0	13	0	39	33	0	0	2	1	1	2	1	9	7	0	494
04:45 PM	16	0	10	0	21	31	1	0	0	2	1	0	0	15	7	0	464
05:00 PM	24	1	11	0	31	51	1	0	2	7	2	0	0	10	9	0	444
05:15 PM	18	0	15	0	25	37	1	0	1	2	0	0	0	9	11	0	
05:30 PM	14	0	13	0	27	20	0	0	0	1	0	0	1	9	7	0	
05:45 PM	14	1	6	1	21	18	1	0	0	0	1	0	0	10	11	0	

04:30 PM
04:45 PM
05:00 PM
05:15 PM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 DD.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: Tide Street/ Diveway
Comment 2: E/W: Drydock Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Tide Street From North				Drydock Avenue From East				Driveway From South				Drydock Avenue From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
04:00 PM	0	0	0	1	0	0	0	12	0	0	0	2	0	0	0	1
04:15 PM	0	0	0	0	0	1	0	8	0	0	0	2	0	0	0	0
04:30 PM	0	0	0	2	0	0	0	8	0	0	0	1	0	0	0	1
04:45 PM	0	0	0	0	1	0	0	13	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	3	1	2	0	18	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	2	1	0	0	7	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	1	0	14	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	2	1	0	0	8	0	0	0	1	0	0	0	0
	0	0	0	7	3	2	0	46	0	0	0	1	0	0	0	1

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 E.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: Tide Street
Comment 2: E/W: Driveway/ Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdiette

	Tide Street From North				Driveway From East				Tide Street From South				Northern Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
07:00 AM	2	0	0	0	0	0	0	0	1	3	8	0	39	1	7	1	304
07:15 AM	2	5	0	0	0	0	0	0	0	4	17	0	42	0	8	0	350
07:30 AM	1	0	0	0	0	0	0	0	0	6	11	0	39	0	8	0	380
07:45 AM	3	2	0	0	0	0	0	0	1	8	20	0	60	1	4	0	395
08:00 AM	4	2	0	0	0	0	0	0	0	12	16	0	66	0	8	0	393
08:15 AM	2	3	0	0	0	0	0	0	1	11	26	0	57	0	8	0	
08:30 AM	2	5	0	0	0	0	0	0	2	9	17	0	40	0	5	0	
08:45 AM	3	4	0	0	0	0	0	0	0	6	16	0	61	1	6	0	

07:45 AM
08:00 AM
08:15 AM
08:30 AM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 E.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: Tide Street
Comment 2: E/W: Driveway/ Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Tide Street From North				Driveway From East				Tide Street From South				Northern Avenue From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
07:00 AM	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	1
07:15 AM	0	0	0	3	0	0	0	2	0	0	0	10	1	0	0	1
07:30 AM	0	0	0	1	0	0	0	6	0	0	0	8	1	0	0	0
07:45 AM	0	0	0	2	0	0	0	9	0	0	0	23	0	0	0	2
08:00 AM	0	0	0	2	0	0	0	3	0	0	0	15	0	0	0	2
08:15 AM	0	0	0	1	0	0	0	3	0	0	0	27	0	0	0	1
08:30 AM	0	0	0	8	0	0	0	6	0	0	0	30	0	0	0	5
08:45 AM	0	0	0	1	0	0	0	1	0	0	0	29	0	0	0	0
	0	0	0	13	0	0	0	21	0	0	0	95	0	0	0	10

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 EE.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: Tide Street
Comment 2: E/W: Driveway/ Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Tide Street From North				Driveway From East				Tide Street From South				Northern Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
04:00 PM	14	9	0	0	0	0	1	0	0	2	27	0	21	0	3	0	287
04:15 PM	4	2	0	0	0	1	2	0	1	2	31	0	18	0	1	0	302
04:30 PM	6	8	0	0	0	2	0	0	0	3	46	0	18	0	1	0	317
04:45 PM	7	4	0	0	0	1	0	0	0	1	28	0	23	0	0	0	297
05:00 PM	7	14	0	0	0	1	1	0	0	2	45	0	18	0	4	0	293
05:15 PM	6	5	0	0	0	0	0	0	0	1	37	0	28	0	0	0	
05:30 PM	3	5	0	0	0	1	1	0	0	2	32	0	19	0	1	0	
05:45 PM	4	8	0	0	0	0	2	0	2	2	29	0	12	0	0	1	

04:30 PM
04:45 PM
05:00 PM
05:15 PM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 EE.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: Tide Street
Comment 2: E/W: Driveway/ Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Tide Street From North				Driveway From East				Tide Street From South				Northern Avenue From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
04:00 PM	0	0	0	9	0	0	0	11	0	0	0	15	0	0	0	9
04:15 PM	0	0	0	13	0	0	0	13	0	0	0	11	0	0	0	12
04:30 PM	0	0	0	21	0	0	0	17	0	0	0	26	0	0	0	22
04:45 PM	0	0	0	14	0	0	0	15	0	0	1	17	0	0	0	16
05:00 PM	0	0	0	11	0	0	0	10	0	0	1	43	0	0	0	50
05:15 PM	0	0	0	1	0	0	0	5	0	0	4	31	0	0	0	33
05:30 PM	0	0	0	2	0	0	0	2	0	0	0	33	0	0	0	33
05:45 PM	0	0	0	6	0	0	0	3	0	0	1	27	0	0	0	15
	0	0	0	47	0	0	0	47	0	0	6	117	0	0	0	121

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 F.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N: Seafood Way
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Seafood Way From North			Northern Avenue From East			Northern Avenue From West			
Start Time	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
07:00 AM	9	2	0	1	15	0	73	24	0	582
07:15 AM	10	1	0	2	24	0	81	16	0	625
07:30 AM	18	1	0	0	22	0	95	16	1	667
07:45 AM	11	1	0	3	28	0	113	15	0	653
08:00 AM	16	1	0	1	25	0	106	18	0	649
08:15 AM	12	0	0	0	34	0	116	14	0	
08:30 AM	11	1	0	2	27	0	87	11	0	
08:45 AM	4	4	0	0	23	0	116	20	0	

07:45 AM
08:00 AM
08:15 AM
08:30 AM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 F.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N: Seafood Way
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Seafood Way From North			Northern Avenue From East			Northern Avenue From West		
Start Time	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds
07:00 AM	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	1	0	0
07:30 AM	0	0	0	0	0	0	1	0	0
07:45 AM	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	2	0	0	1	0	0	0
08:30 AM	0	0	1	0	0	0	0	0	2
08:45 AM	0	0	4	0	0	1	0	0	0
	0	0	3	0	0	1	0	0	2

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 FF.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N: Seafood Way
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Seafood Way From North			Northern Avenue From East			Northern Avenue From West			
Start Time	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	
04:00 PM	18	3	0	1	78	0	23	6	2	488
04:15 PM	13	2	0	2	62	0	20	5	0	494
04:30 PM	15	2	0	0	90	0	20	4	0	526
04:45 PM	19	0	0	0	72	0	27	4	0	497
05:00 PM	6	1	0	0	101	0	26	3	0	474
05:15 PM	19	2	0	0	88	0	22	5	0	
05:30 PM	8	2	0	0	72	0	19	1	0	
05:45 PM	10	0	0	0	71	0	17	1	0	

04:30 PM
04:45 PM
05:00 PM
05:15 PM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 FF.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N: Seafood Way
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Seafood Way From North			Northern Avenue From East			Northern Avenue From West		
Start Time	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds
04:00 PM	0	0	0	0	1	0	0	0	0
04:15 PM	0	0	2	0	0	0	0	0	0
04:30 PM	0	0	3	0	0	0	0	0	2
04:45 PM	0	0	1	0	1	1	0	0	2
05:00 PM	0	0	5	0	1	0	0	0	2
05:15 PM	0	0	2	0	1	0	0	0	1
05:30 PM	0	0	5	0	1	0	1	0	1
05:45 PM	0	0	12	0	1	3	0	0	0
	0	0	11	0	3	1	0	0	7

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 G.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: S: Harbor Street
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Northern Avenue From East			Harbor Street From South			Northern Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
07:00 AM	20	2	0	9	23	0	18	85	0	747
07:15 AM	29	4	0	5	17	0	22	92	0	800
07:30 AM	37	5	0	11	28	0	21	101	0	853
07:45 AM	36	5	0	6	29	0	18	124	0	828
08:00 AM	35	5	0	9	24	0	24	113	0	825
08:15 AM	44	6	0	9	22	0	18	123	0	
08:30 AM	33	3	0	12	33	0	9	88	0	
08:45 AM	26	2	0	5	33	0	20	129	0	

07:45 AM
08:00 AM
08:15 AM
08:30 AM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 G.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: S: Harbor Street
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Northern Avenue From East			Harbor Street From South			Northern Avenue From West		
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds
07:00 AM	0	0	0	0	0	4	0	0	0
07:15 AM	0	0	0	0	0	10	0	1	1
07:30 AM	0	0	1	0	0	19	0	1	0
07:45 AM	0	0	0	0	0	12	0	0	2
08:00 AM	0	0	0	0	0	13	0	0	2
08:15 AM	0	0	6	0	0	17	0	0	0
08:30 AM	0	0	2	0	0	15	0	0	0
08:45 AM	0	0	4	0	0	11	0	0	2
	0	0	8	0	0	57	0	0	4

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 GG.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: S: Harbor Street
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Northern Avenue From East			Harbor Street From South			Northern Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	
04:00 PM	83	10	0	2	19	0	21	32	0	653
04:15 PM	76	4	0	2	25	0	22	24	0	679
04:30 PM	88	8	0	4	22	0	23	19	0	698
04:45 PM	95	4	0	1	15	0	26	28	0	686
05:00 PM	104	4	0	2	22	0	34	27	0	671
05:15 PM	103	3	0	2	15	0	23	26	0	
05:30 PM	72	6	0	1	17	0	38	18	0	
05:45 PM	75	5	0	0	17	0	39	17	1	

04:30 PM
04:45 PM
05:00 PM
05:15 PM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 GG.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: S: Harbor Street
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Northern Avenue From East			Harbor Street From South			Northern Avenue From West		
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds
04:00 PM	0	0	6	0	0	7	0	0	7
04:15 PM	0	0	2	0	0	6	0	0	0
04:30 PM	1	0	7	1	0	4	0	0	0
04:45 PM	3	0	6	2	0	16	0	0	3
05:00 PM	1	0	8	0	0	10	0	0	1
05:15 PM	0	0	4	0	0	12	0	0	0
05:30 PM	0	0	3	0	0	8	0	1	0
05:45 PM	1	0	2	0	0	2	1	0	2
	5	0	25	3	0	42	0	0	4

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 HH.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: Driveway/ Haul Road
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Driveway From North				Northern Avenue From East				Haul Road From South				Northern Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
04:00 PM	3	1	0	0	2	78	29	0	9	0	8	0	6	43	1	6	778
04:15 PM	5	2	0	0	1	70	40	0	7	0	9	1	9	35	1	4	835
04:30 PM	2	2	0	0	2	91	29	0	9	0	11	0	8	36	3	9	882
04:45 PM	2	4	0	0	0	76	35	0	6	0	8	1	17	47	3	7	885
05:00 PM	2	3	0	0	3	102	36	0	5	0	14	1	12	56	1	8	893
05:15 PM	2	5	1	0	1	80	46	0	3	2	15	0	13	51	4	8	
05:30 PM	3	3	0	0	0	75	26	0	9	0	14	0	16	47	0	12	
05:45 PM	2	2	0	0	0	74	33	0	8	0	19	0	10	53	1	12	

04:30 PM
04:45 PM
05:00 PM
05:15 PM

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 H.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: Driveway/ Haul Road
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Driveway From North				Northern Avenue From East				Haul Road From South				Northern Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	
07:00 AM	2	2	0	0	1	35	5	0	31	0	6	0	9	76	1	5	824
07:15 AM	1	0	0	0	2	38	8	0	32	0	11	0	12	88	0	2	869
07:30 AM	6	3	3	0	3	47	13	1	31	2	10	0	5	93	2	2	913
07:45 AM	3	3	1	0	2	46	14	0	40	0	13	0	6	103	2	3	934
08:00 AM	1	0	1	0	0	43	11	0	38	1	10	1	6	99	1	6	956
08:15 AM	3	1	2	0	2	51	15	0	33	2	9	0	8	107	4	1	
08:30 AM	3	4	0	0	2	57	8	0	18	1	14	1	46	77	3	8	
08:45 AM	1	2	0	0	1	53	10	2	32	0	12	0	20	120	2	3	

Cars and Trucks

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 H.ppd
Start Date: 1/8/2014
Start Time: 7:00:00 AM
Site Code: TBA
Comment 1: N/S: Driveway/ Haul Road
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Driveway From North				Northern Avenue From East				Haul Road From South				Northern Avenue From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	10	0	1	0	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	18	0	1	0	0
07:45 AM	0	0	0	2	0	0	0	1	0	0	0	9	0	0	0	0
08:00 AM	0	0	0	1	0	0	0	0	0	0	0	9	0	1	0	0
08:15 AM	0	0	0	3	0	0	0	0	0	0	0	5	0	0	0	0
08:30 AM	0	0	0	2	0	0	0	1	0	0	0	2	0	0	0	0
08:45 AM	0	0	0	5	0	0	0	0	0	0	0	4	0	0	0	0
	0	0	0	8	0	0	0	2	0	0	0	25	0	1	0	0

Peds and Bicycles

File Name: C:\Users\Owner\Desktop\PDI 2013 Jobs\133690-Boston (VHB)\133690 HH.ppd
Start Date: 1/8/2014
Start Time: 4:00:00 PM
Site Code: TBA
Comment 1: N/S: Driveway/ Haul Road
Comment 2: E/W: Northern Avenue
Comment 3: City, State: Boston, MA
Comment 4: Client: VHB/ M. Houdlette

	Driveway From North				Northern Avenue From East				Haul Road From South				Northern Avenue From West			
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
04:00 PM	0	0	0	6	0	1	0	0	0	0	0	6	0	0	0	2
04:15 PM	0	0	0	4	0	0	0	0	0	0	0	7	0	0	0	0
04:30 PM	0	0	0	5	0	0	0	0	0	0	0	4	0	0	0	0
04:45 PM	0	0	0	9	0	0	0	0	0	0	0	16	0	0	0	2
05:00 PM	0	0	0	5	0	0	0	2	0	0	0	5	1	0	0	0
05:15 PM	0	0	0	5	0	0	0	3	0	0	0	12	0	0	0	0
05:30 PM	0	0	0	5	0	1	0	1	0	0	0	7	0	1	0	0
05:45 PM	0	0	0	5	0	1	0	1	0	0	0	4	0	0	0	0
	0	0	0	24	0	0	0	5	0	0	0	37	1	0	0	2

Intersection LOS/Synchro Reports

Existing Conditions (2012) Level of Service Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
		Signalized Intersections		
Summer Street/Drydock Avenue	**D**	**44.9**		
Summer EB left	D	47.9	0.85	#224
Summer EB thru | thru/right	A	6.4	0.29	119
Summer WB left	D	40.4	0.43	23
Summer WB thru | thru/right	E	57.9	>1.00	#728
Pappas NB left/thru/right	D	54.3	0.72	#117
Drydock SB left/thru	E	62.5	0.75	#106
Drydock SB right	A	5.8	0.22	32
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**B**	**16.8**		
Seaport EB left/thru | thru/right	C	23.3	0.49	207
Seaport WB left/thru | thru/right	A	1.9	0.33	m0
Fish Pier SB left/thru/right	D	51.2	0.70	96
Northern Avenue/D Street (northbound)	**C**	**23.1**		
Northern EB thru | thru	A	3.0	0.23	20
Northern WB thru | thru	B	19.7	0.25	133
D NB left	E	70.1	0.85	m#209
D NB right	B	17.7	0.11	m6
Congress Street/D Street	**D**	**41.8**		
Congress EB left/thru | thru/right	D	45.2	0.83	226
Congress EB right	B	14.2	0.69	100
Congress WB left/thru | thru/right	D	40.4	0.71	83
D NB left	E	56.9	0.80	236
D NB left/thru | thru/right	D	41.5	0.79	137
D SB left/thru | thru/right	D	53.4	0.54	79
Summer Street/D Street	**D**	**43.6**		
Summer EB left	C	32.6	0.68	#134
Summer EB thru | thru/right	B	15.7	0.34	104
Summer WB left/thru | thru	F	>80.0	>1.00dl	#344
Summer WB right	C	24.6	0.75	381
D NB left	D	39.1	0.44	92
D NB thru | thru/right	C	34.6	0.54	136
D SB left	D	37.9	0.63	169
D SB thru | thru/right	B	17.3	0.49	141
		Unsignalized Intersections		
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	2.3	0.13	12
Drydock WB left/thru/right	A	0.8	0.01	1
Harbor NB left/thru	E	42.4	0.17	15
Harbor NB right	B	11.0	0.04	3
Harbor SB left/thru/right	C	21.9	0.41	49

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	3.6	0.11	10
Drydock WB left/thru/right	A	0.5	0.01	0
Design Center NB left/thru/right	C	16.2	0.09	7
Garage SB left/thru/right	B	13.1	0.03	3
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	2.1	0.04	4
Drydock WB left/thru/right	A	0.0	0.00	0
Parking NB left/thru/right	B	12.5	0.06	5
Tide SB left/thru/right	C	17.5	0.49	66
Northern Avenue/Tide Street				
Northern EB left/thru/right	B	10.7	0.33	36
Alley WB left/thru/right	A	0.0	0.00	0
Tide NB left/thru/right	A	5.3	0.08	6
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.06	5
Northern WB thru/right	A	0.0	0.09	0
Seafood SB left/right	B	10.6	0.10	8
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.36	0
Northern WB left/thru	A	1.5	0.03	2
Harbor NB left/right	C	23.9	0.50	66
Unsignalized Roundabouts				
Northern Avenue/Haul Road				
Northern EB left/thru	B	10.2	0.50	50
Northern EB right	A	4.6	0.08	5
Northern WB left	A	6.1	0.08	5
Northern WB thru/right	A	7.3	0.27	19
Haul NB left/thru	A	7.6	0.11	9
Haul NB right	B	10.0	0.27	25
Parking SB left/thru/right	A	6.5	0.05	3

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m = 95th percentile queue is metered by upstream traffic signal.
* = defacto lane

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	47.9	6.4		40.4	57.9			54.3			62.5	5.8
LOS	D	A		D	E			D			E	A
Approach Delay		19.3			57.5			54.3			34.8	
Approach LOS		B			E			D			C	
90th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
90th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
70th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
70th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
50th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
50th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
30th %ile Green (s)	11.0			39.0	39.0		13.7	13.7		13.7	13.7	11.0
30th %ile Term Code	Max			Max	Max		Gap	Gap		Gap	Gap	Max
10th %ile Green (s)	11.0			39.0	39.0		8.6	8.6		8.6	8.6	11.0
10th %ile Term Code	Max			Max	Max		Gap	Gap		Gap	Gap	Max
Stops (vph)	98	155		12	1057			86			63	14
Fuel Used(gal)	4	6		0	29			2			2	1
CO Emissions (g/hr)	294	405		20	2038			133			120	44
NOx Emissions (g/hr)	57	79		4	396			26			23	9
VOC Emissions (g/hr)	68	94		5	472			31			28	10
Dilemma Vehicles (#)	0	0		0	0			0			0	0
Queue Length 50th (ft)	70	38		9	~418			65			54	0
Queue Length 95th (ft)	#224	119		23	#728			#117			#106	32
Internal Link Dist (ft)		1148			612			241			531	
Turn Bay Length (ft)				150								
Base Capacity (vph)	281	1833		75	1543			221			173	519
Starvation Cap Reductn	0	0		0	0			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	0.85	0.29		0.43	1.04			0.66			0.68	0.22

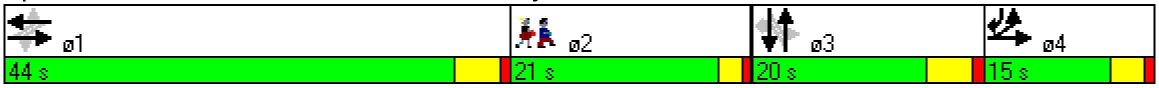
Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 81.7
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 44.9 Intersection LOS: D
Intersection Capacity Utilization 77.6% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 79
50th %ile Actuated Cycle: 79
30th %ile Actuated Cycle: 77.7
10th %ile Actuated Cycle: 72.6
~ 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.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	12	13
Storage Length (ft)	0		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.970			0.973			0.993				0.850
Flt Protected	0.950			0.950				0.976			0.962	
Satd. Flow (prot)	1490	2666	0	1438	3080	0	0	1603	0	0	1360	1231
Flt Permitted	0.100			0.100				0.689			0.633	
Satd. Flow (perm)	157	2666	0	151	3080	0	0	1132	0	0	895	1231
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		49			32			2				113
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.01	1.14	1.14	1.14	1.10
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1228			692			321			611	
Travel Time (s)		27.9			15.7			7.3			13.9	
Volume (vph)	190	386	67	16	1094	263	54	45	6	62	16	94
Peak Hour Factor	0.80	0.91	0.64	0.50	0.83	0.90	0.74	0.69	0.75	0.66	0.67	0.83
Heavy Vehicles (%)	9%	17%	23%	13%	3%	1%	15%	14%	0%	23%	13%	22%
Adj. Flow (vph)	238	424	105	32	1318	292	73	65	8	94	24	113
Lane Group Flow (vph)	238	529	0	32	1610	0	0	146	0	0	118	113
Turn Type	D.P+P			Perm			Perm			Perm		custom
Protected Phases	4	1 4			1			3			3	4
Permitted Phases	1			1			3			3		3 4
Detector Phases	4	1 4		1	1		3	3		3	3	4
Minimum Initial (s)	8.0			8.0	8.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	12.0			20.0	20.0		20.0	20.0		20.0	20.0	12.0
Total Split (s)	15.0	59.0	0.0	44.0	44.0	0.0	20.0	20.0	0.0	20.0	20.0	15.0
Total Split (%)	15.0%	59.0%	0.0%	44.0%	44.0%	0.0%	20.0%	20.0%	0.0%	20.0%	20.0%	15.0%
Maximum Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
Yellow Time (s)	3.0			4.0	4.0		4.0	4.0		4.0	4.0	3.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lag			Lead	Lead		Lead	Lead		Lead	Lead	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	None			Min	Min		None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	51.6	55.7		40.5	40.5			14.5			14.5	29.7
Actuated g/C Ratio	0.63	0.68		0.50	0.50			0.18			0.18	0.36
v/c Ratio	0.85	0.29		0.43	1.04			0.72			0.75	0.22
Control Delay	47.9	6.4		40.4	57.9			54.3			62.5	5.8
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0

Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	3.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	12.0
Flash Dont Walk (s)	6.0
Pedestrian Calls (#/hr)	10
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Splits and Phases: 1: Summer Street & Drydock Avenue



Lane Group	ø2
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	18.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	143	346	15	6	108	22	11	1	15	28	11	58
Peak Hour Factor	0.79	0.92	0.63	0.38	0.80	0.71	0.69	0.25	0.54	0.61	0.55	0.72
Hourly flow rate (vph)	181	376	24	16	135	31	16	4	28	46	20	81
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		611										
pX, platoon unblocked												
vC, conflicting volume	166			376			1023	948	200	762	920	150
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	166			376			1023	948	200	762	920	150
tC, single (s)	4.3			4.1			8.0	8.5	8.4	7.6	7.4	7.6
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.8	5.0	4.0	3.5	4.5	3.7
p0 queue free %	87			99			86	97	96	81	89	90
cM capacity (veh/h)	1353			1193			115	118	627	240	175	769

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	369	212	182	20	28	146
Volume Left	181	0	16	16	0	46
Volume Right	0	24	31	0	28	81
cSH	1353	1700	1193	116	627	357
Volume to Capacity	0.13	0.12	0.01	0.17	0.04	0.41
Queue Length 95th (ft)	12	0	1	15	3	49
Control Delay (s)	4.6	0.0	0.8	42.4	11.0	21.9
Lane LOS	A		A	E	B	C
Approach Delay (s)	2.9		0.8	24.1		21.9
Approach LOS				C		C

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	112	201	22	3	102	7	14	2	4	5	0	7
Peak Hour Factor	0.67	0.91	0.50	0.38	0.89	0.58	0.70	0.50	0.50	0.63	0.25	0.88
Hourly flow rate (vph)	167	221	44	8	115	12	20	4	8	8	0	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	127			265			722	720	243	724	736	121
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	127			265			722	720	243	724	736	121
tC, single (s)	4.1			4.1			7.2	6.5	6.7	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.8	3.5	4.0	3.3
p0 queue free %	89			99			93	99	99	97	100	99
cM capacity (veh/h)	1472			1311			303	314	691	306	308	936

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	432	135	32	16
Volume Left	167	8	20	8
Volume Right	44	12	8	8
cSH	1472	1311	354	461
Volume to Capacity	0.11	0.01	0.09	0.03
Queue Length 95th (ft)	10	0	7	3
Control Delay (s)	3.6	0.5	16.2	13.1
Lane LOS	A	A	C	B
Approach Delay (s)	3.6	0.5	16.2	13.1
Approach LOS			C	B

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	55	135	9	0	48	57	7	6	4	167	14	54
Peak Hour Factor	0.96	0.79	0.45	0.92	0.69	0.78	0.88	0.38	0.50	0.89	0.88	0.83
Hourly flow rate (vph)	57	171	20	0	70	73	8	16	8	188	16	65
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	143			191			475	438	181	417	412	106
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	143			191			475	438	181	417	412	106
tC, single (s)	4.4			4.1			7.1	6.7	6.5	7.2	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.2	3.5	3.6	4.0	3.5
p0 queue free %	96			100			98	97	99	62	97	93
cM capacity (veh/h)	1280			1395			440	468	806	491	510	894

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	248	143	32	269
Volume Left	57	0	8	188
Volume Right	20	73	8	65
cSH	1280	1395	515	552
Volume to Capacity	0.04	0.00	0.06	0.49
Queue Length 95th (ft)	4	0	5	66
Control Delay (s)	2.1	0.0	12.5	17.5
Lane LOS	A		B	C
Approach Delay (s)	2.1	0.0	12.5	17.5
Approach LOS			B	C

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	26	1	227	0	0	0	81	41	4	0	12	11
Peak Hour Factor	0.78	0.25	0.84	0.92	0.92	0.92	0.76	0.83	0.50	0.92	0.60	0.69
Hourly flow rate (vph)	33	4	270	0	0	0	107	49	8	0	20	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	295	299	28	567	302	53	36			57		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	295	299	28	567	302	53	36			57		
tC, single (s)	7.1	6.5	6.3	7.1	6.5	6.2	4.5			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.6			2.2		
p0 queue free %	95	99	73	100	100	100	92			100		
cM capacity (veh/h)	615	569	1016	298	563	1014	1367			1547		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	308	0	164	36
Volume Left	33	0	107	0
Volume Right	270	0	8	16
cSH	940	1700	1367	1547
Volume to Capacity	0.33	0.00	0.08	0.00
Queue Length 95th (ft)	36	0	6	0
Control Delay (s)	10.7	0.0	5.3	0.0
Lane LOS	B	A	A	
Approach Delay (s)	10.7	0.0	5.3	0.0
Approach LOS	B	A		

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	59	430	116	6	3	51
Peak Hour Factor	0.81	0.91	0.84	0.50	0.75	0.78
Hourly flow rate (vph)	73	473	138	12	4	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	150				762	144
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	150				762	144
tC, single (s)	4.5				6.7	6.8
tC, 2 stage (s)						
tF (s)	2.5				3.8	3.9
p0 queue free %	94				99	91
cM capacity (veh/h)	1248				312	766

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	545	150	69
Volume Left	73	0	4
Volume Right	0	12	65
cSH	1248	1700	707
Volume to Capacity	0.06	0.09	0.10
Queue Length 95th (ft)	5	0	8
Control Delay (s)	1.6	0.0	10.6
Lane LOS	A		B
Approach Delay (s)	1.6	0.0	10.6
Approach LOS			B

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	457	70	19	152	110	37
Peak Hour Factor	0.90	0.72	0.79	0.84	0.82	0.75
Hourly flow rate (vph)	508	97	24	181	134	49
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			605		785	556
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			605		785	556
tC, single (s)			4.6		6.5	6.4
tC, 2 stage (s)						
tF (s)			2.7		3.6	3.5
p0 queue free %			97		60	90
cM capacity (veh/h)			767		339	494

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	605	205	183
Volume Left	0	24	134
Volume Right	97	0	49
cSH	1700	767	370
Volume to Capacity	0.36	0.03	0.50
Queue Length 95th (ft)	0	2	66
Control Delay (s)	0.0	1.5	23.9
Lane LOS		A	C
Approach Delay (s)	0.0	1.5	23.9
Approach LOS			C

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: Existing_AM - Seasonally Adj

Northern Avenue at Trilling Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Trilling Road											
3	L	58	16.3	0.108	7.6	LOS A	0.3	9.0	0.50	0.84	25.8
8	T	5	0.0	0.108	7.6	LOS A	0.3	9.0	0.50	0.71	27.9
18	R	155	16.0	0.272	10.0	LOS B	0.9	24.8	0.55	0.83	26.3
Approach		218	15.7	0.272	9.3	LOS A	0.9	24.8	0.54	0.83	26.2
East: Northern Avenue											
1	L	53	52.0	0.078	6.1	LOS A	0.1	4.9	0.17	0.69	26.5
6	T	218	25.0	0.270	7.3	LOS A	0.6	19.3	0.19	0.55	28.4
16	R	7	33.0	0.270	7.3	LOS A	0.6	19.3	0.19	0.70	27.7
Approach		278	30.4	0.270	7.0	LOS A	0.6	19.3	0.19	0.58	28.0
North East: Parking Lot											
1X	L	15	33.3	0.046	6.5	LOS A	0.1	2.7	0.34	0.81	26.7
16X	R	13	40.0	0.046	6.5	LOS A	0.1	2.7	0.34	0.60	28.8
Approach		28	36.4	0.046	6.5	LOS A	0.1	2.7	0.34	0.71	27.6
West: Northern Avenue											
5	L	31	35.4	0.502	10.2	LOS B	1.8	50.0	0.25	0.86	24.6
2	T	438	11.0	0.502	10.2	LOS B	1.8	50.0	0.25	0.55	26.8
12	R	74	12.0	0.080	4.6	LOS A	0.2	5.3	0.17	0.59	29.4
Approach		543	12.5	0.502	9.4	LOS A	1.8	50.0	0.24	0.57	26.9
All Vehicles		1067	18.5	0.502	8.7	LOS A	1.8	50.0	0.29	0.63	27.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	11	15	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.967			0.981						0.944	
Flt Protected		0.997			0.995						0.981	
Satd. Flow (prot)	0	2822	0	0	2791	0	0	0	0	0	1266	0
Flt Permitted		0.881			0.878						0.981	
Satd. Flow (perm)	0	2494	0	0	2463	0	0	0	0	0	1266	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)					24						31	
Headway Factor	1.14	1.22	1.14	1.01	1.19	1.01	1.14	1.14	1.14	1.14	1.14	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		450			148			271			263	
Travel Time (s)		10.2			3.4			6.2			6.0	
Volume (vph)	33	335	103	44	405	63	0	0	0	39	19	30
Peak Hour Factor	0.84	0.80	0.79	0.86	0.92	0.88	0.92	0.92	0.92	0.75	0.75	0.55
Heavy Vehicles (%)	15%	5%	4%	10%	8%	21%	2%	2%	2%	28%	37%	17%
Parking (#/hr)		0	0									
Adj. Flow (vph)	39	419	130	51	440	72	0	0	0	52	25	55
Lane Group Flow (vph)	0	588	0	0	563	0	0	0	0	0	132	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					20.0	20.0	
Total Split (s)	35.0	35.0	0.0	24.0	35.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	24.0%	35.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%
Maximum Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	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	C-Max					None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		48.4			66.9						12.7	
Actuated g/C Ratio		0.48			0.67						0.13	
v/c Ratio		0.49			0.33						0.70	
Control Delay		23.3			1.5						51.2	
Queue Delay		0.0			0.4						0.0	
Total Delay		23.3			1.9						51.2	

Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	16.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			A						D	
Approach Delay		23.3			1.9						51.2	
Approach LOS		C			A						D	
90th %ile Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
90th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
70th %ile Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
70th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
50th %ile Green (s)	53.8	53.8		19.0	53.8					12.2	12.2	
50th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
30th %ile Green (s)	58.0	58.0		17.7	58.0					9.3	9.3	
30th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
10th %ile Green (s)	65.3	65.3		12.8	65.3					6.9	6.9	
10th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
Stops (vph)		329			25						64	
Fuel Used(gal)		6			1						1	
CO Emissions (g/hr)		399			62						101	
NOx Emissions (g/hr)		78			12						20	
VOC Emissions (g/hr)		92			14						24	
Dilemma Vehicles (#)		0			0						0	
Queue Length 50th (ft)		110			1						62	
Queue Length 95th (ft)		207			m0						96	
Internal Link Dist (ft)		370			68			191			183	
Turn Bay Length (ft)												
Base Capacity (vph)		1208			1717						229	
Starvation Cap Reductn		0			651						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.49			0.53						0.58	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 16.8 Intersection LOS: B
Intersection Capacity Utilization 46.6% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Seaport Boulevard & Fish Pier

Lane Group	ø2
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	16.0
90th %ile Term Code	Ped
70th %ile Green (s)	16.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations	↑↑			↑↑	↰	↱		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	16	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00		
Frt						0.850		
Flt Protected					0.950			
Satd. Flow (prot)	3094	0	0	2855	1450	1172		
Flt Permitted					0.950			
Satd. Flow (perm)	3094	0	0	2855	1450	1172		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						27		
Headway Factor	1.14	0.97	1.14	1.19	1.14	1.14		
Link Speed (mph)	30			30	30			
Link Distance (ft)	148			788	266			
Travel Time (s)	3.4			17.9	6.0			
Volume (vph)	373	0	0	322	190	16		
Peak Hour Factor	0.80	0.92	0.92	0.92	0.83	0.60		
Heavy Vehicles (%)	5%	2%	2%	10%	12%	24%		
Adj. Flow (vph)	466	0	0	350	229	27		
Lane Group Flow (vph)	466	0	0	350	229	27		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	20.0
Total Split (s)	55.0	0.0	0.0	35.0	24.0	24.0	21.0	20.0
Total Split (%)	55.0%	0.0%	0.0%	35.0%	24.0%	24.0%	21%	20%
Maximum Green (s)				30.0	19.0	19.0	16.0	15.0
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?								
Vehicle Extension (s)				2.0	2.0	2.0	2.0	2.0
Recall Mode				C-Max	None	None	None	None
Walk Time (s)							7.0	
Flash Dont Walk (s)							9.0	
Pedestrian Calls (#/hr)							20	
Act Effct Green (s)	65.1			48.4	18.5	18.5		
Actuated g/C Ratio	0.65			0.48	0.18	0.18		
v/c Ratio	0.23			0.25	0.85	0.11		
Control Delay	2.4			19.7	70.1	17.7		
Queue Delay	0.6			0.0	0.0	0.0		
Total Delay	3.0			19.7	70.1	17.7		
LOS	A			B	E	B		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Approach Delay	3.0			19.7	64.6			
Approach LOS	A			B	E			
90th %ile Green (s)				30.0	19.0	19.0	16.0	15.0
90th %ile Term Code				Coord	Max	Max	Ped	Max
70th %ile Green (s)				30.0	19.0	19.0	16.0	15.0
70th %ile Term Code				Coord	Max	Max	Ped	Max
50th %ile Green (s)				53.8	19.0	19.0	0.0	12.2
50th %ile Term Code				Coord	Max	Max	Skip	Gap
30th %ile Green (s)				58.0	17.7	17.7	0.0	9.3
30th %ile Term Code				Coord	Gap	Gap	Skip	Gap
10th %ile Green (s)				65.3	12.8	12.8	0.0	6.9
10th %ile Term Code				Coord	Gap	Gap	Skip	Gap
Stops (vph)	21			198	178	14		
Fuel Used(gal)	1			4	4	0		
CO Emissions (g/hr)	51			305	286	12		
NOx Emissions (g/hr)	10			59	56	2		
VOC Emissions (g/hr)	12			71	66	3		
Dilemma Vehicles (#)	0			0	0	0		
Queue Length 50th (ft)	6			57	149	2		
Queue Length 95th (ft)	20			133	m#209	m6		
Internal Link Dist (ft)	68			708	186			
Turn Bay Length (ft)								
Base Capacity (vph)	2007			1382	290	256		
Starvation Cap Reductn	1116			0	0	0		
Spillback Cap Reductn	0			0	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.52			0.25	0.79	0.11		

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 23.1 Intersection LOS: C

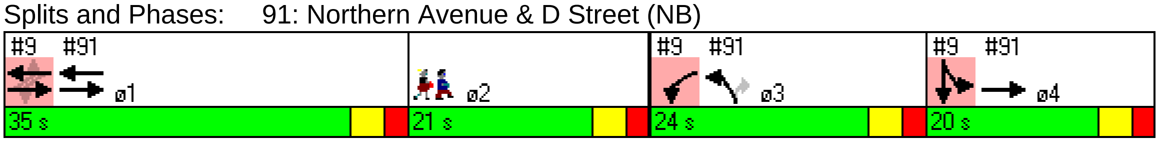
Intersection Capacity Utilization 29.8% ICU Level of Service A

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: 91: Northern Avenue & D Street (NB)



Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	12	13	12	11	12	12	12	14
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50		50	50		50	50
Trailing Detector (ft)	0	0	0	0	0	0		0	0		0	0
Turning Speed (mph)	9	15		9	15		9	15		9	15	
Lane Util. Factor	0.95	0.95	0.91	0.91	0.95	0.95	0.95	0.91	0.91	0.95	0.95	0.95
Ped Bike Factor			0.88	0.58		0.88		0.97	0.97			0.98
Frt			0.974	0.850		0.946			0.974			0.982
Flt Protected			0.989			0.992		0.950	0.981			0.992
Satd. Flow (prot)	0	0	2464	1277	0	2632	0	1276	2475	0	0	2613
Flt Permitted			0.989			0.992		0.950	0.981			0.992
Satd. Flow (perm)	0	0	2352	737	0	2543	0	1236	2444	0	0	2565
Right Turn on Red				Yes			Yes			Yes		
Satd. Flow (RTOR)			23	275		87			23			13
Headway Factor	1.14	1.14	1.14	1.10	1.14	1.10	1.14	1.19	1.22	1.14	1.14	1.13
Link Speed (mph)			30			30			30			30
Link Distance (ft)			665			205			225			206
Travel Time (s)			15.1			4.7			5.1			4.7
Volume (vph)	6	75	278	346	62	108	69	387	140	36	21	120
Confl. Peds. (#/hr)		58		239	239		58	11		60	60	
Peak Hour Factor	0.25	0.83	0.89	0.95	0.91	0.55	0.47	0.84	0.64	0.41	0.63	0.82
Heavy Vehicles (%)	0%	35%	9%	7%	5%	12%	6%	12%	16%	6%	8%	25%
Parking (#/hr)									0	0	0	0
Adj. Flow (vph)	24	90	312	364	68	196	147	461	219	88	33	146
Lane Group Flow (vph)	0	0	515	275	0	411	0	259	509	0	0	203
Turn Type	Perm	Split		Perm	Split			Split			Split	
Protected Phases		1	1		4	4		2	2		3	3
Permitted Phases	1			1								
Detector Phases	1	1	1	1	4	4		2	2		3	3
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0
Total Split (s)	31.0	31.0	31.0	31.0	16.0	16.0	0.0	32.0	32.0	0.0	21.0	21.0
Total Split (%)	31.0%	31.0%	31.0%	31.0%	16.0%	16.0%	0.0%	32.0%	32.0%	0.0%	21.0%	21.0%
Maximum Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
Yellow Time (s)	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		3.0	3.0
Lead/Lag								Lead	Lead		Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max		None	None		None	None
Walk Time (s)	7.0	7.0	7.0	7.0							7.0	7.0
Flash Dont Walk (s)	1.0	1.0	1.0	1.0							1.0	1.0
Pedestrian Calls (#/hr)	0	0	0	0							0	0
Act Effct Green (s)			25.1	25.1		19.5		25.3	25.3			14.1
Actuated g/C Ratio			0.25	0.25		0.20		0.25	0.25			0.14
v/c Ratio			0.81	0.70		0.70		0.80	0.79			0.53
Control Delay			44.4	14.7		39.9		47.9	36.8			53.6

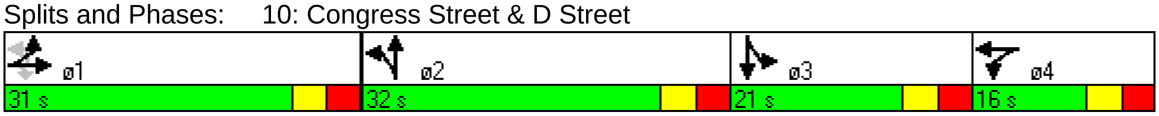
Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	19
Confl. Peds. (#/hr)	11
Peak Hour Factor	0.79
Heavy Vehicles (%)	23%
Parking (#/hr)	
Adj. Flow (vph)	24
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay			0.0	0.0		0.0		9.1	4.7			0.0
Total Delay			44.4	14.7		39.9		57.0	41.5			53.6
LOS			D	B		D		E	D			D
Approach Delay			34.1			39.9			46.7			53.6
Approach LOS			C			D			D			D
90th %ile Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
70th %ile Green (s)	25.0	25.0	25.0	25.0	10.9	10.9		26.0	26.0		14.1	14.1
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Gap	Gap
50th %ile Green (s)	25.0	25.0	25.0	25.0	13.0	13.0		26.0	26.0		12.0	12.0
50th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Gap	Gap
30th %ile Green (s)	22.7	22.7	22.7	22.7	20.4	20.4		22.0	22.0		10.9	10.9
30th %ile Term Code	Gap	Gap	Gap	Gap	Coord	Coord		Gap	Gap		Gap	Gap
10th %ile Green (s)	17.7	17.7	17.7	17.7	33.2	33.2		16.6	16.6		8.5	8.5
10th %ile Term Code	Gap	Gap	Gap	Gap	Coord	Coord		Gap	Gap		Gap	Gap
Stops (vph)			387	45		149		191	293			327
Fuel Used(gal)			8	2		3		4	5			4
CO Emissions (g/hr)			590	167		220		249	337			265
NOx Emissions (g/hr)			115	32		43		48	66			52
VOC Emissions (g/hr)			137	39		51		58	78			62
Dilemma Vehicles (#)			0	0		0		0	0			0
Queue Length 50th (ft)			158	0		108		158	148			55
Queue Length 95th (ft)			220	105		83		236	137			79
Internal Link Dist (ft)			585			125			145			126
Turn Bay Length (ft)												
Base Capacity (vph)			682	400		583		357	710			455
Starvation Cap Reductn			0	0		0		69	137			0
Spillback Cap Reductn			0	0		0		0	0			0
Storage Cap Reductn			0	0		0		0	0			0
Reduced v/c Ratio			0.76	0.69		0.70		0.90	0.89			0.45

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 41.5 Intersection LOS: D
Intersection Capacity Utilization 62.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 10: Congress Street & D Street



Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	13	12	12	12	16	16	12	16	12	11	13
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50	50	50	50	50		50	50
Trailing Detector (ft)	0	0		0	0	0	0	0	0		0	0
Turning Speed (mph)	15		9	9	15		9	15		9	15	
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	0.99	0.97					0.94	0.99	0.98		0.96	0.99
Frt		0.957					0.850		0.965			0.939
Flt Protected	0.950					0.985		0.950			0.950	
Satd. Flow (prot)	1540	2715	0	0	0	3263	1525	1477	2936	0	1454	2892
Flt Permitted	0.212					0.574		0.950			0.950	
Satd. Flow (perm)	340	2715	0	0	0	1902	1440	1462	2936	0	1394	2892
Right Turn on Red			Yes				No			Yes		
Satd. Flow (RTOR)		74							36			145
Headway Factor	1.19	1.17	1.14	1.14	1.14	0.97	0.97	1.14	1.04	1.14	1.19	1.10
Link Speed (mph)		30				30			30			30
Link Distance (ft)		523				1228			316			323
Travel Time (s)		11.9				27.9			7.2			7.3
Volume (vph)	163	256	115	29	76	378	537	90	241	70	150	190
Confl. Peds. (#/hr)	27		63		63		27	10		45	45	
Peak Hour Factor	0.87	0.82	0.92	0.30	0.78	0.84	0.94	0.65	0.89	0.86	0.78	0.90
Heavy Vehicles (%)	2%	10%	8%	0%	23%	11%	8%	10%	12%	16%	8%	11%
Parking (#/hr)		0	0						0	0		
Adj. Flow (vph)	187	312	125	97	97	450	571	138	271	81	192	211
Lane Group Flow (vph)	187	437	0	0	0	644	571	138	352	0	192	356
Turn Type	D.P+P			Perm	Perm		pm+ov	Split			Split	
Protected Phases	4	1 4				1	2	3	3		2	2
Permitted Phases	1			1	1		1					
Detector Phases	4	1 4		1	1	1	2	3	3		2	2
Minimum Initial (s)	6.0			10.0	10.0	10.0	6.0	6.0	6.0		6.0	6.0
Minimum Split (s)	12.0			28.0	28.0	28.0	24.0	26.0	26.0		24.0	24.0
Total Split (s)	15.0	46.0	0.0	31.0	31.0	31.0	27.0	27.0	27.0	0.0	27.0	27.0
Total Split (%)	15.0%	46.0%	0.0%	31.0%	31.0%	31.0%	27.0%	27.0%	27.0%	0.0%	27.0%	27.0%
Maximum Green (s)	10.0			26.0	26.0	26.0	22.0	22.0	22.0		22.0	22.0
Yellow Time (s)	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	2.0			2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0
Lead/Lag							Lead	Lag	Lag		Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Recall Mode	None			C-Max	C-Max	C-Max	Ped	Ped	Ped		Ped	Ped
Walk Time (s)				7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)				16.0	16.0	16.0	11.0	13.0	13.0		11.0	11.0
Pedestrian Calls (#/hr)				0	0	0	0	0	0		0	0
Act Effct Green (s)	41.5	45.5				30.6	51.7	21.3	21.3		21.1	21.1
Actuated g/C Ratio	0.42	0.46				0.31	0.52	0.21	0.21		0.21	0.21
v/c Ratio	0.68	0.34				2.46dl	0.75	0.44	0.54		0.63	0.49
Control Delay	32.6	15.7				104.8	24.6	39.1	34.6		37.4	17.0

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	128
Confl. Peds. (#/hr)	10
Peak Hour Factor	0.88
Heavy Vehicles (%)	3%
Parking (#/hr)	
Adj. Flow (vph)	145
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay	0.0	0.0				0.0	0.0	0.0	0.0		0.1	0.0
Total Delay	32.6	15.7				104.8	24.6	39.1	34.6		37.5	17.0
LOS	C	B				F	C	D	C		D	B
Approach Delay		20.8				67.1			35.9			24.2
Approach LOS		C				E			D			C
90th %ile Green (s)	10.0			26.4	26.4	26.4	22.0	21.6	21.6		22.0	22.0
90th %ile Term Code	Max			Coord	Coord	Coord	Max	Gap	Gap		Max	Max
70th %ile Green (s)	10.0			28.0	28.0	28.0	22.0	20.0	20.0		22.0	22.0
70th %ile Term Code	Max			Coord	Coord	Coord	Max	Ped	Ped		Max	Max
50th %ile Green (s)	10.0			29.3	29.3	29.3	20.7	20.0	20.0		20.7	20.7
50th %ile Term Code	Max			Coord	Coord	Coord	Gap	Ped	Ped		Gap	Gap
30th %ile Green (s)	10.0			32.0	32.0	32.0	18.0	20.0	20.0		18.0	18.0
30th %ile Term Code	Max			Coord	Coord	Coord	Ped	Ped	Ped		Ped	Ped
10th %ile Green (s)	9.8			32.2	32.2	32.2	18.0	20.0	20.0		18.0	18.0
10th %ile Term Code	Gap			Coord	Coord	Coord	Ped	Ped	Ped		Ped	Ped
Stops (vph)	101	193				386	417	76	242		130	199
Fuel Used(gal)	2	4				17	10	1	4		2	3
CO Emissions (g/hr)	161	263				1192	708	95	300		157	210
NOx Emissions (g/hr)	31	51				232	138	18	58		30	41
VOC Emissions (g/hr)	37	61				276	164	22	70		36	49
Dilemma Vehicles (#)	0	0				0	0	0	0		0	0
Queue Length 50th (ft)	72	75				~250	241	77	94		114	65
Queue Length 95th (ft)	#134	104				#344	381	92	136		169	141
Internal Link Dist (ft)		443				1148			236			243
Turn Bay Length (ft)												
Base Capacity (vph)	273	1257				582	791	340	703		334	777
Starvation Cap Reductn	0	0				0	0	0	0		3	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	0.68	0.35				1.11	0.72	0.41	0.50		0.58	0.46

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 7 (7%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 43.6 Intersection LOS: D

Intersection Capacity Utilization 85.3% ICU Level of Service E

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.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 11: Summer Street & D Street

Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Existing Conditions (2012) Level of Service Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Signalized Intersections				
Summer Street/Drydock Avenue	**C**	**25.4**		
Summer EB left	B	11.0	0.19	37
Summer EB thru | thru/right	B	15.6	0.69	347
Summer WB left	D	41.8	0.40	24
Summer WB thru | thru/right	C	21.4	0.60	173
Pappas NB left/thru/right	D	38.2	0.51	#57
Drydock SB left/thru	E	76.7	>1.00	#337
Drydock SB right	A	3.7	0.39	24
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**B**	**13.0**		
Seaport EB left/thru | thru/right	C	20.4	0.51	224
Seaport WB left/thru | thru/right	A	2.2	0.39	m7
Fish Pier SB left/thru/right	C	31.8	0.61	57
Northern Avenue/D Street (northbound)	**C**	**23.0**		
Northern EB thru | thru	A	2.9	0.16	15
Northern WB thru | thru	B	17.3	0.34	172
D NB left	E	70.0	0.84	m174
D NB right	C	20.5	0.17	m15
Congress Street/D Street	**D**	**39.1**		
Congress EB left/thru | thru/right	D	54.4	0.85	141
Congress EB right	C	21.8	0.85	#202
Congress WB left/thru | thru/right	D	45.5	0.71	128
D NB left	D	41.2	0.65	162
D NB left/thru | thru/right	D	35.2	0.65	150
D SB left/thru | thru/right	D	38.8	0.74	222
Summer Street/D Street	**C**	**28.9**		
Summer EB left	C	33.2	0.74	#240
Summer EB thru | thru/right	B	19.1	0.44	175
Summer WB left/thru | thru	D	39.1	0.66	138
Summer WB right	B	17.2	0.48	170
D NB left	C	33.7	0.18	50
D NB thru | thru/right	D	38.5	0.60	127
D SB left	D	37.1	0.73	m#254
D SB thru | thru/right	C	26.6	0.73	m199
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	3.6	0.11	9
Drydock WB left/thru/right	A	0.2	0.01	0
Harbor NB left/thru	F	61.1	0.27	25
Harbor NB right	A	9.7	0.02	1
Harbor SB left/thru/right	D	28.4	0.61	97

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	0.8	0.01	0
Drydock WB left/thru/right	A	0.6	0.02	1
Design Center NB left/thru/right	D	26.3	0.47	59
Garage SB left/thru/right	B	12.8	0.31	32
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	3.9	0.05	4
Drydock WB left/thru/right	A	0.3	0.01	1
Parking NB left/thru/right	B	13.9	0.10	8
Tide SB left/thru/right	B	14.4	0.30	31
Northern Avenue/Tide Street				
Northern EB left/thru/right	B	10.4	0.16	14
Alley WB left/thru/right	B	14.3	0.05	4
Tide NB left/thru/right	A	7.5	0.13	11
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.02	2
Northern WB thru/right	A	0.0	0.24	0
Seafood SB left/right	B	12.6	0.15	13
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.15	0
Northern WB left/thru	A	0.8	0.03	2
Harbor NB left/right	C	16.2	0.25	24
Unsignalized Roundabouts				
Northern Avenue/Haul Road				
Northern EB left/thru	A	7.1	0.27	20
Northern EB right	A	4.6	0.06	4
Northern WB left	A	6.2	0.20	14
Northern WB thru/right	A	8.5	0.42	39
Haul NB left/thru	A	4.9	0.07	6
Haul NB right	A	6.8	0.04	3
Parking SB left/thru/right	A	6.4	0.05	3

\# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m = 95th percentile queue is metered by upstream traffic signal.
* = defacto lane

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	12	13
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.984			0.971			0.969				0.850
Flt Protected	0.950			0.950				0.968			0.960	
Satd. Flow (prot)	1377	3065	0	1624	2943	0	0	1631	0	0	1602	1444
Flt Permitted	0.341			0.108				0.231			0.738	
Satd. Flow (perm)	494	3065	0	185	2943	0	0	389	0	0	1231	1444
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			32			14				364
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.01	1.14	1.14	1.14	1.10
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1228			692			321			611	
Travel Time (s)		27.9			15.7			7.3			13.9	
Volume (vph)	50	902	87	15	388	77	34	5	12	264	42	277
Peak Hour Factor	0.77	0.92	0.76	0.65	0.85	0.72	0.75	0.63	0.75	0.79	0.64	0.76
Heavy Vehicles (%)	18%	4%	7%	0%	7%	8%	9%	20%	0%	2%	5%	4%
Adj. Flow (vph)	65	980	114	23	456	107	45	8	16	334	66	364
Lane Group Flow (vph)	65	1094	0	23	563	0	0	69	0	0	400	364
Turn Type	D.P+P			Perm			Perm			Perm		custom
Protected Phases	4	1 4			1			3			3	4
Permitted Phases	1			1			3			3		3 4
Detector Phases	4	1 4		1	1		3	3		3	3	4
Minimum Initial (s)	8.0			8.0	8.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	12.0			20.0	20.0		20.0	20.0		20.0	20.0	12.0
Total Split (s)	13.0	54.0	0.0	41.0	41.0	0.0	25.0	25.0	0.0	25.0	25.0	13.0
Total Split (%)	13.0%	54.0%	0.0%	41.0%	41.0%	0.0%	25.0%	25.0%	0.0%	25.0%	25.0%	13.0%
Maximum Green (s)	9.0			36.0	36.0		20.0	20.0		20.0	20.0	9.0
Yellow Time (s)	3.0			4.0	4.0		4.0	4.0		4.0	4.0	3.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lag			Lead	Lead		Lead	Lead		Lead	Lead	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	None			Min	Min		None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	30.8	35.0		21.4	21.4			22.0			22.0	35.7
Actuated g/C Ratio	0.45	0.51		0.31	0.31			0.32			0.32	0.52
v/c Ratio	0.19	0.69		0.40	0.60			0.51			1.01	0.39
Control Delay	11.0	15.6		41.8	21.4			38.2			76.7	3.7
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	11.0	15.6		41.8	21.4			38.2			76.7	3.7
LOS	B	B		D	C			D			E	A

Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	3.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	12.0
Flash Dont Walk (s)	6.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	

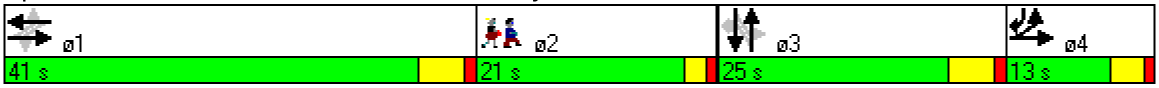
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		15.4			22.2			38.2			41.9	
Approach LOS		B			C			D			D	
90th %ile Green (s)	9.0			36.0	36.0		20.0	20.0		20.0	20.0	9.0
90th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
70th %ile Green (s)	9.0			24.3	24.3		20.0	20.0		20.0	20.0	9.0
70th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
50th %ile Green (s)	9.0			19.4	19.4		20.0	20.0		20.0	20.0	9.0
50th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
30th %ile Green (s)	9.0			15.4	15.4		20.0	20.0		20.0	20.0	9.0
30th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
10th %ile Green (s)	9.0			10.3	10.3		20.0	20.0		20.0	20.0	9.0
10th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
Stops (vph)	24	665		13	335			32			217	25
Fuel Used(gal)	1	16		0	6			1			7	2
CO Emissions (g/hr)	51	1138		20	447			49			520	117
NOx Emissions (g/hr)	10	221		4	87			10			101	23
VOC Emissions (g/hr)	12	264		5	103			11			120	27
Dilemma Vehicles (#)	0	0		0	0			0			0	0
Queue Length 50th (ft)	11	140		7	85			16			146	0
Queue Length 95th (ft)	37	347		24	173			#57			#337	24
Internal Link Dist (ft)		1148			612			241			531	
Turn Bay Length (ft)												
Base Capacity (vph)	345	1865		83	1338			135			397	928
Starvation Cap Reductn	0	0		0	0			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	0.19	0.59		0.28	0.42			0.51			1.01	0.39

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 68.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 25.4 — Intersection LOS: C
Intersection Capacity Utilization 71.4% — ICU Level of Service C
Analysis Period (min) 15
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 67.3
50th %ile Actuated Cycle: 62.4
30th %ile Actuated Cycle: 58.4
10th %ile Actuated Cycle: 53.3

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

Splits and Phases: 1: Summer Street & Drydock Avenue



Lane Group	ø2
Approach Delay	
Approach LOS	
90th %ile Green (s)	18.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	58	68	10	6	427	31	15	1	10	9	3	146
Peak Hour Factor	0.58	0.84	0.50	0.75	0.74	0.69	0.75	0.25	0.69	0.44	0.25	0.74
Hourly flow rate (vph)	100	81	20	8	577	45	20	4	14	20	12	197
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		611										
pX, platoon unblocked												
vC, conflicting volume	622			81			1110	929	50	872	896	599
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	622			81			1110	929	50	872	896	599
tC, single (s)	4.3			4.1			7.6	6.5	8.7	8.3	6.6	6.9
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.0	4.2	3.9	4.0	3.3
p0 queue free %	89			99			74	98	98	88	95	56
cM capacity (veh/h)	890			1529			78	238	781	168	242	449

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	140	60	630	24	14	230
Volume Left	100	0	8	20	0	20
Volume Right	0	20	45	0	14	197
cSH	890	1700	1529	87	781	377
Volume to Capacity	0.11	0.04	0.01	0.27	0.02	0.61
Queue Length 95th (ft)	9	0	0	25	1	97
Control Delay (s)	7.1	0.0	0.2	61.1	9.7	28.4
Lane LOS	A		A	F	A	D
Approach Delay (s)	5.0		0.2	41.7		28.4
Approach LOS				E		D

Intersection Summary			
Average Delay	8.4		
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	58	8	13	239	4	68	0	22	4	1	126
Peak Hour Factor	0.38	0.79	1.00	0.65	0.69	0.50	0.60	0.50	0.69	0.33	0.25	0.67
Hourly flow rate (vph)	8	73	8	20	346	8	113	0	32	12	4	188
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	354			81			674	488	77	515	488	350
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	354			81			674	488	77	515	488	350
tC, single (s)	4.1			4.7			7.1	6.5	6.8	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.8	3.5	4.0	3.3
p0 queue free %	99			98			57	100	96	97	99	73
cM capacity (veh/h)	1216			1210			264	472	846	447	472	695

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	89	374	145	204
Volume Left	8	20	113	12
Volume Right	8	8	32	188
cSH	1216	1210	311	667
Volume to Capacity	0.01	0.02	0.47	0.31
Queue Length 95th (ft)	0	1	59	32
Control Delay (s)	0.8	0.6	26.3	12.8
Lane LOS	A	A	D	B
Approach Delay (s)	0.8	0.6	26.3	12.8
Approach LOS			D	B

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	35	44	1	3	155	118	4	12	5	50	1	73
Peak Hour Factor	0.77	0.72	0.25	0.25	0.75	0.74	0.50	0.43	0.63	0.82	0.25	0.75
Hourly flow rate (vph)	45	61	4	12	207	159	8	28	8	61	4	97
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	366			65			564	544	63	486	466	286
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	366			65			564	544	63	486	466	286
tC, single (s)	4.6			4.1			7.3	6.5	6.4	7.5	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.6			2.2			3.7	4.0	3.5	3.8	4.0	3.5
p0 queue free %	95			99			98	93	99	85	99	86
cM capacity (veh/h)	982			1550			332	425	953	396	470	716

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	111	378	44	162
Volume Left	45	12	8	61
Volume Right	4	159	8	97
cSH	982	1550	447	544
Volume to Capacity	0.05	0.01	0.10	0.30
Queue Length 95th (ft)	4	1	8	31
Control Delay (s)	3.9	0.3	13.9	14.4
Lane LOS	A	A	B	B
Approach Delay (s)	3.9	0.3	13.9	14.4
Approach LOS			B	B

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	0	89	1	4	0	159	7	0	0	32	27
Peak Hour Factor	0.31	0.25	0.78	0.25	0.25	0.92	0.85	0.58	0.50	0.92	0.55	0.93
Hourly flow rate (vph)	16	0	114	4	16	0	187	12	0	0	58	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	467	459	73	573	473	12	87			12		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	467	459	73	573	473	12	87			12		
tC, single (s)	7.3	6.5	6.5	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.6	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	96	100	88	99	96	100	87			100		
cM capacity (veh/h)	417	436	921	341	427	1074	1419			1620		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	130	20	199	87
Volume Left	16	4	187	0
Volume Right	114	0	0	29
cSH	801	407	1419	1620
Volume to Capacity	0.16	0.05	0.13	0.00
Queue Length 95th (ft)	14	4	11	0
Control Delay (s)	10.4	14.3	7.5	0.0
Lane LOS	B	B	A	
Approach Delay (s)	10.4	14.3	7.5	0.0
Approach LOS	B	B		

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	97	358	0	5	60
Peak Hour Factor	0.80	0.88	0.87	0.50	0.63	0.78
Hourly flow rate (vph)	20	110	411	0	8	77
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	411				562	411
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	411				562	411
tC, single (s)	4.7				7.2	6.5
tC, 2 stage (s)						
tF (s)	2.7				4.2	3.6
p0 queue free %	98				98	87
cM capacity (veh/h)	909				370	586

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	130	411	85
Volume Left	20	0	8
Volume Right	0	0	77
cSH	909	1700	556
Volume to Capacity	0.02	0.24	0.15
Queue Length 95th (ft)	2	0	13
Control Delay (s)	1.6	0.0	12.6
Lane LOS	A		B
Approach Delay (s)	1.6	0.0	12.6
Approach LOS			B

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	32.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	102	108	19	398	75	9
Peak Hour Factor	0.89	0.78	0.59	0.94	0.84	0.56
Hourly flow rate (vph)	115	138	32	423	89	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			253		672	184
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			253		672	184
tC, single (s)			4.2		6.5	6.8
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.8
p0 queue free %			97		78	98
cM capacity (veh/h)			1261		397	737

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	253	456	105
Volume Left	0	32	89
Volume Right	138	0	16
cSH	1700	1261	427
Volume to Capacity	0.15	0.03	0.25
Queue Length 95th (ft)	0	2	24
Control Delay (s)	0.0	0.8	16.2
Lane LOS		A	C
Approach Delay (s)	0.0	0.8	16.2
Approach LOS			C

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: Existing_PM - Seasonally Adj

Northern Avenue at Trilling Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Trilling Road											
3	L	54	3.8	0.067	4.9	LOS A	0.2	5.8	0.35	0.73	27.1
8	T	2	0.0	0.067	4.9	LOS A	0.2	5.8	0.35	0.55	29.6
18	R	24	52.0	0.043	6.8	LOS A	0.1	3.4	0.34	0.63	28.1
Approach		81	18.3	0.067	5.5	LOS A	0.2	5.8	0.35	0.69	27.4
East: Northern Avenue											
1	L	167	21.0	0.196	6.2	LOS A	0.5	14.1	0.20	0.70	26.5
6	T	400	7.0	0.419	8.5	LOS A	1.5	38.5	0.24	0.56	27.7
16	R	7	17.0	0.419	8.5	LOS A	1.5	38.5	0.24	0.70	27.1
Approach		574	11.2	0.419	7.8	LOS A	1.5	38.5	0.23	0.60	27.3
North East: Parking Lot											
1X	L	21	6.5	0.051	6.4	LOS A	0.1	3.2	0.43	0.86	26.9
16X	R	11	13.0	0.051	6.4	LOS A	0.1	3.2	0.43	0.69	28.7
Approach		32	8.8	0.051	6.4	LOS A	0.1	3.2	0.43	0.80	27.5
West: Northern Avenue											
5	L	48	25.5	0.268	7.1	LOS A	0.7	19.6	0.28	0.88	25.8
2	T	178	11.0	0.268	7.1	LOS A	0.7	19.6	0.28	0.59	28.4
12	R	55	6.0	0.062	4.6	LOS A	0.2	4.1	0.25	0.62	29.4
Approach		282	12.5	0.268	6.6	LOS A	0.7	19.6	0.28	0.64	28.1
All Vehicles		968	12.1	0.419	7.2	LOS A	1.5	38.5	0.26	0.63	27.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	11	15	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.932			0.994						0.914	
Flt Protected		0.997			0.995						0.993	
Satd. Flow (prot)	0	2729	0	0	2857	0	0	0	0	0	1261	0
Flt Permitted		0.886			0.789						0.993	
Satd. Flow (perm)	0	2425	0	0	2265	0	0	0	0	0	1261	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)					6						74	
Headway Factor	1.14	1.22	1.14	1.01	1.19	1.01	1.14	1.14	1.14	1.14	1.14	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		450			148			271			263	
Travel Time (s)		10.2			3.4			6.2			6.0	
Volume (vph)	30	259	235	61	510	23	0	0	0	12	20	41
Peak Hour Factor	0.84	0.80	0.79	0.86	0.92	0.88	0.92	0.92	0.92	0.75	0.75	0.55
Heavy Vehicles (%)	15%	5%	4%	10%	8%	21%	2%	2%	2%	28%	37%	17%
Parking (#/hr)		0	0									
Adj. Flow (vph)	36	324	297	71	554	26	0	0	0	16	27	75
Lane Group Flow (vph)	0	657	0	0	651	0	0	0	0	0	118	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					19.0	19.0	
Total Split (s)	39.0	39.0	0.0	21.0	39.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0
Total Split (%)	39.0%	39.0%	0.0%	21.0%	39.0%	0.0%	0.0%	0.0%	0.0%	19.0%	19.0%	0.0%
Maximum Green (s)	34.0	34.0		16.0	34.0					14.0	14.0	
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	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	C-Max					None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		53.5			69.5						10.1	
Actuated g/C Ratio		0.54			0.70						0.10	
v/c Ratio		0.51			0.39						0.61	
Control Delay		20.4			1.9						31.8	
Queue Delay		0.0			0.3						0.0	
Total Delay		20.4			2.2						31.8	

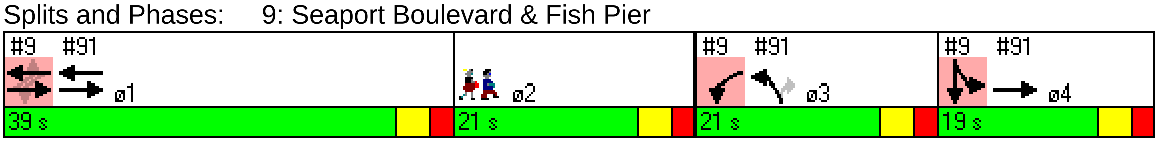
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	16.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			A						C	
Approach Delay		20.4			2.2						31.8	
Approach LOS		C			A						C	
90th %ile Green (s)	34.0	34.0		16.0	34.0					14.0	14.0	
90th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
70th %ile Green (s)	37.3	37.3		16.0	37.3					10.7	10.7	
70th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
50th %ile Green (s)	61.1	61.1		16.0	61.1					7.9	7.9	
50th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
30th %ile Green (s)	62.6	62.6		15.7	62.6					6.7	6.7	
30th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
10th %ile Green (s)	67.4	67.4		11.6	67.4					6.0	6.0	
10th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
Stops (vph)		346			41						32	
Fuel Used(gal)		6			1						1	
CO Emissions (g/hr)		414			80						56	
NOx Emissions (g/hr)		81			16						11	
VOC Emissions (g/hr)		96			18						13	
Dilemma Vehicles (#)		0			0						0	
Queue Length 50th (ft)		105			3						27	
Queue Length 95th (ft)		224			m7						57	
Internal Link Dist (ft)		370			68			191			183	
Turn Bay Length (ft)												
Base Capacity (vph)		1297			1672						252	
Starvation Cap Reductn		0			471						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.51			0.54						0.47	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 13.0 Intersection LOS: B
Intersection Capacity Utilization 50.5% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Seaport Boulevard & Fish Pier



Lane Group	ø2
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	16.0
90th %ile Term Code	Ped
70th %ile Green (s)	16.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

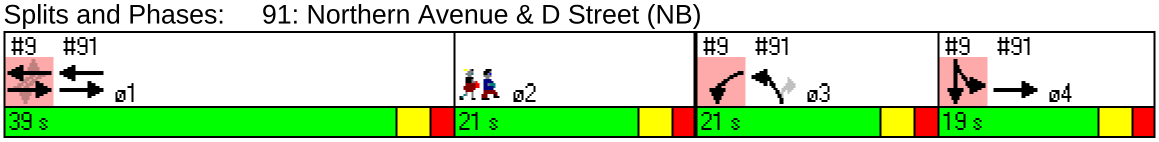
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	16	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00		
Frt						0.850		
Flt Protected					0.950			
Satd. Flow (prot)	3154	0	0	2991	1593	1346		
Flt Permitted					0.950			
Satd. Flow (perm)	3154	0	0	2991	1593	1346		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						42		
Headway Factor	1.14	0.97	1.14	1.19	1.14	1.14		
Link Speed (mph)	30			30	30			
Link Distance (ft)	148			788	266			
Travel Time (s)	3.4			17.9	6.0			
Volume (vph)	271	0	0	443	152	27		
Peak Hour Factor	0.80	0.92	0.92	0.82	0.71	0.65		
Heavy Vehicles (%)	3%	2%	2%	5%	2%	8%		
Adj. Flow (vph)	339	0	0	540	214	42		
Lane Group Flow (vph)	339	0	0	540	214	42		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	19.0
Total Split (s)	58.0	0.0	0.0	39.0	21.0	21.0	21.0	19.0
Total Split (%)	58.0%	0.0%	0.0%	39.0%	21.0%	21.0%	21%	19%
Maximum Green (s)				34.0	16.0	16.0	16.0	14.0
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?								
Vehicle Extension (s)				2.0	2.0	2.0	2.0	2.0
Recall Mode				C-Max	None	None	None	None
Walk Time (s)							7.0	
Flash Dont Walk (s)							9.0	
Pedestrian Calls (#/hr)							20	
Act Effct Green (s)	67.5			53.5	16.1	16.1		
Actuated g/C Ratio	0.68			0.54	0.16	0.16		
v/c Ratio	0.16			0.34	0.84	0.17		
Control Delay	2.2			17.3	70.0	20.5		
Queue Delay	0.7			0.0	0.0	0.0		
Total Delay	2.9			17.3	70.0	20.5		
LOS	A			B	E	C		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Approach Delay	2.9			17.3	61.9			
Approach LOS	A			B	E			
90th %ile Green (s)				34.0	16.0	16.0	16.0	14.0
90th %ile Term Code				Coord	Max	Max	Ped	Max
70th %ile Green (s)				37.3	16.0	16.0	16.0	10.7
70th %ile Term Code				Coord	Max	Max	Ped	Gap
50th %ile Green (s)				61.1	16.0	16.0	0.0	7.9
50th %ile Term Code				Coord	Max	Max	Skip	Gap
30th %ile Green (s)				62.6	15.7	15.7	0.0	6.7
30th %ile Term Code				Coord	Gap	Gap	Skip	Gap
10th %ile Green (s)				67.4	11.6	11.6	0.0	6.0
10th %ile Term Code				Coord	Gap	Gap	Skip	Gap
Stops (vph)	16			258	140	20		
Fuel Used(gal)	1			6	3	0		
CO Emissions (g/hr)	36			399	228	20		
NOx Emissions (g/hr)	7			78	44	4		
VOC Emissions (g/hr)	8			92	53	5		
Dilemma Vehicles (#)	0			0	0	0		
Queue Length 50th (ft)	4			76	140	6		
Queue Length 95th (ft)	15			172	m174	m15		
Internal Link Dist (ft)	68			708	186			
Turn Bay Length (ft)								
Base Capacity (vph)	2126			1600	271	264		
Starvation Cap Reductn	1435			0	0	0		
Spillback Cap Reductn	0			0	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.49			0.34	0.79	0.16		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 23.0 Intersection LOS: C
Intersection Capacity Utilization 29.6% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 91: Northern Avenue & D Street (NB)



Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	12	13	12	11	12	12	12	14
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50		50	50		50	50
Trailing Detector (ft)	0	0	0	0	0	0		0	0		0	0
Turning Speed (mph)	9	15		9	15		9	15		9	15	
Lane Util. Factor	0.95	0.95	0.91	0.91	0.95	0.95	0.95	0.91	0.91	0.95	0.95	0.95
Ped Bike Factor			0.95	0.69		0.93		0.97	0.99			0.99
Frt				0.850		0.980			0.998			0.988
Flt Protected			0.981			0.986		0.950	0.983			0.997
Satd. Flow (prot)	0	0	2443	1353	0	3118	0	1374	2754	0	0	3168
Flt Permitted			0.981			0.986		0.950	0.983			0.997
Satd. Flow (perm)	0	0	2313	931	0	2977	0	1332	2725	0	0	3152
Right Turn on Red				Yes			Yes			Yes		
Satd. Flow (RTOR)				511		14			1			8
Headway Factor	1.14	1.14	1.14	1.10	1.14	1.10	1.14	1.19	1.22	1.14	1.14	1.13
Link Speed (mph)			30			30			30			30
Link Distance (ft)			665			205			225			206
Travel Time (s)			15.1			4.7			5.1			4.7
Volume (vph)	8	100	177	450	115	165	30	224	186	3	18	383
Confl. Peds. (#/hr)		44		88	88		44	16		43	43	
Peak Hour Factor	0.50	0.63	0.64	0.88	0.83	0.56	0.45	0.76	0.81	0.68	0.71	0.91
Heavy Vehicles (%)	0%	17%	31%	1%	0%	3%	0%	4%	6%	0%	18%	1%
Parking (#/hr)									0	0	0	0
Adj. Flow (vph)	16	159	277	511	139	295	67	295	230	4	25	421
Lane Group Flow (vph)	0	0	452	511	0	501	0	175	354	0	0	484
Turn Type	Perm	Split		Perm	Split			Split			Split	
Protected Phases		1	1		4	4		2	2		3	3
Permitted Phases	1			1								
Detector Phases	1	1	1	1	4	4		2	2		3	3
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0
Total Split (s)	26.0	26.0	26.0	26.0	19.0	19.0	0.0	29.0	29.0	0.0	26.0	26.0
Total Split (%)	26.0%	26.0%	26.0%	26.0%	19.0%	19.0%	0.0%	29.0%	29.0%	0.0%	26.0%	26.0%
Maximum Green (s)	20.0	20.0	20.0	20.0	13.0	13.0		23.0	23.0		20.0	20.0
Yellow Time (s)	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		3.0	3.0
Lead/Lag								Lead	Lead		Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max		None	None		None	None
Walk Time (s)	7.0	7.0	7.0	7.0							7.0	7.0
Flash Dont Walk (s)	1.0	1.0	1.0	1.0							1.0	1.0
Pedestrian Calls (#/hr)	0	0	0	0							0	0
Act Effct Green (s)			21.7	21.7		22.2		19.7	19.7			20.4
Actuated g/C Ratio			0.22	0.22		0.22		0.20	0.20			0.20
v/c Ratio			0.85	0.85		0.71		0.65	0.65			0.74
Control Delay			54.4	18.3		43.8		39.4	34.3			38.1

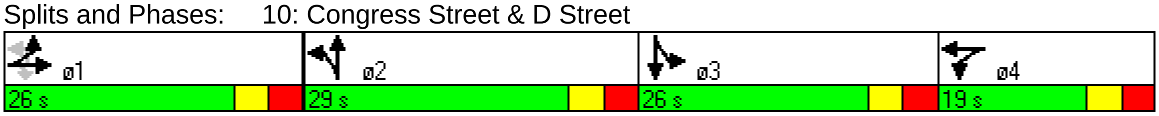
Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	28
Confl. Peds. (#/hr)	16
Peak Hour Factor	0.73
Heavy Vehicles (%)	0%
Parking (#/hr)	
Adj. Flow (vph)	38
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay			0.0	3.5		1.6		1.7	1.0			0.7
Total Delay			54.4	21.8		45.5		41.2	35.2			38.8
LOS			D	C		D		D	D			D
Approach Delay			37.1			45.5			37.2			38.8
Approach LOS			D			D			D			D
90th %ile Green (s)	20.0	20.0	20.0	20.0	13.0	13.0		23.0	23.0		20.0	20.0
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
70th %ile Green (s)	20.0	20.0	20.0	20.0	14.6	14.6		21.4	21.4		20.0	20.0
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Max	Max
50th %ile Green (s)	20.0	20.0	20.0	20.0	18.8	18.8		17.2	17.2		20.0	20.0
50th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Max	Max
30th %ile Green (s)	20.0	20.0	20.0	20.0	23.3	23.3		15.0	15.0		17.7	17.7
30th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Gap	Gap
10th %ile Green (s)	18.4	18.4	18.4	18.4	31.4	31.4		11.9	11.9		14.3	14.3
10th %ile Term Code	Gap	Gap	Gap	Gap	Coord	Coord		Gap	Gap		Gap	Gap
Stops (vph)			257	48		245		125	261			398
Fuel Used(gal)			6	4		5		2	4			6
CO Emissions (g/hr)			423	299		323		139	272			435
NOx Emissions (g/hr)			82	58		63		27	53			85
VOC Emissions (g/hr)			98	69		75		32	63			101
Dilemma Vehicles (#)			0	0		0		0	0			0
Queue Length 50th (ft)			152	0		154		112	113			149
Queue Length 95th (ft)			141	#202		128		162	150			222
Internal Link Dist (ft)			585			125			145			126
Turn Bay Length (ft)												
Base Capacity (vph)			537	603		704		344	689			703
Starvation Cap Reductn			0	0		0		68	141			0
Spillback Cap Reductn			0	42		83		0	0			51
Storage Cap Reductn			0	0		0		0	0			0
Reduced v/c Ratio			0.84	0.91		0.81		0.63	0.65			0.74

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 14 (14%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 39.1 Intersection LOS: D
Intersection Capacity Utilization 68.5% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: Congress Street & D Street



Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	13	12	12	16	16	12	16	12	11	13	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95	0.91	0.91	0.95
Ped Bike Factor	0.99	0.99				0.96	0.99	0.99		0.97	0.99	
Frt		0.975				0.850		0.985			0.967	
Flt Protected	0.950				0.993		0.950			0.950	0.988	
Satd. Flow (prot)	1540	2892	0	0	3497	1584	1518	3338	0	1415	2962	0
Flt Permitted	0.447				0.531		0.950			0.950	0.988	
Satd. Flow (perm)	714	2892	0	0	1870	1513	1505	3338	0	1378	2944	0
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)		29						11			31	
Headway Factor	1.19	1.17	1.14	1.14	0.97	0.97	1.14	1.04	1.14	1.19	1.10	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		523			1228			316			323	
Travel Time (s)		11.9			27.9			7.2			7.3	
Volume (vph)	279	459	89	43	241	282	42	268	25	295	227	78
Confl. Peds. (#/hr)	20		43	43		20	10		32	32		10
Peak Hour Factor	0.93	0.95	0.92	0.83	0.80	0.76	0.70	0.69	0.57	0.89	0.89	0.74
Heavy Vehicles (%)	2%	5%	13%	2%	5%	4%	7%	2%	8%	1%	4%	3%
Parking (#/hr)		0	0					0	0			
Adj. Flow (vph)	300	483	97	52	301	371	60	388	44	331	255	105
Lane Group Flow (vph)	300	580	0	0	353	371	60	432	0	219	472	0
Turn Type	D.P+P			Perm		pm+ov	Split			Split		
Protected Phases	4	1 4			1	2	3	3		2	2	
Permitted Phases	1			1		1						
Detector Phases	4	1 4		1	1	2	3	3		2	2	
Minimum Initial (s)	6.0			10.0	10.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	12.0			28.0	28.0	24.0	26.0	26.0		24.0	24.0	
Total Split (s)	17.0	47.0	0.0	30.0	30.0	26.0	27.0	27.0	0.0	26.0	26.0	0.0
Total Split (%)	17.0%	47.0%	0.0%	30.0%	30.0%	26.0%	27.0%	27.0%	0.0%	26.0%	26.0%	0.0%
Maximum Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
Yellow Time (s)	3.0			3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag						Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None			C-Max	C-Max	Ped	Ped	Ped		Ped	Ped	
Walk Time (s)				7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)				16.0	16.0	11.0	13.0	13.0		11.0	11.0	
Pedestrian Calls (#/hr)				0	0	0	0	0		0	0	
Act Effct Green (s)	41.5	45.5			28.5	49.6	21.4	21.4		21.1	21.1	
Actuated g/C Ratio	0.42	0.46			0.28	0.50	0.21	0.21		0.21	0.21	
v/c Ratio	0.74	0.44			0.66	0.48	0.18	0.60		0.73	0.73	
Control Delay	33.2	19.1			39.1	17.2	33.7	38.3		37.1	26.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.2		0.0	0.0	
Total Delay	33.2	19.1			39.1	17.2	33.7	38.5		37.1	26.7	
LOS	C	B			D	B	C	D		D	C	
Approach Delay		23.9			27.8			37.9			30.0	
Approach LOS		C			C			D			C	
90th %ile Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
90th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
70th %ile Green (s)	12.0			27.0	27.0	21.0	20.0	20.0		21.0	21.0	
70th %ile Term Code	Max			Coord	Coord	Max	Ped	Ped		Max	Max	
50th %ile Green (s)	12.0			27.0	27.0	21.0	20.0	20.0		21.0	21.0	
50th %ile Term Code	Max			Coord	Coord	Max	Ped	Ped		Max	Max	
30th %ile Green (s)	12.0			28.7	28.7	19.3	20.0	20.0		19.3	19.3	
30th %ile Term Code	Max			Coord	Coord	Gap	Ped	Ped		Gap	Gap	
10th %ile Green (s)	12.0			30.0	30.0	18.0	20.0	20.0		18.0	18.0	
10th %ile Term Code	Max			Coord	Coord	Ped	Ped	Ped		Ped	Ped	
Stops (vph)	195	343			245	171	34	250		152	294	
Fuel Used(gal)	4	6			6	5	1	4		3	5	
CO Emissions (g/hr)	287	437			443	324	41	307		196	338	
NOx Emissions (g/hr)	56	85			86	63	8	60		38	66	
VOC Emissions (g/hr)	66	101			103	75	9	71		45	78	
Dilemma Vehicles (#)	0	0			0	0	0	0		0	0	
Queue Length 50th (ft)	127	122			104	135	32	128		113	112	
Queue Length 95th (ft)	#240	175			138	170	50	127		m#254	m199	
Internal Link Dist (ft)		443			1148			236			243	
Turn Bay Length (ft)												
Base Capacity (vph)	404	1333			534	780	349	776		311	676	
Starvation Cap Reductn	0	0			0	0	0	0		0	2	
Spillback Cap Reductn	0	0			0	0	0	51		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.74	0.44			0.66	0.48	0.17	0.60		0.70	0.70	

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 60 (60%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 28.9 Intersection LOS: C

Intersection Capacity Utilization 83.3% 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: 11: Summer Street & D Street

No-Build Conditions (2019) Level of Service Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Signalized Intersections				
Summer Street/Drydock Avenue	**E**	**79.3**		
Summer EB left	F	>80.0	>1.00	#319
Summer EB thru | thru/right	A	7.0	0.33	139
Summer WB left	D	43.5	0.47	25
Summer WB thru | thru/right	F	>80.0	>1.00	#843
Pappas NB left/thru/right	E	57.8	0.76	#138
Drydock SB left/thru	E	66.4	0.79	#123
Drydock SB right	A	5.6	0.24	33
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**B**	**18.8**		
Seaport EB left/thru | thru/right	C	28.0	0.56	#301
Seaport WB left/thru | thru/right	A	4.2	0.51	m30
Fish Pier SB left/thru/right	D	51.4	0.71	97
Northern Avenue/D Street (northbound)	**C**	**23.8**		
Northern EB thru | thru	A	4.1	0.27	23
Northern WB thru | thru	C	20.7	0.32	167
D NB left	E	76.6	0.92	m#232
D NB right	B	10.9	0.43	m8
Congress Street/D Street	**E**	**63.6**		
Congress EB left/thru | thru/right	D	52.8	0.90	#302
Congress EB right	C	20.4	0.85	#231
Congress WB left/thru | thru/right	F	>80.0	>1.00	#109
D NB left	F	>80.0	0.89	#324
D NB left/thru | thru/right	E	62.7	0.87	164
D SB left/thru | thru/right	D	54.1	0.72	121
Summer Street/D Street	**E**	**65.6**		
Summer EB left	E	63.0	0.91	#224
Summer EB thru | thru/right	B	17.4	0.41	124
Summer WB left/thru | thru	F	>80.0	>1.00dl	#402
Summer WB right	C	29.4	0.82	#484
D NB left	D	42.8	0.57	119
D NB thru | thru/right	D	38.1	0.66	174
D SB left	D	49.8	0.76	206
D SB thru | thru/right	C	27.0	0.66	177
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	2.2	0.15	12
Drydock WB left/thru/right	A	0.8	0.01	1
Harbor NB left/thru	F	>50.0	0.22	19
Harbor NB right	B	11.5	0.05	4
Harbor SB left/thru/right	D	26.4	0.48	61

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	3.4	0.12	10
Drydock WB left/thru/right	A	0.5	0.01	0
Design Center NB left/thru/right	C	18.4	0.11	9
Garage SB left/thru/right	B	14.3	0.04	3
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	3.8	0.10	8
Drydock WB left/thru/right	A	0.0	0.00	0
Parking NB left/thru/right	C	15.2	0.09	8
Tide SB left/thru/right	D	27.3	0.66	115
Northern Avenue/Tide Street				
Northern EB left/thru/right	C	19.0	0.64	114
Alley WB left/thru/right	A	0.0	0.00	0
Tide NB left/thru/right	A	6.3	0.14	13
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.06	5
Northern WB thru/right	A	0.0	0.12	0
Seafood SB left/right	B	11.4	0.11	9
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.45	0
Northern WB left/thru	A	1.4	0.04	3
Harbor NB left/right	E	40.5	0.67	111
Unsignalized Roundabouts				
Northern Avenue/Haul Road				
Northern EB left/thru	B	13.0	0.62	73
Northern EB right	A	4.7	0.09	6
Northern WB left	A	6.3	0.09	6
Northern WB thru/right	A	8.1	0.33	25
Haul NB left/thru	A	8.9	0.14	12
Haul NB right	B	12.6	0.35	34
Parking SB left/thru/right	A	6.8	0.04	3

\# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m = 95th percentile queue is metered by upstream traffic signal.
* = defacto lane

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	12	13
Storage Length (ft)	0		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.972			0.972			0.993				0.850
Flt Protected	0.950			0.950				0.975			0.961	
Satd. Flow (prot)	1490	2673	0	1438	3077	0	0	1601	0	0	1356	1231
Flt Permitted	0.100			0.100				0.650			0.624	
Satd. Flow (perm)	157	2673	0	151	3077	0	0	1067	0	0	881	1231
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		44			33			2				128
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.01	1.14	1.14	1.14	1.10
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1228			692			321			611	
Travel Time (s)		27.9			15.7			7.3			13.9	
Volume (vph)	244	440	72	17	1203	300	58	46	6	70	16	106
Peak Hour Factor	0.80	0.91	0.64	0.50	0.83	0.90	0.74	0.69	0.75	0.66	0.67	0.83
Heavy Vehicles (%)	9%	17%	23%	13%	3%	1%	15%	14%	0%	23%	13%	22%
Adj. Flow (vph)	305	484	112	34	1449	333	78	67	8	106	24	128
Lane Group Flow (vph)	305	596	0	34	1782	0	0	153	0	0	130	128
Turn Type	D.P+P			Perm			Perm			Perm		custom
Protected Phases	4	1 4			1			3			3	4
Permitted Phases	1			1			3			3		3 4
Detector Phases	4	1 4		1	1		3	3		3	3	4
Minimum Initial (s)	8.0			8.0	8.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	12.0			20.0	20.0		20.0	20.0		20.0	20.0	12.0
Total Split (s)	15.0	59.0	0.0	44.0	44.0	0.0	20.0	20.0	0.0	20.0	20.0	15.0
Total Split (%)	15.0%	59.0%	0.0%	44.0%	44.0%	0.0%	20.0%	20.0%	0.0%	20.0%	20.0%	15.0%
Maximum Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
Yellow Time (s)	3.0			4.0	4.0		4.0	4.0		4.0	4.0	3.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lag			Lead	Lead		Lead	Lead		Lead	Lead	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	None			Min	Min		None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	51.5	55.5		40.4	40.4			15.5			15.5	30.7
Actuated g/C Ratio	0.62	0.67		0.49	0.49			0.19			0.19	0.37
v/c Ratio	1.10	0.33		0.47	1.17			0.76			0.79	0.24
Control Delay	108.3	7.0		43.5	107.3			57.8			66.4	5.6
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0

Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	3.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	12.0
Flash Dont Walk (s)	6.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	108.3	7.0		43.5	107.3			57.8			66.4	5.6
LOS	F	A		D	F			E			E	A
Approach Delay		41.3			106.2			57.8			36.2	
Approach LOS		D			F			E			D	
90th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
90th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
70th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
70th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
50th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
50th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
30th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
30th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
10th %ile Green (s)	11.0			39.0	39.0		12.1	12.1		12.1	12.1	11.0
10th %ile Term Code	Max			Max	Max		Gap	Gap		Gap	Gap	Max
Stops (vph)	130	189		12	1183			88			69	15
Fuel Used(gal)	8	7		0	47			2			2	1
CO Emissions (g/hr)	590	467		22	3318			144			137	50
NOx Emissions (g/hr)	115	91		4	646			28			27	10
VOC Emissions (g/hr)	137	108		5	769			33			32	11
Dilemma Vehicles (#)	0	0		0	0			0			0	0
Queue Length 50th (ft)	~125	45		10	~544			70			60	0
Queue Length 95th (ft)	#319	139		25	#843			#138			#123	33
Internal Link Dist (ft)		1148			612			241			531	
Turn Bay Length (ft)				150								
Base Capacity (vph)	277	1811		73	1521			209			171	538
Starvation Cap Reductn	0	0		0	0			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	1.10	0.33		0.47	1.17			0.73			0.76	0.24

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 82.6

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 79.3 Intersection LOS: E

Intersection Capacity Utilization 85.9% ICU Level of Service E

Analysis Period (min) 15

90th %ile Actuated Cycle: 100

70th %ile Actuated Cycle: 79

50th %ile Actuated Cycle: 79

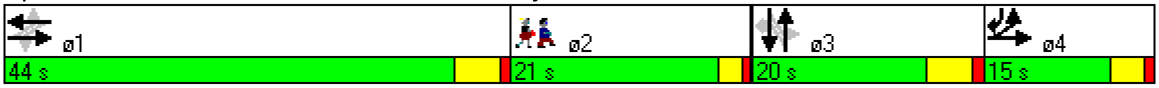
30th %ile Actuated Cycle: 79

10th %ile Actuated Cycle: 76.1

~ 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: Summer Street & Drydock Avenue



Lane Group	ø2
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	18.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	147	423	15	6	124	23	11	1	15	29	11	59
Peak Hour Factor	0.79	0.92	0.63	0.38	0.80	0.71	0.69	0.25	0.54	0.61	0.55	0.72
Hourly flow rate (vph)	186	460	24	16	155	32	16	4	28	48	20	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		611										
pX, platoon unblocked												
vC, conflicting volume	187			460			1139	1063	242	835	1035	171
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	187			460			1139	1063	242	835	1035	171
tC, single (s)	4.3			4.1			8.0	8.5	8.4	7.6	7.4	7.6
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.8	5.0	4.0	3.5	4.5	3.7
p0 queue free %	86			99			82	96	95	77	86	89
cM capacity (veh/h)	1328			1112			91	95	582	209	145	743

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	416	254	203	20	28	149
Volume Left	186	0	16	16	0	48
Volume Right	0	24	32	0	28	82
cSH	1328	1700	1112	91	582	315
Volume to Capacity	0.14	0.15	0.01	0.22	0.05	0.48
Queue Length 95th (ft)	12	0	1	19	4	61
Control Delay (s)	4.4	0.0	0.8	55.0	11.5	26.4
Lane LOS	A		A	F	B	D
Approach Delay (s)	2.7		0.8	29.7		26.4
Approach LOS				D		D

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	115	274	23	3	118	7	14	2	4	5	0	7
Peak Hour Factor	0.67	0.91	0.50	0.38	0.89	0.58	0.70	0.50	0.50	0.63	0.25	0.88
Hourly flow rate (vph)	172	301	46	8	133	12	20	4	8	8	0	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	145			347			830	828	324	832	845	139
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	145			347			830	828	324	832	845	139
tC, single (s)	4.1			4.1			7.2	6.5	6.7	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.8	3.5	4.0	3.3
p0 queue free %	88			99			92	99	99	97	100	99
cM capacity (veh/h)	1450			1223			255	270	619	257	264	915

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	519	153	32	16
Volume Left	172	8	20	8
Volume Right	46	12	8	8
cSH	1450	1223	301	401
Volume to Capacity	0.12	0.01	0.11	0.04
Queue Length 95th (ft)	10	0	9	3
Control Delay (s)	3.4	0.5	18.4	14.3
Lane LOS	A	A	C	B
Approach Delay (s)	3.4	0.5	18.4	14.3
Approach LOS			C	B

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	124	138	9	0	49	62	11	6	4	171	14	68
Peak Hour Factor	0.96	0.79	0.45	0.92	0.69	0.78	0.88	0.38	0.50	0.89	0.88	0.83
Hourly flow rate (vph)	129	175	20	0	71	79	12	16	8	192	16	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	151			195			644	594	185	570	564	111
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	151			195			644	594	185	570	564	111
tC, single (s)	4.4			4.1			7.1	6.7	6.5	7.2	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.2	3.5	3.6	4.0	3.5
p0 queue free %	90			100			96	96	99	48	96	91
cM capacity (veh/h)	1271			1390			316	358	802	368	393	889

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	324	151	36	290
Volume Left	129	0	12	192
Volume Right	20	79	8	82
cSH	1271	1390	387	442
Volume to Capacity	0.10	0.00	0.09	0.66
Queue Length 95th (ft)	8	0	8	115
Control Delay (s)	3.8	0.0	15.2	27.3
Lane LOS	A		C	D
Approach Delay (s)	3.8	0.0	15.2	27.3
Approach LOS			C	D

Intersection Summary			
Average Delay	12.1		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	107	1	246	0	0	0	143	54	4	0	16	46
Peak Hour Factor	0.78	0.25	0.84	0.92	0.92	0.92	0.76	0.83	0.50	0.92	0.60	0.69
Hourly flow rate (vph)	137	4	293	0	0	0	188	65	8	0	27	67
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	505	509	60	800	539	69	93			73		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	505	509	60	800	539	69	93			73		
tC, single (s)	7.1	6.5	6.3	7.1	6.5	6.2	4.5			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.6			2.2		
p0 queue free %	67	99	70	100	100	100	86			100		
cM capacity (veh/h)	421	402	975	187	384	994	1298			1527		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	434	0	261	93
Volume Left	137	0	188	0
Volume Right	293	0	8	67
cSH	683	1700	1298	1527
Volume to Capacity	0.64	0.00	0.14	0.00
Queue Length 95th (ft)	114	0	13	0
Control Delay (s)	19.0	0.0	6.3	0.0
Lane LOS	C	A	A	
Approach Delay (s)	19.0	0.0	6.3	0.0
Approach LOS	C	A		

Intersection Summary			
Average Delay	12.5		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	60	565	163	6	3	52
Peak Hour Factor	0.81	0.91	0.84	0.50	0.75	0.78
Hourly flow rate (vph)	74	621	194	12	4	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	206				969	200
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206				969	200
tC, single (s)	4.5				6.7	6.8
tC, 2 stage (s)						
tF (s)	2.5				3.8	3.9
p0 queue free %	94				98	91
cM capacity (veh/h)	1187				232	710

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	695	206	71
Volume Left	74	0	4
Volume Right	0	12	67
cSH	1187	1700	636
Volume to Capacity	0.06	0.12	0.11
Queue Length 95th (ft)	5	0	9
Control Delay (s)	1.6	0.0	11.4
Lane LOS	A		B
Approach Delay (s)	1.6	0.0	11.4
Approach LOS			B

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	593	72	19	200	113	38
Peak Hour Factor	0.90	0.72	0.79	0.84	0.82	0.75
Hourly flow rate (vph)	659	100	24	238	138	51
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			759		995	709
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			759		995	709
tC, single (s)			4.6		6.5	6.4
tC, 2 stage (s)						
tF (s)			2.7		3.6	3.5
p0 queue free %			96		45	87
cM capacity (veh/h)			663		253	402

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	759	262	188
Volume Left	0	24	138
Volume Right	100	0	51
cSH	1700	663	281
Volume to Capacity	0.45	0.04	0.67
Queue Length 95th (ft)	0	3	111
Control Delay (s)	0.0	1.4	40.5
Lane LOS		A	E
Approach Delay (s)	0.0	1.4	40.5
Approach LOS			E

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: No Build_AM

Northern Avenue at Trilling Road
Roundabout

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
Movement Performance - Vehicles											
South: Trilling Road											
3	L	68	16.5	0.143	8.9	LOS A	0.4	11.8	0.55	0.88	25.2
8	T	4	0.0	0.143	8.9	LOS A	0.4	11.8	0.55	0.76	27.1
18	R	178	16.0	0.350	12.6	LOS B	1.2	33.8	0.61	0.87	25.0
Approach		251	15.8	0.350	11.5	LOS B	1.2	33.8	0.59	0.87	25.1
East: Northern Avenue											
1	L	62	52.0	0.092	6.3	LOS A	0.2	5.7	0.18	0.69	26.4
6	T	264	25.0	0.327	8.1	LOS A	0.8	24.6	0.21	0.55	27.9
16	R	7	33.0	0.327	8.1	LOS A	0.8	24.6	0.21	0.71	27.3
Approach		333	30.2	0.327	7.8	LOS A	0.8	24.6	0.21	0.58	27.6
North East: Parking Lot											
1X	L	13	33.3	0.042	6.8	LOS A	0.1	2.5	0.36	0.82	26.5
16X	R	11	40.0	0.042	6.8	LOS A	0.1	2.5	0.36	0.62	28.6
Approach		24	36.4	0.042	6.8	LOS A	0.1	2.5	0.36	0.73	27.4
West: Northern Avenue											
5	L	30	35.4	0.616	13.0	LOS B	2.7	72.8	0.31	0.85	23.5
2	T	542	11.0	0.616	13.0	LOS B	2.7	72.8	0.31	0.57	25.4
12	R	83	12.0	0.089	4.7	LOS A	0.2	6.0	0.18	0.60	29.3
Approach		655	12.3	0.616	11.9	LOS B	2.7	72.8	0.29	0.58	25.7
All Vehicles		1263	18.2	0.616	10.7	LOS B	2.7	72.8	0.33	0.64	26.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	11	15	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.961			0.985						0.944	
Flt Protected		0.997			0.995						0.981	
Satd. Flow (prot)	0	2809	0	0	2811	0	0	0	0	0	1266	0
Flt Permitted		0.837			0.706						0.981	
Satd. Flow (perm)	0	2358	0	0	1995	0	0	0	0	0	1266	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)					17						31	
Headway Factor	1.14	1.22	1.14	1.01	1.19	1.01	1.14	1.14	1.14	1.14	1.14	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		450			148			271			263	
Travel Time (s)		10.2			3.4			6.2			6.0	
Volume (vph)	34	397	151	72	555	65	0	0	0	40	19	31
Peak Hour Factor	0.84	0.80	0.79	0.86	0.92	0.88	0.92	0.92	0.92	0.75	0.75	0.55
Heavy Vehicles (%)	15%	5%	4%	10%	8%	21%	2%	2%	2%	28%	37%	17%
Parking (#/hr)		0	0									
Adj. Flow (vph)	40	496	191	84	603	74	0	0	0	53	25	56
Lane Group Flow (vph)	0	727	0	0	761	0	0	0	0	0	134	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					20.0	20.0	
Total Split (s)	35.0	35.0	0.0	24.0	35.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	24.0%	35.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%
Maximum Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	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	C-Max					None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		47.3			66.8						12.8	
Actuated g/C Ratio		0.47			0.67						0.13	
v/c Ratio		0.65			0.51						0.71	
Control Delay		28.0			3.8						51.4	
Queue Delay		0.0			0.4						0.0	
Total Delay		28.0			4.2						51.4	

Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	16.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			A						D	
Approach Delay		28.0			4.2						51.4	
Approach LOS		C			A						D	
90th %ile Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
90th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
70th %ile Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
70th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
50th %ile Green (s)	53.6	53.6		19.0	53.6					12.4	12.4	
50th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
30th %ile Green (s)	56.5	56.5		19.0	56.5					9.5	9.5	
30th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
10th %ile Green (s)	61.2	61.2		16.5	61.2					7.3	7.3	
10th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
Stops (vph)		388			135						66	
Fuel Used(gal)		7			2						1	
CO Emissions (g/hr)		524			145						103	
NOx Emissions (g/hr)		102			28						20	
VOC Emissions (g/hr)		121			34						24	
Dilemma Vehicles (#)		0			0						0	
Queue Length 50th (ft)		151			11						63	
Queue Length 95th (ft)		#301			m30						97	
Internal Link Dist (ft)		370			68			191			183	
Turn Bay Length (ft)												
Base Capacity (vph)		1114			1497						229	
Starvation Cap Reductn		0			306						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.65			0.64						0.59	

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 95

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 18.8 Intersection LOS: B

Intersection Capacity Utilization 56.0% ICU Level of Service B

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: 9: Seaport Boulevard & Fish Pier

Lane Group	ø2
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	16.0
90th %ile Term Code	Ped
70th %ile Green (s)	16.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	16	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00		
Frt						0.850		
Flt Protected					0.950			
Satd. Flow (prot)	3094	0	0	2855	1450	1172		
Flt Permitted					0.950			
Satd. Flow (perm)	3094	0	0	2855	1450	1172		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						152		
Headway Factor	1.14	0.97	1.14	1.19	1.14	1.14		
Link Speed (mph)	30			30	30			
Link Distance (ft)	148			788	266			
Travel Time (s)	3.4			17.9	6.0			
Volume (vph)	424	0	0	403	216	91		
Peak Hour Factor	0.80	0.92	0.92	0.92	0.83	0.60		
Heavy Vehicles (%)	5%	2%	2%	10%	12%	24%		
Adj. Flow (vph)	530	0	0	438	260	152		
Lane Group Flow (vph)	530	0	0	438	260	152		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	20.0
Total Split (s)	55.0	0.0	0.0	35.0	24.0	24.0	21.0	20.0
Total Split (%)	55.0%	0.0%	0.0%	35.0%	24.0%	24.0%	21%	20%
Maximum Green (s)				30.0	19.0	19.0	16.0	15.0
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?								
Vehicle Extension (s)				2.0	2.0	2.0	2.0	2.0
Recall Mode				C-Max	None	None	None	None
Walk Time (s)							7.0	
Flash Dont Walk (s)							9.0	
Pedestrian Calls (#/hr)							20	
Act Effct Green (s)	64.1			47.3	19.5	19.5		
Actuated g/C Ratio	0.64			0.47	0.20	0.20		
v/c Ratio	0.27			0.32	0.92	0.43		
Control Delay	3.2			20.7	76.6	10.9		
Queue Delay	0.9			0.0	0.0	0.0		
Total Delay	4.1			20.7	76.6	10.9		
LOS	A			C	E	B		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Approach Delay	4.1			20.7	52.4			
Approach LOS	A			C	D			
90th %ile Green (s)				30.0	19.0	19.0	16.0	15.0
90th %ile Term Code				Coord	Max	Max	Ped	Max
70th %ile Green (s)				30.0	19.0	19.0	16.0	15.0
70th %ile Term Code				Coord	Max	Max	Ped	Max
50th %ile Green (s)				53.6	19.0	19.0	0.0	12.4
50th %ile Term Code				Coord	Max	Max	Skip	Gap
30th %ile Green (s)				56.5	19.0	19.0	0.0	9.5
30th %ile Term Code				Coord	Max	Max	Skip	Gap
10th %ile Green (s)				61.2	16.5	16.5	0.0	7.3
10th %ile Term Code				Coord	Gap	Gap	Skip	Gap
Stops (vph)	31			258	191	36		
Fuel Used(gal)	1			6	5	1		
CO Emissions (g/hr)	65			392	341	41		
NOx Emissions (g/hr)	13			76	66	8		
VOC Emissions (g/hr)	15			91	79	10		
Dilemma Vehicles (#)	0			0	0	0		
Queue Length 50th (ft)	6			74	166	7		
Queue Length 95th (ft)	23			167	m#232	m8		
Internal Link Dist (ft)	68			708	186			
Turn Bay Length (ft)								
Base Capacity (vph)	1975			1349	290	356		
Starvation Cap Reductn	1124			0	0	0		
Spillback Cap Reductn	0			48	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.62			0.34	0.90	0.43		

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 95

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 23.8 Intersection LOS: C

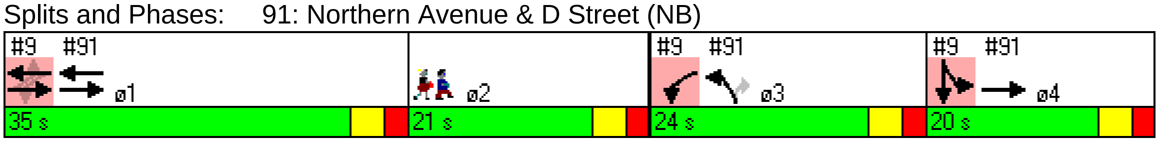
Intersection Capacity Utilization 33.0% ICU Level of Service A

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: 91: Northern Avenue & D Street (NB)



Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	12	13	12	11	12	12	12	14
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50		50	50		50	50
Trailing Detector (ft)	0	0	0	0	0	0		0	0		0	0
Turning Speed (mph)	9	15		9	15		9	15		9	15	
Lane Util. Factor	0.95	0.95	0.91	0.91	0.95	0.95	0.95	0.91	0.91	0.95	0.95	0.95
Ped Bike Factor			0.90	0.58		0.88		0.97	0.98			0.98
Frt			0.986	0.850		0.948			0.968			0.986
Flt Protected			0.983			0.991		0.950	0.985			0.991
Satd. Flow (prot)	0	0	2490	1277	0	2645	0	1276	2463	0	0	2631
Flt Permitted			0.983			0.991		0.950	0.985			0.991
Satd. Flow (perm)	0	0	2333	737	0	2561	0	1242	2442	0	0	2584
Right Turn on Red				Yes			Yes			Yes		
Satd. Flow (RTOR)			10	445		77			32			9
Headway Factor	1.14	1.14	1.14	1.10	1.14	1.10	1.14	1.19	1.22	1.14	1.14	1.13
Link Speed (mph)			30			30			30			30
Link Distance (ft)			665			205			225			206
Travel Time (s)			15.1			4.7			5.1			4.7
Volume (vph)	6	152	303	477	78	129	79	412	183	53	36	182
Confl. Peds. (#/hr)		58		239	239		58	11		60	60	
Peak Hour Factor	0.25	0.83	0.89	0.95	0.91	0.55	0.47	0.84	0.64	0.41	0.63	0.82
Heavy Vehicles (%)	0%	35%	9%	7%	5%	12%	6%	12%	16%	6%	8%	25%
Parking (#/hr)									0	0	0	0
Adj. Flow (vph)	24	183	340	502	86	235	168	490	286	129	57	222
Lane Group Flow (vph)	0	0	604	445	0	489	0	304	601	0	0	308
Turn Type	Perm	Split		Perm	Split			Split			Split	
Protected Phases		1	1		4	4		2	2		3	3
Permitted Phases	1			1								
Detector Phases	1	1	1	1	4	4		2	2		3	3
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0
Total Split (s)	31.0	31.0	31.0	31.0	16.0	16.0	0.0	32.0	32.0	0.0	21.0	21.0
Total Split (%)	31.0%	31.0%	31.0%	31.0%	16.0%	16.0%	0.0%	32.0%	32.0%	0.0%	21.0%	21.0%
Maximum Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
Yellow Time (s)	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		3.0	3.0
Lead/Lag								Lead	Lead		Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max		None	None		None	None
Walk Time (s)	7.0	7.0	7.0	7.0							7.0	7.0
Flash Dont Walk (s)	1.0	1.0	1.0	1.0							1.0	1.0
Pedestrian Calls (#/hr)	0	0	0	0							0	0
Act Effct Green (s)			26.7	26.7		14.4		26.9	26.9			16.0
Actuated g/C Ratio			0.27	0.27		0.14		0.27	0.27			0.16
v/c Ratio			0.90	0.85		1.10		0.89	0.87			0.72
Control Delay			52.8	20.4		107.7		57.2	42.4			54.1

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	23
Confl. Peds. (#/hr)	11
Peak Hour Factor	0.79
Heavy Vehicles (%)	23%
Parking (#/hr)	
Adj. Flow (vph)	29
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay			0.0	0.0		0.0		31.2	20.3			0.0
Total Delay			52.8	20.4		107.7		88.4	62.7			54.1
LOS			D	C		F		F	E			D
Approach Delay			39.1			107.7			71.4			54.1
Approach LOS			D			F			E			D
90th %ile Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
70th %ile Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
50th %ile Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
50th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
30th %ile Green (s)	25.0	25.0	25.0	25.0	11.1	11.1		26.0	26.0		13.9	13.9
30th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Gap	Gap
10th %ile Green (s)	23.4	23.4	23.4	23.4	20.7	20.7		20.6	20.6		11.3	11.3
10th %ile Term Code	Gap	Gap	Gap	Gap	Coord	Coord		Gap	Gap		Gap	Gap
Stops (vph)			456	52		178		221	328			199
Fuel Used(gal)			11	4		8		5	6			4
CO Emissions (g/hr)			750	296		539		324	412			289
NOx Emissions (g/hr)			146	58		105		63	80			56
VOC Emissions (g/hr)			174	69		125		75	95			67
Dilemma Vehicles (#)			0	0		0		0	0			0
Queue Length 50th (ft)			200	0		~184		196	185			87
Queue Length 95th (ft)			#302	#231		#109		#324	164			121
Internal Link Dist (ft)			585			125			145			126
Turn Bay Length (ft)												
Base Capacity (vph)			680	524		446		357	713			455
Starvation Cap Reductn			0	0		0		64	121			0
Spillback Cap Reductn			0	0		0		0	0			0
Storage Cap Reductn			0	0		0		0	0			0
Reduced v/c Ratio			0.89	0.85		1.10		1.04	1.02			0.68

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.10
Intersection Signal Delay: 63.6 Intersection LOS: E
Intersection Capacity Utilization 70.7% 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: 10: Congress Street & D Street

Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	13	12	12	12	16	16	12	16	12	11	13
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50	50	50	50	50		50	50
Trailing Detector (ft)	0	0		0	0	0	0	0	0		0	0
Turning Speed (mph)	15		9	9	15		9	15		9	15	
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	0.99	0.97					0.94	0.99	0.98		0.96	0.99
Frt		0.955					0.850		0.967			0.943
Flt Protected	0.950					0.986		0.950			0.950	
Satd. Flow (prot)	1540	2707	0	0	0	3262	1525	1477	2944	0	1454	2901
Flt Permitted	0.161					0.571		0.950			0.950	
Satd. Flow (perm)	259	2707	0	0	0	1889	1440	1464	2944	0	1401	2901
Right Turn on Red			Yes				No			Yes		
Satd. Flow (RTOR)		81							34			124
Headway Factor	1.19	1.17	1.14	1.14	1.14	0.97	0.97	1.14	1.04	1.14	1.19	1.10
Link Speed (mph)		30				30			30			30
Link Distance (ft)		523				1228			316			323
Travel Time (s)		11.9				27.9			7.2			7.3
Volume (vph)	194	293	139	30	85	430	580	120	305	84	192	270
Confl. Peds. (#/hr)	27		63		63		27	10		45	45	
Peak Hour Factor	0.87	0.82	0.92	0.30	0.78	0.84	0.94	0.65	0.89	0.86	0.78	0.90
Heavy Vehicles (%)	2%	10%	8%	0%	23%	11%	8%	10%	12%	16%	8%	11%
Parking (#/hr)		0	0						0	0		
Adj. Flow (vph)	223	357	151	100	109	512	617	185	343	98	246	300
Lane Group Flow (vph)	223	508	0	0	0	721	617	185	441	0	246	485
Turn Type	D.P+P			Perm	Perm		pm+ov	Split			Split	
Protected Phases	4	1 4				1	2	3	3		2	2
Permitted Phases	1			1	1		1					
Detector Phases	4	1 4		1	1	1	2	3	3		2	2
Minimum Initial (s)	6.0			10.0	10.0	10.0	6.0	6.0	6.0		6.0	6.0
Minimum Split (s)	12.0			28.0	28.0	28.0	24.0	26.0	26.0		24.0	24.0
Total Split (s)	15.0	46.0	0.0	31.0	31.0	31.0	27.0	27.0	27.0	0.0	27.0	27.0
Total Split (%)	15.0%	46.0%	0.0%	31.0%	31.0%	31.0%	27.0%	27.0%	27.0%	0.0%	27.0%	27.0%
Maximum Green (s)	10.0			26.0	26.0	26.0	22.0	22.0	22.0		22.0	22.0
Yellow Time (s)	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	2.0			2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0
Lead/Lag							Lead	Lag	Lag		Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Recall Mode	None			C-Max	C-Max	C-Max	Ped	Ped	Ped		Ped	Ped
Walk Time (s)				7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)				16.0	16.0	16.0	11.0	13.0	13.0		11.0	11.0
Pedestrian Calls (#/hr)				0	0	0	0	0	0		0	0
Act Effct Green (s)	40.1	44.1				29.1	51.2	21.8	21.8		22.1	22.1
Actuated g/C Ratio	0.40	0.44				0.29	0.51	0.22	0.22		0.22	0.22
v/c Ratio	0.91	0.41				2.82dl	0.82	0.57	0.66		0.76	0.66
Control Delay	63.0	17.4				185.5	29.4	42.8	38.1		49.3	26.9

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	163
Confl. Peds. (#/hr)	10
Peak Hour Factor	0.88
Heavy Vehicles (%)	3%
Parking (#/hr)	
Adj. Flow (vph)	185
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay	0.0	0.0				0.0	0.0	0.0	0.0		0.4	0.1
Total Delay	63.0	17.4				185.5	29.4	42.8	38.1		49.8	27.0
LOS	E	B				F	C	D	D		D	C
Approach Delay		31.3				113.5			39.5			34.7
Approach LOS		C				F			D			C
90th %ile Green (s)	10.0			26.0	26.0	26.0	22.0	22.0	22.0		22.0	22.0
90th %ile Term Code	Max			Coord	Coord	Coord	Max	Max	Max		Max	Max
70th %ile Green (s)	10.0			26.0	26.0	26.0	22.0	22.0	22.0		22.0	22.0
70th %ile Term Code	Max			Coord	Coord	Coord	Max	Max	Max		Max	Max
50th %ile Green (s)	10.0			28.0	28.0	28.0	22.0	20.0	20.0		22.0	22.0
50th %ile Term Code	Max			Coord	Coord	Coord	Max	Ped	Ped		Max	Max
30th %ile Green (s)	10.0			28.3	28.3	28.3	21.7	20.0	20.0		21.7	21.7
30th %ile Term Code	Max			Coord	Coord	Coord	Gap	Ped	Ped		Gap	Gap
10th %ile Green (s)	10.0			32.0	32.0	32.0	18.0	20.0	20.0		18.0	18.0
10th %ile Term Code	Max			Coord	Coord	Coord	Ped	Ped	Ped		Ped	Ped
Stops (vph)	115	242				414	471	106	322		169	297
Fuel Used(gal)	4	5				28	12	2	6		3	5
CO Emissions (g/hr)	274	323				1964	813	135	403		234	357
NOx Emissions (g/hr)	53	63				382	158	26	78		46	69
VOC Emissions (g/hr)	63	75				455	188	31	93		54	83
Dilemma Vehicles (#)	0	0				0	0	0	0		0	0
Queue Length 50th (ft)	91	93				~313	274	107	126		144	110
Queue Length 95th (ft)	#224	124				#402	#484	119	174		206	177
Internal Link Dist (ft)		443				1148			236			243
Turn Bay Length (ft)												
Base Capacity (vph)	245	1238				549	769	340	703		334	763
Starvation Cap Reductn	0	0				0	0	0	0		7	15
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	0.91	0.41				1.31	0.80	0.54	0.63		0.75	0.65

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 7 (7%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 65.6 Intersection LOS: E

Intersection Capacity Utilization 88.2% ICU Level of Service E

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.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 11: Summer Street & D Street

Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

No Build Conditions (2019) Level of Service Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Signalized Intersections				
Summer Street/Drydock Avenue	**D**	**38.0**		
Summer EB left	B	12.1	0.31	50
Summer EB thru | thru/right	B	16.8	0.75	436
Summer WB left	D	37.4	0.37	26
Summer WB thru | thru/right	C	22.2	0.66	231
Pappas NB left/thru/right	F	>80.0	0.85	#86
Drydock SB left/thru	F	>80.0	>1.00	#386
Drydock SB right	A	4.1	0.43	23
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**B**	**18.8**		
Seaport EB left/thru | thru/right	C	25.4	0.67	#319
Seaport WB left/thru | thru/right	B	11.7	0.72	m89
Fish Pier SB left/thru/right	C	32.1	0.61	59
Northern Avenue/D Street (northbound)	**D**	**39.1**		
Northern EB thru | thru	A	4.0	0.20	19
Northern WB thru | thru	B	19.6	0.47	241
D NB left	F	>80.0	>1.00	m#259
D NB right	B	15.2	0.27	m17
Congress Street/D Street	**F**	**>80.0**		
Congress EB left/thru | thru/right	F	>80.0	>1.00	176
Congress EB right	F	>80.0	>1.00	#367
Congress WB left/thru | thru/right	F	>80.0	>1.00	155
D NB left	E	72.8	0.75	212
D NB left/thru | thru/right	E	56.9	0.75	194
D SB left/thru | thru/right	F	>80.0	0.93	#334
Summer Street/D Street	**D**	**44.4**		
Summer EB left	E	71.1	0.99	#300
Summer EB thru | thru/right	C	21.9	0.54	216
Summer WB left/thru | thru	E	65.4	0.94	#204
Summer WB right	B	19.6	0.56	198
D NB left	D	36.5	0.38	95
D NB thru | thru/right	D	45.8	0.80	181
D SB left	E	64.6	0.92	m#373
D SB thru | thru/right	D	47.0	0.92	m#317
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	3.5	0.13	11
Drydock WB left/thru/right	A	0.1	0.01	0
Harbor NB left/thru	F	>50.0	0.41	39
Harbor NB right	A	9.8	0.02	1
Harbor SB left/thru/right	E	42.4	0.74	138

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	0.6	0.01	1
Drydock WB left/thru/right	A	0.5	0.02	1
Design Center NB left/thru/right	E	41.3	0.62	92
Garage SB left/thru/right	B	14.6	0.36	40
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	5.1	0.08	6
Drydock WB left/thru/right	A	0.3	0.01	1
Parking NB left/thru/right	C	18.7	0.18	16
Tide SB left/thru/right	C	16.7	0.45	58
Northern Avenue/Tide Street				
Northern EB left/thru/right	D	31.6	0.75	160
Alley WB left/thru/right	C	18.2	0.07	5
Tide NB left/thru/right	A	7.4	0.16	15
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.3	0.03	2
Northern WB thru/right	A	0.0	0.34	0
Seafood SB left/right	C	15.4	0.20	19
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.19	0
Northern WB left/thru	A	0.7	0.03	2
Harbor NB left/right	C	22.1	0.34	37
Unsignalized Roundabouts				
Northern Avenue/Haul Road				
Northern EB left/thru	A	8.7	0.37	29
Northern EB right	A	4.9	0.08	6
Northern WB left	A	6.8	0.24	18
Northern WB thru/right	B	10.7	0.54	58
Haul NB left/thru	A	5.6	0.09	8
Haul NB right	A	8.0	0.09	7
Parking SB left/thru/right	A	7.1	0.05	3

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m = 95th percentile queue is metered by upstream traffic signal.
* = defacto lane

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	12	13
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.985			0.974			0.972				0.850
Flt Protected	0.950			0.950				0.967			0.959	
Satd. Flow (prot)	1377	3068	0	1624	2953	0	0	1633	0	0	1601	1444
Flt Permitted	0.252			0.108				0.160			0.728	
Satd. Flow (perm)	365	3068	0	185	2953	0	0	270	0	0	1215	1444
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			28			12				421
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.01	1.14	1.14	1.14	1.10
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1228			692			321			611	
Travel Time (s)		27.9			15.7			7.3			13.9	
Volume (vph)	72	1043	96	16	499	89	39	5	12	298	43	320
Peak Hour Factor	0.77	0.92	0.76	0.65	0.85	0.72	0.75	0.63	0.75	0.79	0.64	0.76
Heavy Vehicles (%)	18%	4%	7%	0%	7%	8%	9%	20%	0%	2%	5%	4%
Adj. Flow (vph)	94	1134	126	25	587	124	52	8	16	377	67	421
Lane Group Flow (vph)	94	1260	0	25	711	0	0	76	0	0	444	421
Turn Type	D.P+P			Perm			Perm			Perm		custom
Protected Phases	4	1 4			1			3			3	4
Permitted Phases	1			1			3			3		3 4
Detector Phases	4	1 4		1	1		3	3		3	3	4
Minimum Initial (s)	8.0			8.0	8.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	12.0			20.0	20.0		20.0	20.0		20.0	20.0	12.0
Total Split (s)	13.0	54.0	0.0	41.0	41.0	0.0	25.0	25.0	0.0	25.0	25.0	13.0
Total Split (%)	13.0%	54.0%	0.0%	41.0%	41.0%	0.0%	25.0%	25.0%	0.0%	25.0%	25.0%	13.0%
Maximum Green (s)	9.0			36.0	36.0		20.0	20.0		20.0	20.0	9.0
Yellow Time (s)	3.0			4.0	4.0		4.0	4.0		4.0	4.0	3.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lag			Lead	Lead		Lead	Lead		Lead	Lead	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	None			Min	Min		None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	35.7	39.8		26.3	26.3			21.8			21.8	35.3
Actuated g/C Ratio	0.49	0.55		0.36	0.36			0.30			0.30	0.48
v/c Ratio	0.31	0.75		0.37	0.66			0.85			1.22	0.46
Control Delay	12.1	16.8		37.4	22.2			93.9			151.6	4.1
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	12.1	16.8		37.4	22.2			93.9			151.6	4.1
LOS	B	B		D	C			F			F	A

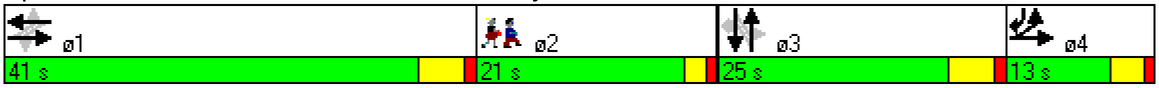
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	3.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	12.0
Flash Dont Walk (s)	6.0
Pedestrian Calls (#/hr)	7
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		16.5			22.7			93.9			79.8	
Approach LOS		B			C			F			E	
90th %ile Green (s)	9.0			36.0	36.0		20.0	20.0		20.0	20.0	9.0
90th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
70th %ile Green (s)	9.0			32.3	32.3		20.0	20.0		20.0	20.0	9.0
70th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
50th %ile Green (s)	9.0			26.5	26.5		20.0	20.0		20.0	20.0	9.0
50th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
30th %ile Green (s)	9.0			20.1	20.1		20.0	20.0		20.0	20.0	9.0
30th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
10th %ile Green (s)	9.0			13.9	13.9		20.0	20.0		20.0	20.0	9.0
10th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
Stops (vph)	32	791		13	433			32			242	29
Fuel Used(gal)	1	19		0	8			1			13	2
CO Emissions (g/hr)	73	1340		20	575			97			943	136
NOx Emissions (g/hr)	14	261		4	112			19			183	27
VOC Emissions (g/hr)	17	311		5	133			22			218	32
Dilemma Vehicles (#)	0	0		0	0			0			0	0
Queue Length 50th (ft)	16	177		7	117			26			~237	0
Queue Length 95th (ft)	50	436		26	231			#86			#386	23
Internal Link Dist (ft)		1148			612			241			531	
Turn Bay Length (ft)												
Base Capacity (vph)	308	1867		83	1340			89			363	915
Starvation Cap Reductn	0	0		0	0			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	0.31	0.67		0.30	0.53			0.85			1.22	0.46

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 73
Natural Cycle: 130
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 38.0 Intersection LOS: D
Intersection Capacity Utilization 78.0% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 75.3
50th %ile Actuated Cycle: 69.5
30th %ile Actuated Cycle: 63.1
10th %ile Actuated Cycle: 56.9
~ 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: Summer Street & Drydock Avenue



Lane Group	ø2
Approach Delay	
Approach LOS	
90th %ile Green (s)	18.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	59	91	10	6	501	32	15	1	10	9	3	150
Peak Hour Factor	0.58	0.84	0.50	0.75	0.74	0.69	0.75	0.25	0.69	0.44	0.25	0.74
Hourly flow rate (vph)	102	108	20	8	677	46	20	4	14	20	12	203
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		611										
pX, platoon unblocked												
vC, conflicting volume	723			108			1247	1061	64	990	1028	700
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	723			108			1247	1061	64	990	1028	700
tC, single (s)	4.3			4.1			7.6	6.5	8.7	8.3	6.6	6.9
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.0	4.2	3.9	4.0	3.3
p0 queue free %	87			99			61	98	98	85	94	48
cM capacity (veh/h)	812			1495			51	196	762	133	200	386

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	156	74	731	24	14	235
Volume Left	102	0	8	20	0	20
Volume Right	0	20	46	0	14	203
cSH	812	1700	1495	58	762	319
Volume to Capacity	0.13	0.04	0.01	0.41	0.02	0.74
Queue Length 95th (ft)	11	0	0	39	1	138
Control Delay (s)	7.0	0.0	0.1	105.0	9.8	42.4
Lane LOS	A		A	F	A	E
Approach Delay (s)	4.8		0.1	69.2		42.4
Approach LOS				F		E

Intersection Summary			
Average Delay	11.2		
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	3	80	8	13	308	4	70	0	23	4	1	129
Peak Hour Factor	0.38	0.79	1.00	0.65	0.69	0.50	0.60	0.50	0.69	0.33	0.25	0.67
Hourly flow rate (vph)	8	101	8	20	446	8	117	0	33	12	4	193
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	454			109			806	615	105	645	615	450
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	454			109			806	615	105	645	615	450
tC, single (s)	4.1			4.7			7.1	6.5	6.8	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.8	3.5	4.0	3.3
p0 queue free %	99			98			42	100	96	97	99	68
cM capacity (veh/h)	1117			1179			202	399	814	365	399	611

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	117	474	150	209
Volume Left	8	20	117	12
Volume Right	8	8	33	193
cSH	1117	1179	242	582
Volume to Capacity	0.01	0.02	0.62	0.36
Queue Length 95th (ft)	1	1	92	40
Control Delay (s)	0.6	0.5	41.3	14.6
Lane LOS	A	A	E	B
Approach Delay (s)	0.6	0.5	41.3	14.6
Approach LOS			E	B

Intersection Summary			
Average Delay	10.1		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	57	45	1	3	159	127	10	12	5	51	1	138
Peak Hour Factor	0.77	0.72	0.25	0.25	0.75	0.74	0.50	0.43	0.63	0.82	0.25	0.75
Hourly flow rate (vph)	74	62	4	12	212	172	20	28	8	62	4	184
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	384			66			720	620	64	556	536	298
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	384			66			720	620	64	556	536	298
tC, single (s)	4.6			4.1			7.3	6.5	6.4	7.5	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.6			2.2			3.7	4.0	3.5	3.8	4.0	3.5
p0 queue free %	92			99			91	93	99	82	99	74
cM capacity (veh/h)	967			1548			216	372	951	344	416	705

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	141	396	56	250
Volume Left	74	12	20	62
Volume Right	4	172	8	184
cSH	967	1548	318	554
Volume to Capacity	0.08	0.01	0.18	0.45
Queue Length 95th (ft)	6	1	16	58
Control Delay (s)	5.1	0.3	18.7	16.7
Lane LOS	A	A	C	C
Approach Delay (s)	5.1	0.3	18.7	16.7
Approach LOS			C	C

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	53	0	152	1	4	0	178	19	0	0	41	119
Peak Hour Factor	0.31	0.25	0.78	0.25	0.25	0.92	0.85	0.58	0.50	0.92	0.55	0.93
Hourly flow rate (vph)	171	0	195	4	16	0	209	33	0	0	75	128
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	598	590	139	785	654	33	203			33		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	598	590	139	785	654	33	203			33		
tC, single (s)	7.3	6.5	6.5	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.6	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	48	100	77	98	95	100	84			100		
cM capacity (veh/h)	328	354	845	210	325	1047	1285			1592		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	366	20	242	203
Volume Left	171	4	209	0
Volume Right	195	0	0	128
cSH	486	293	1285	1592
Volume to Capacity	0.75	0.07	0.16	0.00
Queue Length 95th (ft)	160	5	15	0
Control Delay (s)	31.6	18.2	7.4	0.0
Lane LOS	D	C	A	
Approach Delay (s)	31.6	18.2	7.4	0.0
Approach LOS	D	C		

Intersection Summary			
Average Delay	16.5		
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	154	508	0	5	62
Peak Hour Factor	0.80	0.88	0.87	0.50	0.63	0.78
Hourly flow rate (vph)	20	175	584	0	8	79
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	584				799	584
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	584				799	584
tC, single (s)	4.7				7.2	6.5
tC, 2 stage (s)						
tF (s)	2.7				4.2	3.6
p0 queue free %	97				97	83
cM capacity (veh/h)	772				259	464

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	195	584	87
Volume Left	20	0	8
Volume Right	0	0	79
cSH	772	1700	433
Volume to Capacity	0.03	0.34	0.20
Queue Length 95th (ft)	2	0	19
Control Delay (s)	1.3	0.0	15.4
Lane LOS	A		C
Approach Delay (s)	1.3	0.0	15.4
Approach LOS			C

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	40.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	160	111	19	549	77	9
Peak Hour Factor	0.89	0.78	0.59	0.94	0.84	0.56
Hourly flow rate (vph)	180	142	32	584	92	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			322		899	251
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			322		899	251
tC, single (s)			4.2		6.5	6.8
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.8
p0 queue free %			97		68	98
cM capacity (veh/h)			1189		290	673

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	322	616	108
Volume Left	0	32	92
Volume Right	142	0	16
cSH	1700	1189	317
Volume to Capacity	0.19	0.03	0.34
Queue Length 95th (ft)	0	2	37
Control Delay (s)	0.0	0.7	22.1
Lane LOS		A	C
Approach Delay (s)	0.0	0.7	22.1
Approach LOS			C

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: No Build_PM

Northern Avenue at Trilling Road
Roundabout

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
Movement Performance - Vehicles											
South: Trilling Road											
3	L	66	3.9	0.089	5.6	LOS A	0.3	7.7	0.41	0.76	26.8
8	T	2	0.0	0.089	5.6	LOS A	0.3	7.7	0.41	0.60	29.1
18	R	49	52.0	0.093	8.0	LOS A	0.2	7.4	0.40	0.69	27.4
Approach		117	23.9	0.093	6.6	LOS A	0.3	7.7	0.41	0.73	27.1
East: Northern Avenue											
1	L	207	21.0	0.244	6.8	LOS A	0.6	18.4	0.22	0.71	26.2
6	T	510	7.0	0.537	10.7	LOS B	2.2	58.2	0.31	0.58	26.5
16	R	7	17.0	0.537	10.7	LOS B	2.2	58.2	0.31	0.71	26.0
Approach		723	11.1	0.537	9.6	LOS A	2.2	58.2	0.28	0.62	26.4
North East: Parking Lot											
1X	L	16	6.5	0.046	7.1	LOS A	0.1	2.8	0.48	0.88	26.5
16X	R	9	13.0	0.046	7.1	LOS A	0.1	2.8	0.48	0.73	28.3
Approach		25	8.8	0.046	7.1	LOS A	0.1	2.8	0.48	0.83	27.1
West: Northern Avenue											
5	L	49	25.6	0.366	8.7	LOS A	1.1	29.4	0.34	0.90	25.2
2	T	253	11.0	0.366	8.7	LOS A	1.1	29.4	0.34	0.63	27.5
12	R	72	6.0	0.082	4.9	LOS A	0.2	5.6	0.28	0.64	29.2
Approach		374	12.0	0.366	8.0	LOS A	1.1	29.4	0.33	0.67	27.5
All Vehicles		1239	12.5	0.537	8.8	LOS A	2.2	58.2	0.31	0.65	26.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	11	15	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.932			0.992						0.915	
Flt Protected		0.998			0.992						0.993	
Satd. Flow (prot)	0	2734	0	0	2834	0	0	0	0	0	1262	0
Flt Permitted		0.808			0.569						0.993	
Satd. Flow (perm)	0	2213	0	0	1626	0	0	0	0	0	1262	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)					9						73	
Headway Factor	1.14	1.22	1.14	1.01	1.19	1.01	1.14	1.14	1.14	1.14	1.14	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		450			148			271			263	
Travel Time (s)		10.2			3.4			6.2			6.0	
Volume (vph)	31	310	278	134	689	47	0	0	0	12	21	42
Peak Hour Factor	0.84	0.80	0.79	0.86	0.92	0.88	0.92	0.92	0.92	0.75	0.75	0.55
Heavy Vehicles (%)	15%	5%	4%	10%	8%	21%	2%	2%	2%	28%	37%	17%
Parking (#/hr)		0	0									
Adj. Flow (vph)	37	388	352	156	749	53	0	0	0	16	28	76
Lane Group Flow (vph)	0	777	0	0	958	0	0	0	0	0	120	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					19.0	19.0	
Total Split (s)	39.0	39.0	0.0	21.0	39.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0
Total Split (%)	39.0%	39.0%	0.0%	21.0%	39.0%	0.0%	0.0%	0.0%	0.0%	19.0%	19.0%	0.0%
Maximum Green (s)	34.0	34.0		16.0	34.0					14.0	14.0	
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	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	C-Max					None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		52.2			69.2						10.4	
Actuated g/C Ratio		0.52			0.69						0.10	
v/c Ratio		0.67			0.72						0.61	
Control Delay		25.4			10.6						32.1	
Queue Delay		0.0			1.1						0.0	
Total Delay		25.4			11.7						32.1	

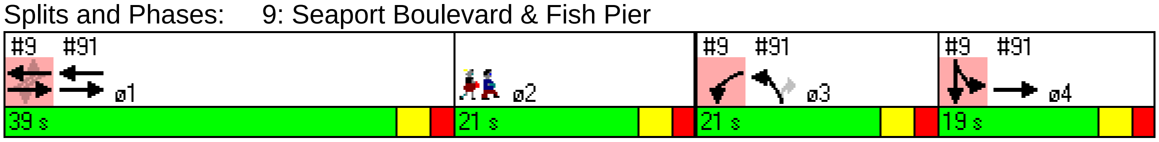
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	16.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			B						C	
Approach Delay		25.4			11.7						32.1	
Approach LOS		C			B						C	
90th %ile Green (s)	34.0	34.0		16.0	34.0					14.0	14.0	
90th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
70th %ile Green (s)	37.0	37.0		16.0	37.0					11.0	11.0	
70th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
50th %ile Green (s)	60.9	60.9		16.0	60.9					8.1	8.1	
50th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
30th %ile Green (s)	61.7	61.7		16.0	61.7					7.3	7.3	
30th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
10th %ile Green (s)	62.4	62.4		16.0	62.4					6.6	6.6	
10th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
Stops (vph)		410			232						33	
Fuel Used(gal)		8			4						1	
CO Emissions (g/hr)		534			291						58	
NOx Emissions (g/hr)		104			57						11	
VOC Emissions (g/hr)		124			68						13	
Dilemma Vehicles (#)		0			0						0	
Queue Length 50th (ft)		140			44						29	
Queue Length 95th (ft)		#319			m89						59	
Internal Link Dist (ft)		370			68			191			183	
Turn Bay Length (ft)												
Base Capacity (vph)		1155			1333						251	
Starvation Cap Reductn		0			171						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.67			0.82						0.48	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 18.8 Intersection LOS: B
Intersection Capacity Utilization 62.4% ICU Level of Service B
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: 9: Seaport Boulevard & Fish Pier



Lane Group	ø2
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	16.0
90th %ile Term Code	Ped
70th %ile Green (s)	16.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	16	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00		
Frt						0.850		
Flt Protected					0.950			
Satd. Flow (prot)	3154	0	0	2991	1593	1346		
Flt Permitted					0.950			
Satd. Flow (perm)	3154	0	0	2991	1593	1346		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						78		
Headway Factor	1.14	0.97	1.14	1.19	1.14	1.14		
Link Speed (mph)	30			30	30			
Link Distance (ft)	148			788	266			
Travel Time (s)	3.4			17.9	6.0			
Volume (vph)	332	0	0	597	216	51		
Peak Hour Factor	0.80	0.92	0.92	0.82	0.71	0.65		
Heavy Vehicles (%)	3%	2%	2%	5%	2%	8%		
Adj. Flow (vph)	415	0	0	728	304	78		
Lane Group Flow (vph)	415	0	0	728	304	78		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	19.0
Total Split (s)	58.0	0.0	0.0	39.0	21.0	21.0	21.0	19.0
Total Split (%)	58.0%	0.0%	0.0%	39.0%	21.0%	21.0%	21%	19%
Maximum Green (s)				34.0	16.0	16.0	16.0	14.0
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?								
Vehicle Extension (s)				2.0	2.0	2.0	2.0	2.0
Recall Mode				C-Max	None	None	None	None
Walk Time (s)							7.0	
Flash Dont Walk (s)							9.0	
Pedestrian Calls (#/hr)							20	
Act Effct Green (s)	66.6			52.2	17.0	17.0		
Actuated g/C Ratio	0.67			0.52	0.17	0.17		
v/c Ratio	0.20			0.47	1.12	0.27		
Control Delay	2.9			19.4	131.6	15.2		
Queue Delay	1.2			0.2	8.4	0.0		
Total Delay	4.0			19.6	140.0	15.2		
LOS	A			B	F	B		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Approach Delay	4.0			19.6	114.5			
Approach LOS	A			B	F			
90th %ile Green (s)				34.0	16.0	16.0	16.0	14.0
90th %ile Term Code				Coord	Max	Max	Ped	Max
70th %ile Green (s)				37.0	16.0	16.0	16.0	11.0
70th %ile Term Code				Coord	Max	Max	Ped	Gap
50th %ile Green (s)				60.9	16.0	16.0	0.0	8.1
50th %ile Term Code				Coord	Max	Max	Skip	Gap
30th %ile Green (s)				61.7	16.0	16.0	0.0	7.3
30th %ile Term Code				Coord	Max	Max	Skip	Gap
10th %ile Green (s)				62.4	16.0	16.0	0.0	6.6
10th %ile Term Code				Coord	Max	Max	Skip	Gap
Stops (vph)	25			383	178	26		
Fuel Used(gal)	1			8	7	0		
CO Emissions (g/hr)	50			570	505	28		
NOx Emissions (g/hr)	10			111	98	6		
VOC Emissions (g/hr)	12			132	117	7		
Dilemma Vehicles (#)	0			0	0	0		
Queue Length 50th (ft)	6			113	~230	8		
Queue Length 95th (ft)	19			241	m#259	m17		
Internal Link Dist (ft)	68			708	186			
Turn Bay Length (ft)								
Base Capacity (vph)	2095			1561	271	294		
Starvation Cap Reductn	1414			0	0	0		
Spillback Cap Reductn	0			206	5	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.61			0.54	1.14	0.27		

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 39.1 Intersection LOS: D

Intersection Capacity Utilization 38.3% ICU Level of Service A

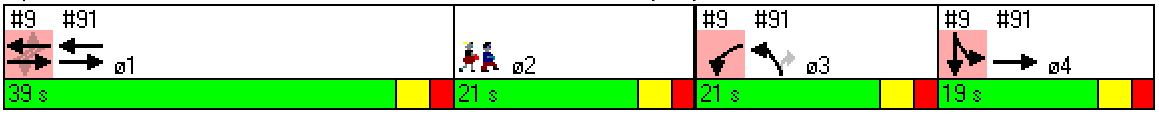
Analysis Period (min) 15

~ 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: 91: Northern Avenue & D Street (NB)



Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	12	13	12	11	12	12	12	14
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50		50	50		50	50
Trailing Detector (ft)	0	0	0	0	0	0		0	0		0	0
Turning Speed (mph)	9	15		9	15		9	15		9	15	
Lane Util. Factor	0.95	0.95	0.91	0.91	0.95	0.95	0.95	0.91	0.91	0.95	0.95	0.95
Ped Bike Factor			0.95	0.69		0.94		0.98	0.99			0.99
Frt				0.850		0.977			0.988			0.989
Flt Protected			0.981			0.986		0.950	0.988			0.996
Satd. Flow (prot)	0	0	2440	1353	0	3101	0	1374	2734	0	0	3157
Flt Permitted			0.981			0.986		0.950	0.988			0.996
Satd. Flow (perm)	0	0	2329	931	0	2982	0	1341	2718	0	0	3138
Right Turn on Red				Yes			Yes			Yes		
Satd. Flow (RTOR)				518		17			8			8
Headway Factor	1.14	1.14	1.14	1.10	1.14	1.10	1.14	1.19	1.22	1.14	1.14	1.13
Link Speed (mph)			30			30			30			30
Link Distance (ft)			665			205			225			206
Travel Time (s)			15.1			4.7			5.1			4.7
Volume (vph)	8	126	221	546	138	195	41	261	260	25	34	505
Confl. Peds. (#/hr)		44		88	88		44	16		43	43	
Peak Hour Factor	0.50	0.63	0.64	0.88	0.83	0.56	0.45	0.76	0.81	0.68	0.71	0.91
Heavy Vehicles (%)	0%	17%	31%	1%	0%	3%	0%	4%	6%	0%	18%	1%
Parking (#/hr)									0	0	0	0
Adj. Flow (vph)	16	200	345	620	166	348	91	343	321	37	48	555
Lane Group Flow (vph)	0	0	561	620	0	605	0	233	468	0	0	652
Turn Type	Perm	Split		Perm	Split			Split			Split	
Protected Phases		1	1		4	4		2	2		3	3
Permitted Phases	1			1								
Detector Phases	1	1	1	1	4	4		2	2		3	3
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0
Total Split (s)	26.0	26.0	26.0	26.0	19.0	19.0	0.0	29.0	29.0	0.0	26.0	26.0
Total Split (%)	26.0%	26.0%	26.0%	26.0%	19.0%	19.0%	0.0%	29.0%	29.0%	0.0%	26.0%	26.0%
Maximum Green (s)	20.0	20.0	20.0	20.0	13.0	13.0		23.0	23.0		20.0	20.0
Yellow Time (s)	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		3.0	3.0
Lead/Lag								Lead	Lead		Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max		None	None		None	None
Walk Time (s)	7.0	7.0	7.0	7.0							7.0	7.0
Flash Dont Walk (s)	1.0	1.0	1.0	1.0							1.0	1.0
Pedestrian Calls (#/hr)	0	0	0	0							0	0
Act Effct Green (s)			22.0	22.0		17.4		22.6	22.6			22.0
Actuated g/C Ratio			0.22	0.22		0.17		0.23	0.23			0.22
v/c Ratio			1.04	1.02		1.09		0.75	0.75			0.93
Control Delay			90.1	50.5		104.7		45.9	37.8			51.4

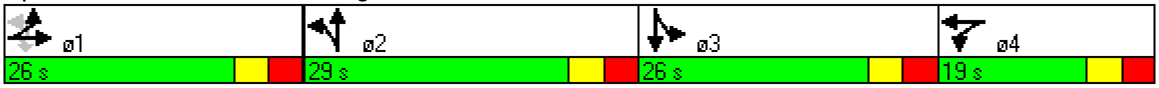
Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	36
Confl. Peds. (#/hr)	16
Peak Hour Factor	0.73
Heavy Vehicles (%)	0%
Parking (#/hr)	
Adj. Flow (vph)	49
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay			0.0	66.9		186.2		26.9	19.1			35.8
Total Delay			90.1	117.4		290.9		72.8	56.9			87.2
LOS			F	F		F		E	E			F
Approach Delay			104.5			290.9			62.2			87.2
Approach LOS			F			F			E			F
90th %ile Green (s)	20.0	20.0	20.0	20.0	13.0	13.0		23.0	23.0		20.0	20.0
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
70th %ile Green (s)	20.0	20.0	20.0	20.0	13.0	13.0		23.0	23.0		20.0	20.0
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
50th %ile Green (s)	20.0	20.0	20.0	20.0	13.2	13.2		22.8	22.8		20.0	20.0
50th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Max	Max
30th %ile Green (s)	20.0	20.0	20.0	20.0	17.1	17.1		18.9	18.9		20.0	20.0
30th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Max	Max
10th %ile Green (s)	20.0	20.0	20.0	20.0	20.9	20.9		15.1	15.1		20.0	20.0
10th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Max	Max
Stops (vph)			305	96		280		168	346			518
Fuel Used(gal)			10	9		10		3	5			10
CO Emissions (g/hr)			702	627		707		202	377			685
NOx Emissions (g/hr)			137	122		138		39	73			133
VOC Emissions (g/hr)			163	145		164		47	87			159
Dilemma Vehicles (#)			0	0		0		0	0			0
Queue Length 50th (ft)			~214	~123		~250		158	157			215
Queue Length 95th (ft)			176	#367		155		212	194			#334
Internal Link Dist (ft)			585			125			145			126
Turn Bay Length (ft)												
Base Capacity (vph)			537	609		555		344	690			701
Starvation Cap Reductn			0	0		0		109	218			0
Spillback Cap Reductn			0	88		156		0	0			95
Storage Cap Reductn			0	0		0		0	0			0
Reduced v/c Ratio			1.04	1.19		1.52		0.99	0.99			1.08

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 14 (14%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 127.4 Intersection LOS: F
Intersection Capacity Utilization 77.1% ICU Level of Service D
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: 10: Congress Street & D Street



Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	13	12	12	16	16	12	16	12	11	13	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95	0.91	0.91	0.95
Ped Bike Factor	0.99	0.99				0.96	0.99	0.99		0.98	0.99	
Frt		0.974				0.850		0.982			0.964	
Flt Protected	0.950				0.993		0.950			0.950	0.992	
Satd. Flow (prot)	1540	2886	0	0	3495	1584	1518	3321	0	1415	2957	0
Flt Permitted	0.355				0.516		0.950			0.950	0.992	
Satd. Flow (perm)	569	2886	0	0	1816	1513	1508	3321	0	1386	2948	0
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)		31						14			36	
Headway Factor	1.19	1.17	1.14	1.14	0.97	0.97	1.14	1.04	1.14	1.19	1.10	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		523			1228			316			323	
Travel Time (s)		11.9			27.9			7.2			7.3	
Volume (vph)	322	540	110	49	313	321	92	371	41	340	338	111
Confl. Peds. (#/hr)	20		43	43		20	10		32	32		10
Peak Hour Factor	0.93	0.95	0.92	0.83	0.80	0.76	0.70	0.69	0.57	0.89	0.89	0.74
Heavy Vehicles (%)	2%	5%	13%	2%	5%	4%	7%	2%	8%	1%	4%	3%
Parking (#/hr)		0	0					0	0			
Adj. Flow (vph)	346	568	120	59	391	422	131	538	72	382	380	150
Lane Group Flow (vph)	346	688	0	0	450	422	131	610	0	287	625	0
Turn Type	D.P+P			Perm		pm+ov	Split			Split		
Protected Phases	4	1 4			1	2	3	3		2	2	
Permitted Phases	1			1		1						
Detector Phases	4	1 4		1	1	2	3	3		2	2	
Minimum Initial (s)	6.0			10.0	10.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	12.0			28.0	28.0	24.0	26.0	26.0		24.0	24.0	
Total Split (s)	17.0	47.0	0.0	30.0	30.0	26.0	27.0	27.0	0.0	26.0	26.0	0.0
Total Split (%)	17.0%	47.0%	0.0%	30.0%	30.0%	26.0%	27.0%	27.0%	0.0%	26.0%	26.0%	0.0%
Maximum Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
Yellow Time (s)	3.0			3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag						Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None			C-Max	C-Max	Ped	Ped	Ped		Ped	Ped	
Walk Time (s)				7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)				16.0	16.0	11.0	13.0	13.0		11.0	11.0	
Pedestrian Calls (#/hr)				0	0	0	0	0		0	0	
Act Effct Green (s)	39.5	43.5			26.5	48.5	22.5	22.5		22.0	22.0	
Actuated g/C Ratio	0.40	0.44			0.26	0.48	0.22	0.22		0.22	0.22	
v/c Ratio	0.99	0.54			0.94	0.56	0.38	0.80		0.92	0.92	
Control Delay	71.1	21.9			65.4	19.6	36.5	45.0		64.6	46.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.8		0.0	0.2	
Total Delay	71.1	21.9			65.4	19.6	36.5	45.8		64.6	47.0	
LOS	E	C			E	B	D	D		E	D	
Approach Delay		38.4			43.3			44.1			52.5	
Approach LOS		D			D			D			D	
90th %ile Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
90th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
70th %ile Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
70th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
50th %ile Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
50th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
30th %ile Green (s)	12.0			25.4	25.4	21.0	21.6	21.6		21.0	21.0	
30th %ile Term Code	Max			Coord	Coord	Max	Gap	Gap		Max	Max	
10th %ile Green (s)	12.0			27.0	27.0	21.0	20.0	20.0		21.0	21.0	
10th %ile Term Code	Max			Coord	Coord	Max	Ped	Ped		Max	Max	
Stops (vph)	219	446			313	215	77	369		206	422	
Fuel Used(gal)	7	8			10	6	1	7		5	9	
CO Emissions (g/hr)	502	560			700	388	93	477		359	612	
NOx Emissions (g/hr)	98	109			136	75	18	93		70	119	
VOC Emissions (g/hr)	116	130			162	90	22	111		83	142	
Dilemma Vehicles (#)	0	0			0	0	0	0		0	0	
Queue Length 50th (ft)	158	160			148	168	71	189		191	196	
Queue Length 95th (ft)	#300	216			#204	198	95	181		m#373	m#317	
Internal Link Dist (ft)		443			1148			236			243	
Turn Bay Length (ft)												
Base Capacity (vph)	351	1273			481	749	349	775		311	679	
Starvation Cap Reductn	0	0			0	0	0	0		0	2	
Spillback Cap Reductn	0	0			0	0	0	35		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.99	0.54			0.94	0.56	0.38	0.82		0.92	0.92	

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 60 (60%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 44.4 Intersection LOS: D

Intersection Capacity Utilization 87.3% 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: 11: Summer Street & D Street

Build Conditions (2019) Level of Service Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Signalized Intersections				
Summer Street/Drydock Avenue	**F**	**>80.0**		
Summer EB left	F	>80.0	>1.00	#461
Summer EB thru | thru/right	A	7.1	0.33	139
Summer WB left	D	43.9	0.47	25
Summer WB thru | thru/right	F	>80.0	>1.00	#853
Pappas NB left/thru/right	E	58.8	0.77	#142
Drydock SB left/thru	E	69.6	0.81	#133
Drydock SB right	A	5.4	0.28	35
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**C**	**20.2**		
Seaport EB left/thru | thru/right	C	29.6	0.70	#335
Seaport WB left/thru | thru/right	A	5.8	0.56	m51
Fish Pier SB left/thru/right	D	51.1	0.70	97
Northern Avenue/D Street (northbound)	**C**	**23.1**		
Northern EB thru | thru	A	4.3	0.29	25
Northern WB thru | thru	C	21.0	0.34	178
D NB left	E	78.8	0.92	m#234
D NB right	B	10.5	0.54	m6
Congress Street/D Street	**E**	**66.0**		
Congress EB left/thru | thru/right	E	56.8	0.93	#323
Congress EB right	C	24.2	0.90	#271
Congress WB left/thru | thru/right	F	>80.0	>1.00	#109
D NB left	F	>80.0	0.89	#324
D NB left/thru | thru/right	E	62.8	0.87	164
D SB left/thru | thru/right	D	54.6	0.74	126
Summer Street/D Street	**E**	**73.4**		
Summer EB left	E	68.5	0.93	#228
Summer EB thru | thru/right	B	18.2	0.43	130
Summer WB left/thru | thru	F	>80.0	>1.00dl	#410
Summer WB right	C	31.3	0.84	#538
D NB left	D	42.7	0.57	119
D NB thru | thru/right	D	38.2	0.69	180
D SB left	E	75.2	0.94	#291
D SB thru | thru/right	C	26.5	0.64	176
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	2.1	0.18	13
Drydock WB left/thru/right	A	0.7	0.02	1
Harbor NB left/thru	F	>50.0	0.29	27
Harbor NB right	B	12.2	0.05	4
Harbor SB left/thru/right	D	34.5	0.56	79

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	4.6	0.19	18
Drydock WB left/thru/right	A	0.4	0.01	0
Design Center NB left/thru/right	D	26.9	0.20	19
Garage SB left/thru/right	B	13.3	0.09	7
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	3.7	0.11	9
Drydock WB left/thru/right	A	0.0	0.00	0
Parking NB left/thru/right	C	16.2	0.10	8
Tide SB left/thru/right	E	37.7	0.78	165
Northern Avenue/Tide Street				
Northern EB left/thru/right	C	21.0	0.69	136
Alley WB left/thru/right	A	0.0	0.00	0
Tide NB left/thru/right	A	6.4	0.15	14
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.06	5
Northern WB thru/right	A	0.0	0.14	0
Seafood SB left/right	B	12.0	0.12	10
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.51	0
Northern WB left/thru	A	1.4	0.04	3
Harbor NB left/right	F	>50.0	0.82	154
Unsignalized Roundabouts				
Northern Avenue/Haul Road				
Northern EB left/thru	C	16.4	0.71	100
Northern EB right	A	5.1	0.13	9
Northern WB left	A	6.6	0.11	7
Northern WB thru/right	A	8.8	0.36	28
Haul NB left/thru	B	10.8	0.21	17
Haul NB right	C	15.7	0.43	45
Parking SB left/thru/right	A	7.2	0.04	3

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m = 95th percentile queue is metered by upstream traffic signal.
* = defacto lane

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	12	13
Storage Length (ft)	0		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.972			0.971			0.993				0.850
Flt Protected	0.950			0.950				0.975			0.960	
Satd. Flow (prot)	1490	2673	0	1438	3074	0	0	1601	0	0	1354	1231
Flt Permitted	0.100			0.100				0.625			0.621	
Satd. Flow (perm)	157	2673	0	151	3074	0	0	1026	0	0	876	1231
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		44			35			2				159
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.01	1.14	1.14	1.14	1.10
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1228			692			321			611	
Travel Time (s)		27.9			15.7			7.3			13.9	
Volume (vph)	326	440	72	17	1203	314	58	46	6	75	16	132
Peak Hour Factor	0.80	0.91	0.64	0.50	0.83	0.90	0.74	0.69	0.75	0.66	0.67	0.83
Heavy Vehicles (%)	9%	17%	23%	13%	3%	1%	15%	14%	0%	23%	13%	22%
Adj. Flow (vph)	408	484	112	34	1449	349	78	67	8	114	24	159
Lane Group Flow (vph)	408	596	0	34	1798	0	0	153	0	0	138	159
Turn Type	D.P+P			Perm			Perm			Perm		custom
Protected Phases	4	1 4			1			3			3	4
Permitted Phases	1			1			3			3		3 4
Detector Phases	4	1 4		1	1		3	3		3	3	4
Minimum Initial (s)	8.0			8.0	8.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	12.0			20.0	20.0		20.0	20.0		20.0	20.0	12.0
Total Split (s)	15.0	59.0	0.0	44.0	44.0	0.0	20.0	20.0	0.0	20.0	20.0	15.0
Total Split (%)	15.0%	59.0%	0.0%	44.0%	44.0%	0.0%	20.0%	20.0%	0.0%	20.0%	20.0%	15.0%
Maximum Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
Yellow Time (s)	3.0			4.0	4.0		4.0	4.0		4.0	4.0	3.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lag			Lead	Lead		Lead	Lead		Lead	Lead	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	None			Min	Min		None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	51.5	55.5		40.4	40.4			16.1			16.1	31.3
Actuated g/C Ratio	0.62	0.67		0.49	0.49			0.19			0.19	0.38
v/c Ratio	1.48	0.33		0.47	1.19			0.77			0.81	0.28
Control Delay	259.1	7.1		43.9	115.8			58.8			69.6	5.4
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0

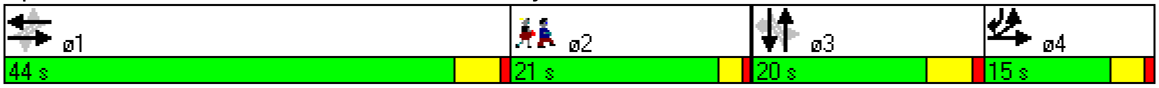
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	3.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	12.0
Flash Dont Walk (s)	6.0
Pedestrian Calls (#/hr)	13
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	259.1	7.1		43.9	115.8			58.8			69.6	5.4
LOS	F	A		D	F			E			E	A
Approach Delay		109.5			114.5			58.8			35.2	
Approach LOS		F			F			E			D	
90th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
90th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
70th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
70th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
50th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
50th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
30th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
30th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
10th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
10th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
Stops (vph)	182	191		12	1205			88			73	17
Fuel Used(gal)	21	7		0	51			2			2	1
CO Emissions (g/hr)	1491	468		22	3538			145			149	61
NOx Emissions (g/hr)	290	91		4	688			28			29	12
VOC Emissions (g/hr)	345	108		5	820			34			34	14
Dilemma Vehicles (#)	0	0		0	0			0			0	0
Queue Length 50th (ft)	~235	45		10	~553			70			65	0
Queue Length 95th (ft)	#461	139		25	#853			#142			#133	35
Internal Link Dist (ft)		1148			612			241			531	
Turn Bay Length (ft)				150								
Base Capacity (vph)	275	1797		73	1509			200			170	562
Starvation Cap Reductn	0	0		0	0			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	1.48	0.33		0.47	1.19			0.77			0.81	0.28

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 83.2
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.48
Intersection Signal Delay: 103.2 Intersection LOS: F
Intersection Capacity Utilization 91.5% ICU Level of Service F
Analysis Period (min) 15
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 79
50th %ile Actuated Cycle: 79
30th %ile Actuated Cycle: 79
10th %ile Actuated Cycle: 79
~ 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: Summer Street & Drydock Avenue



Lane Group	ø2
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	18.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	147	519	15	6	155	23	11	1	15	29	11	59
Peak Hour Factor	0.79	0.92	0.63	0.38	0.80	0.71	0.69	0.25	0.54	0.61	0.55	0.72
Hourly flow rate (vph)	186	564	24	16	194	32	16	4	28	48	20	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		611										
pX, platoon unblocked												
vC, conflicting volume	226			564			1282	1206	294	926	1178	210
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	226			564			1282	1206	294	926	1178	210
tC, single (s)	4.3			4.1			8.0	8.5	8.4	7.6	7.4	7.6
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.8	5.0	4.0	3.5	4.5	3.7
p0 queue free %	85			98			76	94	95	73	83	88
cM capacity (veh/h)	1283			1018			67	72	530	176	115	698

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	468	306	242	20	28	149
Volume Left	186	0	16	16	0	48
Volume Right	0	24	32	0	28	82
cSH	1283	1700	1018	68	530	266
Volume to Capacity	0.15	0.18	0.02	0.29	0.05	0.56
Queue Length 95th (ft)	13	0	1	27	4	79
Control Delay (s)	4.2	0.0	0.7	78.7	12.2	34.5
Lane LOS	A		A	F	B	D
Approach Delay (s)	2.5		0.7	40.0		34.5
Approach LOS				E		D

Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	183	293	23	3	134	7	17	2	7	5	0	29
Peak Hour Factor	0.67	0.91	0.50	0.38	0.89	0.58	0.70	0.50	0.50	0.63	0.25	0.88
Hourly flow rate (vph)	273	322	46	8	151	12	24	4	14	8	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	163			368			1097	1070	345	1080	1087	157
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	163			368			1097	1070	345	1080	1087	157
tC, single (s)	4.1			4.1			7.2	6.5	6.7	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.8	3.5	4.0	3.3
p0 queue free %	81			99			84	98	98	95	100	96
cM capacity (veh/h)	1428			1202			152	179	601	161	175	894

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	641	171	42	41
Volume Left	273	8	24	8
Volume Right	46	12	14	33
cSH	1428	1202	206	475
Volume to Capacity	0.19	0.01	0.20	0.09
Queue Length 95th (ft)	18	0	19	7
Control Delay (s)	4.6	0.4	26.9	13.3
Lane LOS	A	A	D	B
Approach Delay (s)	4.6	0.4	26.9	13.3
Approach LOS			D	B

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	127	157	9	0	55	68	11	6	4	190	14	78
Peak Hour Factor	0.96	0.79	0.45	0.92	0.69	0.78	0.88	0.38	0.50	0.89	0.88	0.83
Hourly flow rate (vph)	132	199	20	0	80	87	12	16	8	213	16	94
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	167			219			699	640	209	613	607	123
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	167			219			699	640	209	613	607	123
tC, single (s)	4.4			4.1			7.1	6.7	6.5	7.2	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.2	3.5	3.6	4.0	3.5
p0 queue free %	89			100			96	95	99	38	96	89
cM capacity (veh/h)	1253			1363			284	335	777	342	370	874

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	351	167	36	323
Volume Left	132	0	12	213
Volume Right	20	87	8	94
cSH	1253	1363	357	417
Volume to Capacity	0.11	0.00	0.10	0.78
Queue Length 95th (ft)	9	0	8	165
Control Delay (s)	3.7	0.0	16.2	37.7
Lane LOS	A		C	E
Approach Delay (s)	3.7	0.0	16.2	37.7
Approach LOS			C	E

Intersection Summary			
Average Delay	16.0		
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	107	1	275	0	0	0	152	54	4	0	16	46
Peak Hour Factor	0.78	0.25	0.84	0.92	0.92	0.92	0.76	0.83	0.50	0.92	0.60	0.69
Hourly flow rate (vph)	137	4	327	0	0	0	200	65	8	0	27	67
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	529	533	60	858	562	69	93			73		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	529	533	60	858	562	69	93			73		
tC, single (s)	7.1	6.5	6.3	7.1	6.5	6.2	4.5			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.6			2.2		
p0 queue free %	66	99	66	100	100	100	85			100		
cM capacity (veh/h)	403	385	975	161	369	994	1298			1527		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	469	0	273	93
Volume Left	137	0	200	0
Volume Right	327	0	8	67
cSH	683	1700	1298	1527
Volume to Capacity	0.69	0.00	0.15	0.00
Queue Length 95th (ft)	136	0	14	0
Control Delay (s)	21.0	0.0	6.4	0.0
Lane LOS	C	A	A	
Approach Delay (s)	21.0	0.0	6.4	0.0
Approach LOS	C	A		

Intersection Summary			
Average Delay	13.9		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	60	662	194	6	3	52
Peak Hour Factor	0.81	0.91	0.84	0.50	0.75	0.78
Hourly flow rate (vph)	74	727	231	12	4	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	243				1113	237
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	243				1113	237
tC, single (s)	4.5				6.7	6.8
tC, 2 stage (s)						
tF (s)	2.5				3.8	3.9
p0 queue free %	94				98	90
cM capacity (veh/h)	1148				188	674

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	802	243	71
Volume Left	74	0	4
Volume Right	0	12	67
cSH	1148	1700	588
Volume to Capacity	0.06	0.14	0.12
Queue Length 95th (ft)	5	0	10
Control Delay (s)	1.6	0.0	12.0
Lane LOS	A		B
Approach Delay (s)	1.6	0.0	12.0
Approach LOS			B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	690	72	19	231	113	38
Peak Hour Factor	0.90	0.72	0.79	0.84	0.82	0.75
Hourly flow rate (vph)	767	100	24	275	138	51
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			867		1140	817
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			867		1140	817
tC, single (s)			4.6		6.5	6.4
tC, 2 stage (s)						
tF (s)			2.7		3.6	3.5
p0 queue free %			96		33	85
cM capacity (veh/h)			598		206	348

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	867	299	188
Volume Left	0	24	138
Volume Right	100	0	51
cSH	1700	598	231
Volume to Capacity	0.51	0.04	0.82
Queue Length 95th (ft)	0	3	154
Control Delay (s)	0.0	1.4	65.3
Lane LOS		A	F
Approach Delay (s)	0.0	1.4	65.3
Approach LOS			F

Intersection Summary			
Average Delay	9.4		
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: Build_AM

Northern Avenue at Trilling Road
Roundabout

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
Movement Performance - Vehicles											
South: Trilling Road											
3	L	91	16.6	0.206	10.8	LOS B	0.6	17.3	0.59	0.89	24.4
8	T	4	0.0	0.206	10.8	LOS B	0.6	17.3	0.59	0.78	26.1
18	R	201	16.0	0.433	15.7	LOS C	1.6	45.2	0.66	0.92	23.7
Approach		297	15.9	0.433	14.1	LOS B	1.6	45.2	0.64	0.91	23.9
East: Northern Avenue											
1	L	70	52.0	0.105	6.6	LOS A	0.2	6.6	0.21	0.70	26.3
6	T	290	25.0	0.366	8.8	LOS A	0.9	28.4	0.24	0.57	27.5
16	R	7	33.0	0.366	8.8	LOS A	0.9	28.4	0.24	0.72	26.9
Approach		366	30.3	0.366	8.4	LOS A	0.9	28.4	0.24	0.60	27.3
North East: Parking Lot											
1X	L	13	33.3	0.044	7.2	LOS A	0.1	2.6	0.39	0.84	26.4
16X	R	11	40.0	0.044	7.2	LOS A	0.1	2.6	0.39	0.65	28.3
Approach		24	36.4	0.044	7.2	LOS A	0.1	2.6	0.39	0.75	27.2
West: Northern Avenue											
5	L	30	35.4	0.710	16.4	LOS C	3.7	100.3	0.38	0.84	22.3
2	T	625	11.0	0.710	16.4	LOS C	3.7	100.3	0.38	0.59	23.9
12	R	117	12.0	0.128	5.1	LOS A	0.3	8.9	0.19	0.60	29.1
Approach		773	12.1	0.710	14.7	LOS B	3.7	100.3	0.35	0.60	24.5
All Vehicles		1460	17.8	0.710	12.9	LOS B	3.7	100.3	0.38	0.67	25.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	11	15	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.963			0.986						0.944	
Flt Protected		0.997			0.994						0.981	
Satd. Flow (prot)	0	2815	0	0	2812	0	0	0	0	0	1266	0
Flt Permitted		0.829			0.646						0.981	
Satd. Flow (perm)	0	2341	0	0	1827	0	0	0	0	0	1266	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)					16						31	
Headway Factor	1.14	1.22	1.14	1.01	1.19	1.01	1.14	1.14	1.14	1.14	1.14	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		450			148			271			263	
Travel Time (s)		10.2			3.4			6.2			6.0	
Volume (vph)	34	435	151	84	567	65	0	0	0	40	19	31
Peak Hour Factor	0.84	0.80	0.79	0.86	0.92	0.88	0.92	0.92	0.92	0.75	0.75	0.55
Heavy Vehicles (%)	15%	5%	4%	10%	8%	21%	2%	2%	2%	28%	37%	17%
Parking (#/hr)		0	0									
Adj. Flow (vph)	40	544	191	98	616	74	0	0	0	53	25	56
Lane Group Flow (vph)	0	775	0	0	788	0	0	0	0	0	134	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					20.0	20.0	
Total Split (s)	35.0	35.0	0.0	24.0	35.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	24.0%	35.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%
Maximum Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	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	C-Max					None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		47.2			66.7						12.9	
Actuated g/C Ratio		0.47			0.67						0.13	
v/c Ratio		0.70			0.56						0.70	
Control Delay		29.6			5.4						51.1	
Queue Delay		0.0			0.4						0.0	
Total Delay		29.6			5.8						51.1	

Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	16.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			A						D	
Approach Delay		29.6			5.8						51.1	
Approach LOS		C			A						D	
90th %ile Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
90th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
70th %ile Green (s)	30.0	30.0		19.0	30.0					15.0	15.0	
70th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
50th %ile Green (s)	53.6	53.6		19.0	53.6					12.4	12.4	
50th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
30th %ile Green (s)	56.5	56.5		19.0	56.5					9.5	9.5	
30th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
10th %ile Green (s)	60.9	60.9		16.4	60.9					7.7	7.7	
10th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
Stops (vph)		406			186						66	
Fuel Used(gal)		8			3						1	
CO Emissions (g/hr)		570			184						103	
NOx Emissions (g/hr)		111			36						20	
VOC Emissions (g/hr)		132			43						24	
Dilemma Vehicles (#)		0			0						0	
Queue Length 50th (ft)		166			18						63	
Queue Length 95th (ft)		#335			m51						97	
Internal Link Dist (ft)		370			68			191			183	
Turn Bay Length (ft)												
Base Capacity (vph)		1105			1416						229	
Starvation Cap Reductn		0			222						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.70			0.66						0.59	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 20.2 Intersection LOS: C
Intersection Capacity Utilization 57.9% ICU Level of Service B
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: 9: Seaport Boulevard & Fish Pier

Lane Group	ø2
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	16.0
90th %ile Term Code	Ped
70th %ile Green (s)	16.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

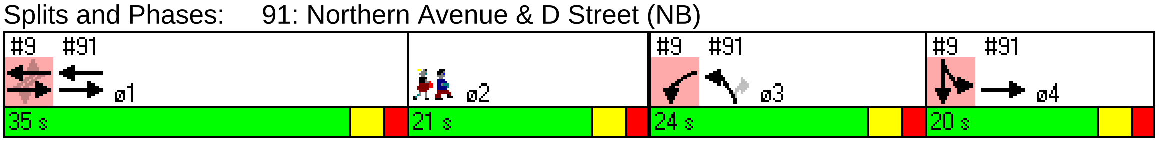
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	16	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00		
Frt						0.850		
Flt Protected					0.950			
Satd. Flow (prot)	3094	0	0	2855	1450	1172		
Flt Permitted					0.950			
Satd. Flow (perm)	3094	0	0	2855	1450	1172		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						215		
Headway Factor	1.14	0.97	1.14	1.19	1.14	1.14		
Link Speed (mph)	30			30	30			
Link Distance (ft)	148			788	266			
Travel Time (s)	3.4			17.9	6.0			
Volume (vph)	462	0	0	427	216	129		
Peak Hour Factor	0.80	0.92	0.92	0.92	0.83	0.60		
Heavy Vehicles (%)	5%	2%	2%	10%	12%	24%		
Adj. Flow (vph)	578	0	0	464	260	215		
Lane Group Flow (vph)	578	0	0	464	260	215		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	20.0
Total Split (s)	55.0	0.0	0.0	35.0	24.0	24.0	21.0	20.0
Total Split (%)	55.0%	0.0%	0.0%	35.0%	24.0%	24.0%	21%	20%
Maximum Green (s)				30.0	19.0	19.0	16.0	15.0
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?								
Vehicle Extension (s)				2.0	2.0	2.0	2.0	2.0
Recall Mode				C-Max	None	None	None	None
Walk Time (s)							7.0	
Flash Dont Walk (s)							9.0	
Pedestrian Calls (#/hr)							20	
Act Effct Green (s)	64.1			47.2	19.5	19.5		
Actuated g/C Ratio	0.64			0.47	0.20	0.20		
v/c Ratio	0.29			0.34	0.92	0.54		
Control Delay	3.2			21.0	76.3	10.5		
Queue Delay	1.1			0.0	2.5	0.0		
Total Delay	4.3			21.0	78.8	10.5		
LOS	A			C	E	B		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Approach Delay	4.3			21.0	47.9			
Approach LOS	A			C	D			
90th %ile Green (s)				30.0	19.0	19.0	16.0	15.0
90th %ile Term Code				Coord	Max	Max	Ped	Max
70th %ile Green (s)				30.0	19.0	19.0	16.0	15.0
70th %ile Term Code				Coord	Max	Max	Ped	Max
50th %ile Green (s)				53.6	19.0	19.0	0.0	12.4
50th %ile Term Code				Coord	Max	Max	Skip	Gap
30th %ile Green (s)				56.5	19.0	19.0	0.0	9.5
30th %ile Term Code				Coord	Max	Max	Skip	Gap
10th %ile Green (s)				60.9	16.4	16.4	0.0	7.7
10th %ile Term Code				Coord	Gap	Gap	Skip	Gap
Stops (vph)	34			275	189	43		
Fuel Used(gal)	1			6	5	1		
CO Emissions (g/hr)	71			417	339	55		
NOx Emissions (g/hr)	14			81	66	11		
VOC Emissions (g/hr)	17			97	79	13		
Dilemma Vehicles (#)	0			0	0	0		
Queue Length 50th (ft)	7			80	163	7		
Queue Length 95th (ft)	25			178	m#234	m6		
Internal Link Dist (ft)	68			708	186			
Turn Bay Length (ft)								
Base Capacity (vph)	1975			1348	290	406		
Starvation Cap Reductn	1107			0	0	0		
Spillback Cap Reductn	0			65	7	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.67			0.36	0.92	0.53		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 23.1 Intersection LOS: C
Intersection Capacity Utilization 34.2% ICU Level of Service A
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: 91: Northern Avenue & D Street (NB)



Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	12	13	12	11	12	12	12	14
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50		50	50		50	50
Trailing Detector (ft)	0	0	0	0	0	0		0	0		0	0
Turning Speed (mph)	9	15		9	15		9	15		9	15	
Lane Util. Factor	0.95	0.95	0.91	0.91	0.95	0.95	0.95	0.91	0.91	0.95	0.95	0.95
Ped Bike Factor			0.90	0.58		0.88		0.97	0.98			0.98
Frt			0.992	0.850		0.948			0.968			0.985
Flt Protected			0.980			0.991		0.950	0.985			0.991
Satd. Flow (prot)	0	0	2503	1277	0	2645	0	1276	2463	0	0	2625
Flt Permitted			0.980			0.991		0.950	0.985			0.991
Satd. Flow (perm)	0	0	2318	737	0	2564	0	1242	2443	0	0	2579
Right Turn on Red				Yes			Yes			Yes		
Satd. Flow (RTOR)			6	522		77			32			10
Headway Factor	1.14	1.14	1.14	1.10	1.14	1.10	1.14	1.19	1.22	1.14	1.14	1.13
Link Speed (mph)			30			30			30			30
Link Distance (ft)			665			205			225			206
Travel Time (s)			15.1			4.7			5.1			4.7
Volume (vph)	6	190	303	529	78	129	79	412	183	53	36	191
Confl. Peds. (#/hr)		58		239	239		58	11		60	60	
Peak Hour Factor	0.25	0.83	0.89	0.95	0.91	0.55	0.47	0.84	0.64	0.41	0.63	0.82
Heavy Vehicles (%)	0%	35%	9%	7%	5%	12%	6%	12%	16%	6%	8%	25%
Parking (#/hr)									0	0	0	0
Adj. Flow (vph)	24	229	340	557	86	235	168	490	286	129	57	233
Lane Group Flow (vph)	0	0	628	522	0	489	0	304	601	0	0	323
Turn Type	Perm	Split		Perm	Split			Split			Split	
Protected Phases		1	1		4	4		2	2		3	3
Permitted Phases	1			1								
Detector Phases	1	1	1	1	4	4		2	2		3	3
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0
Total Split (s)	31.0	31.0	31.0	31.0	16.0	16.0	0.0	32.0	32.0	0.0	21.0	21.0
Total Split (%)	31.0%	31.0%	31.0%	31.0%	16.0%	16.0%	0.0%	32.0%	32.0%	0.0%	21.0%	21.0%
Maximum Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
Yellow Time (s)	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		3.0	3.0
Lead/Lag								Lead	Lead		Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max		None	None		None	None
Walk Time (s)	7.0	7.0	7.0	7.0							7.0	7.0
Flash Dont Walk (s)	1.0	1.0	1.0	1.0							1.0	1.0
Pedestrian Calls (#/hr)	0	0	0	0							0	0
Act Effct Green (s)			27.0	27.0		13.8		26.9	26.9			16.3
Actuated g/C Ratio			0.27	0.27		0.14		0.27	0.27			0.16
v/c Ratio			0.92	0.90		1.13		0.89	0.87			0.74
Control Delay			56.3	24.1		119.9		57.3	42.5			54.6

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	26
Confl. Peds. (#/hr)	11
Peak Hour Factor	0.79
Heavy Vehicles (%)	23%
Parking (#/hr)	
Adj. Flow (vph)	33
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay			0.0	0.0		0.0		31.2	20.3			0.0
Total Delay			56.3	24.1		119.9		88.5	62.8			54.6
LOS			E	C		F		F	E			D
Approach Delay			41.7			119.9			71.4			54.6
Approach LOS			D			F			E			D
90th %ile Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
70th %ile Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
50th %ile Green (s)	25.0	25.0	25.0	25.0	10.0	10.0		26.0	26.0		15.0	15.0
50th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
30th %ile Green (s)	25.0	25.0	25.0	25.0	10.3	10.3		26.0	26.0		14.7	14.7
30th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Gap	Gap
10th %ile Green (s)	25.0	25.0	25.0	25.0	18.8	18.8		20.6	20.6		11.6	11.6
10th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Gap	Gap
Stops (vph)			468	52		178		221	330			210
Fuel Used(gal)			11	5		8		5	6			4
CO Emissions (g/hr)			800	370		589		325	413			306
NOx Emissions (g/hr)			156	72		115		63	80			60
VOC Emissions (g/hr)			185	86		136		75	96			71
Dilemma Vehicles (#)			0	0		0		0	0			0
Queue Length 50th (ft)			212	0		~184		197	185			93
Queue Length 95th (ft)			#321	#273		#109		#324	164			126
Internal Link Dist (ft)			585			125			145			126
Turn Bay Length (ft)												
Base Capacity (vph)			680	580		432		357	713			455
Starvation Cap Reductn			0	0		0		64	121			0
Spillback Cap Reductn			0	0		0		0	0			0
Storage Cap Reductn			0	0		0		0	0			0
Reduced v/c Ratio			0.92	0.90		1.13		1.04	1.02			0.71

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.13
Intersection Signal Delay: 65.9 Intersection LOS: E
Intersection Capacity Utilization 73.0% ICU Level of Service D
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: 10: Congress Street & D Street

Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	13	12	12	12	16	16	12	16	12	11	13
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50	50	50	50	50		50	50
Trailing Detector (ft)	0	0		0	0	0	0	0	0		0	0
Turning Speed (mph)	15		9	9	15		9	15		9	15	
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	0.99	0.97					0.94	0.99	0.98		0.96	0.99
Frt		0.957					0.850		0.961			0.943
Flt Protected	0.950					0.986		0.950			0.950	
Satd. Flow (prot)	1540	2715	0	0	0	3260	1525	1477	2914	0	1454	2901
Flt Permitted	0.154					0.572		0.950			0.950	
Satd. Flow (perm)	247	2715	0	0	0	1891	1440	1464	2914	0	1402	2901
Right Turn on Red			Yes				No			Yes		
Satd. Flow (RTOR)		76							45			124
Headway Factor	1.19	1.17	1.14	1.14	1.14	0.97	0.97	1.14	1.04	1.14	1.19	1.10
Link Speed (mph)		30				30			30			30
Link Distance (ft)		523				1228			316			323
Travel Time (s)		11.9				27.9			7.2			7.3
Volume (vph)	194	305	139	30	90	434	597	120	305	103	244	270
Confl. Peds. (#/hr)	27		63		63		27	10		45	45	
Peak Hour Factor	0.87	0.82	0.92	0.30	0.78	0.84	0.94	0.65	0.89	0.86	0.78	0.90
Heavy Vehicles (%)	2%	10%	8%	0%	23%	11%	8%	10%	12%	16%	8%	11%
Parking (#/hr)		0	0						0	0		
Adj. Flow (vph)	223	372	151	100	115	517	635	185	343	120	313	300
Lane Group Flow (vph)	223	523	0	0	0	732	635	185	463	0	313	485
Turn Type	D.P+P			Perm	Perm		pm+ov	Split			Split	
Protected Phases	4	1 4				1	2	3	3		2	2
Permitted Phases	1			1	1		1					
Detector Phases	4	1 4		1	1	1	2	3	3		2	2
Minimum Initial (s)	6.0			10.0	10.0	10.0	6.0	6.0	6.0		6.0	6.0
Minimum Split (s)	12.0			28.0	28.0	28.0	24.0	26.0	26.0		24.0	24.0
Total Split (s)	15.0	46.0	0.0	31.0	31.0	31.0	27.0	27.0	27.0	0.0	27.0	27.0
Total Split (%)	15.0%	46.0%	0.0%	31.0%	31.0%	31.0%	27.0%	27.0%	27.0%	0.0%	27.0%	27.0%
Maximum Green (s)	10.0			26.0	26.0	26.0	22.0	22.0	22.0		22.0	22.0
Yellow Time (s)	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	2.0			2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0
Lead/Lag							Lead	Lag	Lag		Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Recall Mode	None			C-Max	C-Max	C-Max	Ped	Ped	Ped		Ped	Ped
Walk Time (s)				7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)				16.0	16.0	16.0	11.0	13.0	13.0		11.0	11.0
Pedestrian Calls (#/hr)				0	0	0	0	0	0		0	0
Act Effct Green (s)	39.2	43.2				28.2	51.2	21.8	21.8		23.0	23.0
Actuated g/C Ratio	0.39	0.43				0.28	0.51	0.22	0.22		0.23	0.23
v/c Ratio	0.93	0.43				2.99dl	0.84	0.57	0.69		0.94	0.64
Control Delay	68.5	18.2				211.0	31.3	42.7	38.2		72.0	26.4

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	163
Confl. Peds. (#/hr)	10
Peak Hour Factor	0.88
Heavy Vehicles (%)	3%
Parking (#/hr)	
Adj. Flow (vph)	185
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay	0.0	0.0				0.0	0.0	0.0	0.0		3.2	0.1
Total Delay	68.5	18.2				211.0	31.3	42.7	38.2		75.2	26.5
LOS	E	B				F	C	D	D		E	C
Approach Delay		33.2				127.6			39.5			45.6
Approach LOS		C				F			D			D
90th %ile Green (s)	10.0			26.0	26.0	26.0	22.0	22.0	22.0		22.0	22.0
90th %ile Term Code	Max			Coord	Coord	Coord	Max	Max	Max		Max	Max
70th %ile Green (s)	10.0			26.0	26.0	26.0	22.0	22.0	22.0		22.0	22.0
70th %ile Term Code	Max			Coord	Coord	Coord	Max	Max	Max		Max	Max
50th %ile Green (s)	10.0			27.8	27.8	27.8	22.0	20.2	20.2		22.0	22.0
50th %ile Term Code	Max			Coord	Coord	Coord	Max	Gap	Gap		Max	Max
30th %ile Green (s)	10.0			28.0	28.0	28.0	22.0	20.0	20.0		22.0	22.0
30th %ile Term Code	Max			Coord	Coord	Coord	Max	Ped	Ped		Max	Max
10th %ile Green (s)	10.0			28.0	28.0	28.0	22.0	20.0	20.0		22.0	22.0
10th %ile Term Code	Max			Coord	Coord	Coord	Max	Ped	Ped		Max	Max
Stops (vph)	117	257				428	492	106	332		204	287
Fuel Used(gal)	4	5				31	12	2	6		5	5
CO Emissions (g/hr)	290	341				2200	856	134	421		372	350
NOx Emissions (g/hr)	56	66				428	167	26	82		72	68
VOC Emissions (g/hr)	67	79				510	198	31	97		86	81
Dilemma Vehicles (#)	0	0				0	0	0	0		0	0
Queue Length 50th (ft)	92	99				~322	289	107	131		192	109
Queue Length 95th (ft)	#228	130				#410	#538	119	180		#291	176
Internal Link Dist (ft)		443				1148			236			243
Turn Bay Length (ft)												
Base Capacity (vph)	239	1215				533	756	340	705		334	763
Starvation Cap Reductn	0	0				0	0	0	0		7	15
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	0.93	0.43				1.37	0.84	0.54	0.66		0.96	0.65

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 7 (7%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.37

Intersection Signal Delay: 73.4 Intersection LOS: E

Intersection Capacity Utilization 89.4% ICU Level of Service E

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.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 11: Summer Street & D Street

Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Build Conditions (2019) Level of Service Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Signalized Intersections				
Summer Street/Drydock Avenue	**D**	**41.0**		
Summer EB left	B	17.0	0.52	79
Summer EB thru | thru/right	B	16.7	0.75	436
Summer WB left	D	37.1	0.37	26
Summer WB thru | thru/right	C	22.3	0.66	234
Pappas NB left/thru/right	F	>80.0	0.85	#86
Drydock SB left/thru	F	>80.0	>1.00	#408
Drydock SB right	A	7.4	0.60	70
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**C**	**23.6**		
Seaport EB left/thru | thru/right	C	27.7	0.73	#350
Seaport WB left/thru | thru/right	B	19.6	0.82	m#184
Fish Pier SB left/thru/right	C	31.9	0.61	59
Northern Avenue/D Street (northbound)	**D**	**39.2**		
Northern EB thru | thru	A	4.3	0.21	20
Northern WB thru | thru	C	21.2	0.54	289
D NB left	F	>80.0	>1.00	m#256
D NB right	B	14.4	0.35	m19
Congress Street/D Street	**F**	**>80.0**		
Congress EB left/thru | thru/right	F	>80.0	>1.00	189
Congress EB right	F	>80.0	>1.00	#426
Congress WB left/thru | thru/right	F	>80.0	>1.00	155
D NB left	E	73.1	0.75	212
D NB left/thru | thru/right	E	57.2	0.75	194
D SB left/thru | thru/right	F	>80.0	0.93	m#374
Summer Street/D Street	**D**	**49.8**		
Summer EB left	F	>80.0	>1.00	#322
Summer EB thru | thru/right	C	22.1	0.55	220
Summer WB left/thru | thru	E	78.4	>1.00dl	#231
Summer WB right	C	23.2	0.68	248
D NB left	D	36.4	0.38	95
D NB thru | thru/right	D	47.5	0.83	186
D SB left	E	73.3	0.96	m#394
D SB thru | thru/right	D	53.9	0.96	#336
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	3.3	0.14	13
Drydock WB left/thru/right	A	0.2	0.01	0
Harbor NB left/thru	F	>50.0	0.89	70
Harbor NB right	B	10.1	0.02	2
Harbor SB left/thru/right	F	>50.0	0.98	226

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	4.8	0.11	9
Drydock WB left/thru/right	A	0.5	0.02	1
Design Center NB left/thru/right	F	>50.0	>1.00	415
Garage SB left/thru/right	C	22.0	0.62	104
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	5.4	0.10	8
Drydock WB left/thru/right	A	0.3	0.01	1
Parking NB left/thru/right	C	22.3	0.21	20
Tide SB left/thru/right	C	21.6	0.56	86
Northern Avenue/Tide Street				
Northern EB left/thru/right	E	47.4	0.87	225
Alley WB left/thru/right	C	20.8	0.08	7
Tide NB left/thru/right	A	7.7	0.20	18
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.1	0.03	2
Northern WB thru/right	A	0.0	0.42	0
Seafood SB left/right	C	18.5	0.25	24
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.23	0
Northern WB left/thru	A	0.8	0.03	2
Harbor NB left/right	D	30.5	0.44	52
Unsignalized Roundabouts				
Northern Avenue/Haul Road				
Northern EB left/thru	A	10.0	0.43	37
Northern EB right	A	5.2	0.10	7
Northern WB left	A	7.4	0.28	22
Northern WB thru/right	B	14.0	0.65	89
Haul NB left/thru	A	6.3	0.13	11
Haul NB right	A	8.8	0.12	10
Parking SB left/thru/right	A	8.0	0.05	3

\# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m = 95th percentile queue is metered by upstream traffic signal.
* = defacto lane

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	59	149	10	6	618	32	15	1	10	9	3	150
Peak Hour Factor	0.58	0.84	0.50	0.75	0.74	0.69	0.75	0.25	0.69	0.44	0.25	0.74
Hourly flow rate (vph)	102	177	20	8	835	46	20	4	14	20	12	203
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		611										
pX, platoon unblocked												
vC, conflicting volume	882			177			1474	1288	99	1183	1255	858
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	882			177			1474	1288	99	1183	1255	858
tC, single (s)	4.3			4.1			7.6	6.5	8.7	8.3	6.6	6.9
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.0	4.2	3.9	4.0	3.3
p0 queue free %	86			99			14	97	98	77	92	33
cM capacity (veh/h)	703			1411			23	141	715	91	142	304

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	190	109	890	24	14	235
Volume Left	102	0	8	20	0	20
Volume Right	0	20	46	0	14	203
cSH	703	1700	1411	27	715	241
Volume to Capacity	0.14	0.06	0.01	0.89	0.02	0.98
Queue Length 95th (ft)	13	0	0	70	2	226
Control Delay (s)	6.7	0.0	0.2	345.4	10.1	95.7
Lane LOS	A		A	F	B	F
Approach Delay (s)	4.2		0.2	219.2		95.7
Approach LOS				F		F

Intersection Summary			
Average Delay	22.1		
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	44	91	8	13	337	4	82	0	35	4	1	211
Peak Hour Factor	0.38	0.79	1.00	0.65	0.69	0.50	0.60	0.50	0.69	0.33	0.25	0.67
Hourly flow rate (vph)	116	115	8	20	488	8	137	0	51	12	4	315
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	496			123			1200	887	119	934	887	492
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	496			123			1200	887	119	934	887	492
tC, single (s)	4.1			4.7			7.1	6.5	6.8	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.8	3.5	4.0	3.3
p0 queue free %	89			98			0	100	94	94	98	46
cM capacity (veh/h)	1078			1164			67	250	799	211	250	578

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	239	516	187	331
Volume Left	116	20	137	12
Volume Right	8	8	51	315
cSH	1078	1164	89	536
Volume to Capacity	0.11	0.02	2.11	0.62
Queue Length 95th (ft)	9	1	415	104
Control Delay (s)	4.8	0.5	614.8	22.0
Lane LOS	A	A	F	C
Approach Delay (s)	4.8	0.5	614.8	22.0
Approach LOS			F	C

Intersection Summary			
Average Delay	97.3		
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	69	56	1	3	182	150	10	12	5	62	1	144
Peak Hour Factor	0.77	0.72	0.25	0.25	0.75	0.74	0.50	0.43	0.63	0.82	0.25	0.75
Hourly flow rate (vph)	90	78	4	12	243	203	20	28	8	76	4	192
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	445			82			821	728	80	649	629	344
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	445			82			821	728	80	649	629	344
tC, single (s)	4.6			4.1			7.3	6.5	6.4	7.5	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.6			2.2			3.7	4.0	3.5	3.8	4.0	3.5
p0 queue free %	90			99			88	91	99	74	99	71
cM capacity (veh/h)	913			1528			174	315	933	288	359	664

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	171	457	56	272
Volume Left	90	12	20	76
Volume Right	4	203	8	192
cSH	913	1528	263	482
Volume to Capacity	0.10	0.01	0.21	0.56
Queue Length 95th (ft)	8	1	20	86
Control Delay (s)	5.4	0.3	22.3	21.6
Lane LOS	A	A	C	C
Approach Delay (s)	5.4	0.3	22.3	21.6
Approach LOS			C	C

Intersection Summary			
Average Delay	8.5		
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	53	0	169	1	4	0	213	19	0	0	41	119
Peak Hour Factor	0.31	0.25	0.78	0.25	0.25	0.92	0.85	0.58	0.50	0.92	0.55	0.93
Hourly flow rate (vph)	171	0	217	4	16	0	251	33	0	0	75	128
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	680	672	139	889	736	33	203			33		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	680	672	139	889	736	33	203			33		
tC, single (s)	7.3	6.5	6.5	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.6	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	39	100	74	98	94	100	80			100		
cM capacity (veh/h)	278	305	845	168	281	1047	1285			1592		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	388	20	283	203
Volume Left	171	4	251	0
Volume Right	217	0	0	128
cSH	445	248	1285	1592
Volume to Capacity	0.87	0.08	0.20	0.00
Queue Length 95th (ft)	225	7	18	0
Control Delay (s)	47.4	20.8	7.7	0.0
Lane LOS	E	C	A	
Approach Delay (s)	47.4	20.8	7.7	0.0
Approach LOS	E	C		

Intersection Summary			
Average Delay	23.5		
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	211	625	0	5	62
Peak Hour Factor	0.80	0.88	0.87	0.50	0.63	0.78
Hourly flow rate (vph)	20	240	718	0	8	79
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	718				998	718
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	718				998	718
tC, single (s)	4.7				7.2	6.5
tC, 2 stage (s)						
tF (s)	2.7				4.2	3.6
p0 queue free %	97				96	79
cM capacity (veh/h)	680				191	387

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	260	718	87
Volume Left	20	0	8
Volume Right	0	0	79
cSH	680	1700	354
Volume to Capacity	0.03	0.42	0.25
Queue Length 95th (ft)	2	0	24
Control Delay (s)	1.1	0.0	18.5
Lane LOS	A		C
Approach Delay (s)	1.1	0.0	18.5
Approach LOS			C

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	217	111	19	666	77	9
Peak Hour Factor	0.89	0.78	0.59	0.94	0.84	0.56
Hourly flow rate (vph)	244	142	32	709	92	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			386		1088	315
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			386		1088	315
tC, single (s)			4.2		6.5	6.8
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.8
p0 queue free %			97		59	97
cM capacity (veh/h)			1125		223	616

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	386	741	108
Volume Left	0	32	92
Volume Right	142	0	16
cSH	1700	1125	246
Volume to Capacity	0.23	0.03	0.44
Queue Length 95th (ft)	0	2	52
Control Delay (s)	0.0	0.8	30.5
Lane LOS		A	D
Approach Delay (s)	0.0	0.8	30.5
Approach LOS			D

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: Build_PM

Northern Avenue at Trilling Road
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Trilling Road											
3	L	90	3.9	0.127	6.3	LOS A	0.4	11.2	0.45	0.80	26.4
8	T	2	0.0	0.127	6.3	LOS A	0.4	11.2	0.45	0.65	28.6
18	R	61	52.0	0.122	8.8	LOS A	0.3	9.8	0.44	0.72	26.9
Approach		153	23.0	0.127	7.3	LOS A	0.4	11.2	0.45	0.77	26.7
East: Northern Avenue											
1	L	232	21.0	0.279	7.4	LOS A	0.7	21.6	0.25	0.72	25.9
6	T	612	7.0	0.654	14.0	LOS B	3.4	89.1	0.41	0.62	24.9
16	R	7	17.0	0.654	14.0	LOS B	3.4	89.1	0.41	0.73	24.5
Approach		850	10.9	0.654	12.2	LOS B	3.4	89.1	0.36	0.65	25.2
North East: Parking Lot											
1X	L	16	6.5	0.051	8.0	LOS A	0.1	3.1	0.54	0.90	26.1
16X	R	9	13.0	0.051	8.0	LOS A	0.1	3.1	0.54	0.76	27.7
Approach		25	8.8	0.051	8.0	LOS A	0.1	3.1	0.54	0.85	26.6
West: Northern Avenue											
5	L	49	25.6	0.434	10.0	LOS A	1.4	37.3	0.38	0.92	24.6
2	T	303	11.0	0.434	10.0	LOS A	1.4	37.3	0.38	0.67	26.8
12	R	84	6.0	0.098	5.2	LOS A	0.3	6.7	0.30	0.66	29.0
Approach		436	11.7	0.434	9.1	LOS A	1.4	37.3	0.37	0.69	26.9
All Vehicles		1464	12.4	0.654	10.7	LOS B	3.4	89.1	0.38	0.68	25.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	12	13
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.985			0.972			0.972				0.850
Flt Protected	0.950			0.950				0.967			0.959	
Satd. Flow (prot)	1377	3068	0	1624	2946	0	0	1633	0	0	1601	1444
Flt Permitted	0.246			0.108				0.160			0.726	
Satd. Flow (perm)	356	3068	0	185	2946	0	0	270	0	0	1212	1444
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			31			12				453
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.01	1.14	1.14	1.14	1.10
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1228			692			321			611	
Travel Time (s)		27.9			15.7			7.3			13.9	
Volume (vph)	122	1043	96	16	499	97	39	5	12	314	43	421
Peak Hour Factor	0.77	0.92	0.76	0.65	0.85	0.72	0.75	0.63	0.75	0.79	0.64	0.76
Heavy Vehicles (%)	18%	4%	7%	0%	7%	8%	9%	20%	0%	2%	5%	4%
Adj. Flow (vph)	158	1134	126	25	587	135	52	8	16	397	67	554
Lane Group Flow (vph)	158	1260	0	25	722	0	0	76	0	0	464	554
Turn Type	D.P+P			Perm			Perm			Perm		custom
Protected Phases	4	1 4			1			3			3	4
Permitted Phases	1			1			3			3		3 4
Detector Phases	4	1 4		1	1		3	3		3	3	4
Minimum Initial (s)	8.0			8.0	8.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	12.0			20.0	20.0		20.0	20.0		20.0	20.0	12.0
Total Split (s)	13.0	54.0	0.0	41.0	41.0	0.0	25.0	25.0	0.0	25.0	25.0	13.0
Total Split (%)	13.0%	54.0%	0.0%	41.0%	41.0%	0.0%	25.0%	25.0%	0.0%	25.0%	25.0%	13.0%
Maximum Green (s)	9.0			36.0	36.0		20.0	20.0		20.0	20.0	9.0
Yellow Time (s)	3.0			4.0	4.0		4.0	4.0		4.0	4.0	3.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lag			Lead	Lead		Lead	Lead		Lead	Lead	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	None			Min	Min		None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	35.9	40.0		26.5	26.5			21.8			21.8	35.3
Actuated g/C Ratio	0.49	0.55		0.36	0.36			0.30			0.30	0.48
v/c Ratio	0.52	0.75		0.37	0.66			0.85			1.29	0.60
Control Delay	17.0	16.7		37.1	22.3			94.5			175.5	7.4
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	17.0	16.7		37.1	22.3			94.5			175.5	7.4
LOS	B	B		D	C			F			F	A

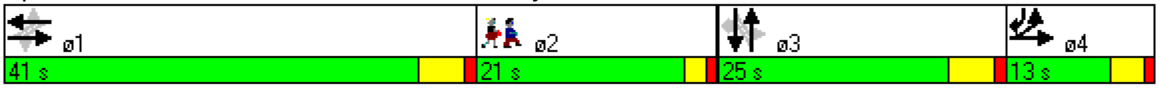
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	3.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	12.0
Flash Dont Walk (s)	6.0
Pedestrian Calls (#/hr)	7
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		16.8			22.8			94.5			84.0	
Approach LOS		B			C			F			F	
90th %ile Green (s)	9.0			36.0	36.0		20.0	20.0		20.0	20.0	9.0
90th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
70th %ile Green (s)	9.0			33.2	33.2		20.0	20.0		20.0	20.0	9.0
70th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
50th %ile Green (s)	9.0			26.5	26.5		20.0	20.0		20.0	20.0	9.0
50th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
30th %ile Green (s)	9.0			20.1	20.1		20.0	20.0		20.0	20.0	9.0
30th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
10th %ile Green (s)	9.0			14.0	14.0		20.0	20.0		20.0	20.0	9.0
10th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
Stops (vph)	60	789		13	438			32			253	84
Fuel Used(gal)	2	19		0	8			1			16	3
CO Emissions (g/hr)	134	1338		20	583			97			1108	217
NOx Emissions (g/hr)	26	260		4	113			19			216	42
VOC Emissions (g/hr)	31	310		5	135			23			257	50
Dilemma Vehicles (#)	0	0		0	0			0			0	0
Queue Length 50th (ft)	29	177		7	119			26			~256	22
Queue Length 95th (ft)	79	436		26	234			#86			#408	70
Internal Link Dist (ft)		1148			612			241			531	
Turn Bay Length (ft)												
Base Capacity (vph)	305	1867		83	1339			89			361	931
Starvation Cap Reductn	0	0		0	0			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	0.52	0.67		0.30	0.54			0.85			1.29	0.60

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 73.2
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.29
Intersection Signal Delay: 41.0 Intersection LOS: D
Intersection Capacity Utilization 79.3% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 76.2
50th %ile Actuated Cycle: 69.5
30th %ile Actuated Cycle: 63.1
10th %ile Actuated Cycle: 57
~ 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: Summer Street & Drydock Avenue



Lane Group	ø2
Approach Delay	
Approach LOS	
90th %ile Green (s)	18.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	11	15	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.934			0.993						0.915	
Flt Protected		0.998			0.990						0.993	
Satd. Flow (prot)	0	2739	0	0	2831	0	0	0	0	0	1262	0
Flt Permitted		0.769			0.547						0.993	
Satd. Flow (perm)	0	2111	0	0	1564	0	0	0	0	0	1262	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)					8						73	
Headway Factor	1.14	1.22	1.14	1.01	1.19	1.01	1.14	1.14	1.14	1.14	1.14	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		450			148			271			263	
Travel Time (s)		10.2			3.4			6.2			6.0	
Volume (vph)	31	333	278	181	736	47	0	0	0	12	21	42
Peak Hour Factor	0.84	0.80	0.79	0.86	0.92	0.88	0.92	0.92	0.92	0.75	0.75	0.55
Heavy Vehicles (%)	15%	5%	4%	10%	8%	21%	2%	2%	2%	28%	37%	17%
Parking (#/hr)		0	0									
Adj. Flow (vph)	37	416	352	210	800	53	0	0	0	16	28	76
Lane Group Flow (vph)	0	805	0	0	1063	0	0	0	0	0	120	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					19.0	19.0	
Total Split (s)	39.0	39.0	0.0	21.0	39.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0
Total Split (%)	39.0%	39.0%	0.0%	21.0%	39.0%	0.0%	0.0%	0.0%	0.0%	19.0%	19.0%	0.0%
Maximum Green (s)	34.0	34.0		16.0	34.0					14.0	14.0	
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	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	C-Max					None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		52.1			69.1						10.5	
Actuated g/C Ratio		0.52			0.69						0.10	
v/c Ratio		0.73			0.82						0.61	
Control Delay		27.7			15.2						31.9	
Queue Delay		0.0			4.5						0.0	
Total Delay		27.7			19.6						31.9	

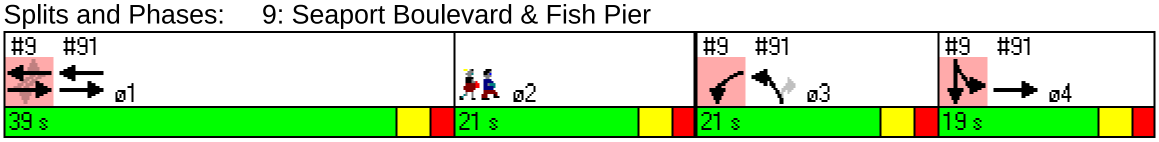
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	16.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		C			B						C	
Approach Delay		27.7			19.6						31.9	
Approach LOS		C			B						C	
90th %ile Green (s)	34.0	34.0		16.0	34.0					14.0	14.0	
90th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
70th %ile Green (s)	37.0	37.0		16.0	37.0					11.0	11.0	
70th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
50th %ile Green (s)	60.9	60.9		16.0	60.9					8.1	8.1	
50th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
30th %ile Green (s)	61.5	61.5		16.0	61.5					7.5	7.5	
30th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
10th %ile Green (s)	62.2	62.2		16.0	62.2					6.8	6.8	
10th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
Stops (vph)		414			236						33	
Fuel Used(gal)		8			5						1	
CO Emissions (g/hr)		570			377						58	
NOx Emissions (g/hr)		111			73						11	
VOC Emissions (g/hr)		132			87						13	
Dilemma Vehicles (#)		0			0						0	
Queue Length 50th (ft)		152			67						29	
Queue Length 95th (ft)		#350			m#184						59	
Internal Link Dist (ft)		370			68			191			183	
Turn Bay Length (ft)												
Base Capacity (vph)		1100			1299						251	
Starvation Cap Reductn		0			171						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.73			0.94						0.48	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 23.6 Intersection LOS: C
Intersection Capacity Utilization 66.1% ICU Level of Service C
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: 9: Seaport Boulevard & Fish Pier



Lane Group	ø2
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	16.0
90th %ile Term Code	Ped
70th %ile Green (s)	16.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	16	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00		
Frt						0.850		
Flt Protected					0.950			
Satd. Flow (prot)	3154	0	0	2991	1593	1346		
Flt Permitted					0.950			
Satd. Flow (perm)	3154	0	0	2991	1593	1346		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						114		
Headway Factor	1.14	0.97	1.14	1.19	1.14	1.14		
Link Speed (mph)	30			30	30			
Link Distance (ft)	148			788	266			
Travel Time (s)	3.4			17.9	6.0			
Volume (vph)	355	0	0	691	216	74		
Peak Hour Factor	0.80	0.92	0.92	0.82	0.71	0.65		
Heavy Vehicles (%)	3%	2%	2%	5%	2%	8%		
Adj. Flow (vph)	444	0	0	843	304	114		
Lane Group Flow (vph)	444	0	0	843	304	114		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	19.0
Total Split (s)	58.0	0.0	0.0	39.0	21.0	21.0	21.0	19.0
Total Split (%)	58.0%	0.0%	0.0%	39.0%	21.0%	21.0%	21%	19%
Maximum Green (s)				34.0	16.0	16.0	16.0	14.0
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?								
Vehicle Extension (s)				2.0	2.0	2.0	2.0	2.0
Recall Mode				C-Max	None	None	None	None
Walk Time (s)							7.0	
Flash Dont Walk (s)							9.0	
Pedestrian Calls (#/hr)							20	
Act Effct Green (s)	66.6			52.1	17.0	17.0		
Actuated g/C Ratio	0.67			0.52	0.17	0.17		
v/c Ratio	0.21			0.54	1.12	0.35		
Control Delay	2.8			20.8	131.9	14.4		
Queue Delay	1.5			0.3	17.3	0.0		
Total Delay	4.3			21.2	149.2	14.4		
LOS	A			C	F	B		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Approach Delay	4.3			21.2	112.5			
Approach LOS	A			C	F			
90th %ile Green (s)				34.0	16.0	16.0	16.0	14.0
90th %ile Term Code				Coord	Max	Max	Ped	Max
70th %ile Green (s)				37.0	16.0	16.0	16.0	11.0
70th %ile Term Code				Coord	Max	Max	Ped	Gap
50th %ile Green (s)				60.9	16.0	16.0	0.0	8.1
50th %ile Term Code				Coord	Max	Max	Skip	Gap
30th %ile Green (s)				61.5	16.0	16.0	0.0	7.5
30th %ile Term Code				Coord	Max	Max	Skip	Gap
10th %ile Green (s)				62.2	16.0	16.0	0.0	6.8
10th %ile Term Code				Coord	Max	Max	Skip	Gap
Stops (vph)	26			464	178	32		
Fuel Used(gal)	1			10	7	1		
CO Emissions (g/hr)	53			681	506	38		
NOx Emissions (g/hr)	10			132	98	7		
VOC Emissions (g/hr)	12			158	117	9		
Dilemma Vehicles (#)	0			0	0	0		
Queue Length 50th (ft)	6			137	~229	12		
Queue Length 95th (ft)	20			289	m#256	m19		
Internal Link Dist (ft)	68			708	186			
Turn Bay Length (ft)								
Base Capacity (vph)	2095			1559	271	323		
Starvation Cap Reductn	1422			0	0	0		
Spillback Cap Reductn	0			246	10	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.66			0.64	1.16	0.35		

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 47 (47%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 39.2 Intersection LOS: D

Intersection Capacity Utilization 41.2% ICU Level of Service A

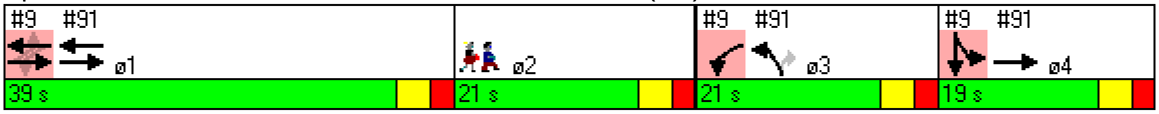
Analysis Period (min) 15

~ 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: 91: Northern Avenue & D Street (NB)



Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	12	13	12	11	12	12	12	14
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50		50	50		50	50
Trailing Detector (ft)	0	0	0	0	0	0		0	0		0	0
Turning Speed (mph)	9	15		9	15		9	15		9	15	
Lane Util. Factor	0.95	0.95	0.91	0.91	0.95	0.95	0.95	0.91	0.91	0.95	0.95	0.95
Ped Bike Factor			0.95	0.69		0.94		0.98	0.99			0.99
Frt				0.850		0.977			0.988			0.986
Flt Protected			0.979			0.986		0.950	0.988			0.997
Satd. Flow (prot)	0	0	2445	1353	0	3101	0	1374	2734	0	0	3150
Flt Permitted			0.979			0.986		0.950	0.988			0.997
Satd. Flow (perm)	0	0	2322	931	0	2988	0	1343	2719	0	0	3132
Right Turn on Red				Yes			Yes			Yes		
Satd. Flow (RTOR)				516		17			8			10
Headway Factor	1.14	1.14	1.14	1.10	1.14	1.10	1.14	1.19	1.22	1.14	1.14	1.13
Link Speed (mph)			30			30			30			30
Link Distance (ft)			665			205			225			206
Travel Time (s)			15.1			4.7			5.1			4.7
Volume (vph)	8	149	221	577	138	195	41	261	260	25	34	540
Confl. Peds. (#/hr)		44		88	88		44	16		43	43	
Peak Hour Factor	0.50	0.63	0.64	0.88	0.83	0.56	0.45	0.76	0.81	0.68	0.71	0.91
Heavy Vehicles (%)	0%	17%	31%	1%	0%	3%	0%	4%	6%	0%	18%	1%
Parking (#/hr)									0	0	0	0
Adj. Flow (vph)	16	237	345	656	166	348	91	343	321	37	48	593
Lane Group Flow (vph)	0	0	598	656	0	605	0	233	468	0	0	707
Turn Type	Perm	Split		Perm	Split			Split			Split	
Protected Phases		1	1		4	4		2	2		3	3
Permitted Phases	1			1								
Detector Phases	1	1	1	1	4	4		2	2		3	3
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0
Total Split (s)	26.0	26.0	26.0	26.0	19.0	19.0	0.0	29.0	29.0	0.0	26.0	26.0
Total Split (%)	26.0%	26.0%	26.0%	26.0%	19.0%	19.0%	0.0%	29.0%	29.0%	0.0%	26.0%	26.0%
Maximum Green (s)	20.0	20.0	20.0	20.0	13.0	13.0		23.0	23.0		20.0	20.0
Yellow Time (s)	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		3.0	3.0
Lead/Lag								Lead	Lead		Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max		None	None		None	None
Walk Time (s)	7.0	7.0	7.0	7.0							7.0	7.0
Flash Dont Walk (s)	1.0	1.0	1.0	1.0							1.0	1.0
Pedestrian Calls (#/hr)	0	0	0	0							0	0
Act Effct Green (s)			22.0	22.0		17.4		22.6	22.6			22.0
Actuated g/C Ratio			0.22	0.22		0.17		0.23	0.23			0.22
v/c Ratio			1.11	1.08		1.09		0.75	0.75			1.01
Control Delay			110.6	71.0		104.7		46.1	38.1			67.2

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	48
Confl. Peds. (#/hr)	16
Peak Hour Factor	0.73
Heavy Vehicles (%)	0%
Parking (#/hr)	
Adj. Flow (vph)	66
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay			0.0	74.6		186.2		26.9	19.1			49.6
Total Delay			110.6	145.6		290.9		73.1	57.2			116.8
LOS			F	F		F		E	E			F
Approach Delay			128.9			290.9			62.5			116.8
Approach LOS			F			F			E			F
90th %ile Green (s)	20.0	20.0	20.0	20.0	13.0	13.0		23.0	23.0		20.0	20.0
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
70th %ile Green (s)	20.0	20.0	20.0	20.0	13.0	13.0		23.0	23.0		20.0	20.0
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
50th %ile Green (s)	20.0	20.0	20.0	20.0	13.2	13.2		22.8	22.8		20.0	20.0
50th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Max	Max
30th %ile Green (s)	20.0	20.0	20.0	20.0	17.1	17.1		18.9	18.9		20.0	20.0
30th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Max	Max
10th %ile Green (s)	20.0	20.0	20.0	20.0	20.9	20.9		15.1	15.1		20.0	20.0
10th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Max	Max
Stops (vph)			319	112		280		168	347			549
Fuel Used(gal)			12	12		10		3	5			13
CO Emissions (g/hr)			855	836		707		203	379			876
NOx Emissions (g/hr)			166	163		138		39	74			171
VOC Emissions (g/hr)			198	194		164		47	88			203
Dilemma Vehicles (#)			0	0		0		0	0			0
Queue Length 50th (ft)			~241	~210		~250		158	157			~241
Queue Length 95th (ft)			189	#426		155		212	194			m#374
Internal Link Dist (ft)			585			125			145			126
Turn Bay Length (ft)												
Base Capacity (vph)			538	607		555		344	690			701
Starvation Cap Reductn			0	0		0		109	218			0
Spillback Cap Reductn			0	85		156		0	0			82
Storage Cap Reductn			0	0		0		0	0			0
Reduced v/c Ratio			1.11	1.26		1.52		0.99	0.99			1.14

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 14 (14%), Referenced to phase 4:WBTL, Start of Green

Natural Cycle: 105

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 142.0 Intersection LOS: F

Intersection Capacity Utilization 79.7% ICU Level of Service D

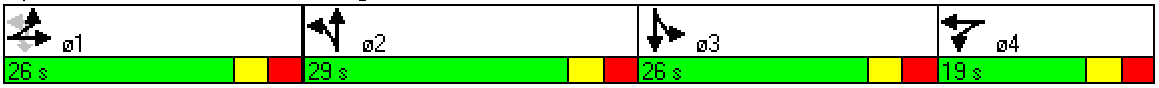
Analysis Period (min) 15

~ 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: 10: Congress Street & D Street



Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	13	12	12	16	16	12	16	12	11	13	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95	0.91	0.91	0.95
Ped Bike Factor	0.99	0.99				0.96	0.99	0.99		0.98	0.99	
Frt		0.974				0.850		0.978			0.965	
Flt Protected	0.950				0.991		0.950			0.950	0.991	
Satd. Flow (prot)	1540	2887	0	0	3493	1584	1518	3297	0	1415	2960	0
Flt Permitted	0.315				0.535		0.950			0.950	0.991	
Satd. Flow (perm)	505	2887	0	0	1886	1513	1508	3297	0	1387	2949	0
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)		31						18			34	
Headway Factor	1.19	1.17	1.14	1.14	0.97	0.97	1.14	1.04	1.14	1.19	1.10	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		523			1228			316			323	
Travel Time (s)		11.9			27.9			7.2			7.3	
Volume (vph)	322	548	110	72	328	384	92	371	52	371	338	111
Confl. Peds. (#/hr)	20		43	43		20	10		32	32		10
Peak Hour Factor	0.93	0.95	0.92	0.83	0.80	0.76	0.70	0.69	0.57	0.89	0.89	0.74
Heavy Vehicles (%)	2%	5%	13%	2%	5%	4%	7%	2%	8%	1%	4%	3%
Parking (#/hr)		0	0					0	0			
Adj. Flow (vph)	346	577	120	87	410	505	131	538	91	417	380	150
Lane Group Flow (vph)	346	697	0	0	497	505	131	629	0	299	648	0
Turn Type	D.P+P			Perm		pm+ov	Split			Split		
Protected Phases	4	1 4			1	2	3	3		2	2	
Permitted Phases	1			1		1						
Detector Phases	4	1 4		1	1	2	3	3		2	2	
Minimum Initial (s)	6.0			10.0	10.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	12.0			28.0	28.0	24.0	26.0	26.0		24.0	24.0	
Total Split (s)	17.0	47.0	0.0	30.0	30.0	26.0	27.0	27.0	0.0	26.0	26.0	0.0
Total Split (%)	17.0%	47.0%	0.0%	30.0%	30.0%	26.0%	27.0%	27.0%	0.0%	26.0%	26.0%	0.0%
Maximum Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
Yellow Time (s)	3.0			3.0	3.0	3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0			2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag						Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None			C-Max	C-Max	Ped	Ped	Ped		Ped	Ped	
Walk Time (s)				7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)				16.0	16.0	11.0	13.0	13.0		11.0	11.0	
Pedestrian Calls (#/hr)				0	0	0	0	0		0	0	
Act Effct Green (s)	39.4	43.4			26.4	48.4	22.6	22.6		22.0	22.0	
Actuated g/C Ratio	0.39	0.43			0.26	0.48	0.23	0.23		0.22	0.22	
v/c Ratio	1.04	0.55			1.13dl	0.68	0.38	0.83		0.96	0.96	
Control Delay	84.9	22.1			78.4	23.2	36.4	46.4		73.3	53.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0			0.0	0.0	0.0	1.1		0.0	0.2	
Total Delay	84.9	22.1			78.4	23.2	36.4	47.5		73.3	53.9	
LOS	F	C			E	C	D	D		E	D	
Approach Delay		43.0			50.6			45.6			60.0	
Approach LOS		D			D			D			E	
90th %ile Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
90th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
70th %ile Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
70th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
50th %ile Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
50th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
30th %ile Green (s)	12.0			25.0	25.0	21.0	22.0	22.0		21.0	21.0	
30th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
10th %ile Green (s)	12.0			27.0	27.0	21.0	20.0	20.0		21.0	21.0	
10th %ile Term Code	Max			Coord	Coord	Max	Ped	Ped		Max	Max	
Stops (vph)	209	455			340	287	77	375		216	441	
Fuel Used(gal)	8	8			12	7	1	7		6	10	
CO Emissions (g/hr)	562	571			845	495	93	497		408	691	
NOx Emissions (g/hr)	109	111			165	96	18	97		79	135	
VOC Emissions (g/hr)	130	132			196	115	22	115		95	160	
Dilemma Vehicles (#)	0	0			0	0	0	0		0	0	
Queue Length 50th (ft)	~170	162			~171	216	71	195		201	207	
Queue Length 95th (ft)	#322	220			#231	248	95	186		m#394	#336	
Internal Link Dist (ft)		443			1148			236			243	
Turn Bay Length (ft)												
Base Capacity (vph)	334	1270			498	748	349	772		311	678	
Starvation Cap Reductn	0	0			0	0	0	0		0	1	
Spillback Cap Reductn	0	0			0	0	0	37		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	1.04	0.55			1.00	0.68	0.38	0.86		0.96	0.96	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 60 (60%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 49.8 Intersection LOS: D
Intersection Capacity Utilization 88.2% ICU Level of Service E
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.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 11: Summer Street & D Street

Build Conditions with Mitigation (2019) Level of Service Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Signalized Intersections				
Summer Street/Drydock Avenue	**F**	**>80.0**		
Summer EB left	F	>80.0	>1.00	#461
Summer EB thru | thru/right	A	7.1	0.33	139
Summer WB left	D	43.9	0.47	25
Summer WB thru | thru/right	F	>80.0	>1.00	#853
Pappas NB left/thru/right	E	58.8	0.77	#142
Drydock SB left/thru	E	69.6	0.81	#133
Drydock SB right	A	3.0	0.24	23
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**C**	**26.7**		
Seaport EB left/thru | thru/right	D	40.3	0.85	#436
Seaport WB left/thru | thru/right	A	8.7	0.58	126
Fish Pier SB left/thru/right	D	54.6	0.72	99
Northern Avenue/D Street (northbound)	**B**	**19.5**		
Northern EB thru | thru	A	7.6	0.31	36
Northern WB thru | thru	C	25.3	0.37	#211
D NB left	D	46.6	0.79	m175
D NB right	A	6.6	0.50	6
Congress Street/D Street	**E**	**57.5**		
Congress EB left/thru | thru/right	E	66.8	0.96	#317
Congress EB right	C	27.6	0.93	#282
Congress WB left/thru | thru/right	E	64.7	0.95	102
D NB left	F	>80.0	0.89	#309
D NB left/thru | thru/right	E	58.8	0.87	96
D SB left/thru | thru/right	D	53.2	0.74	m134
Summer Street/D Street	**E**	**68.5**		
Summer EB left	D	46.4	0.83	#196
Summer EB thru | thru/right	B	16.4	0.41	121
Summer WB left/thru | thru	F	>80.0	>1.00dl	#397
Summer WB right	C	32.6	0.85	#540
D NB left	D	43.6	0.58	120
D NB thru | thru/right	D	39.1	0.70	183
D SB left	F	>80.0	>1.00	#313
D SB thru | thru/right	C	25.4	0.69	184
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	2.1	0.18	13
Drydock WB left/thru/right	A	0.7	0.02	1
Harbor NB left/thru	F	>50.0	0.29	27
Harbor NB right	B	12.2	0.05	4
Harbor SB left/thru/right	D	34.5	0.56	79

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	4.6	0.19	18
Drydock WB left/thru/right	A	0.4	0.01	0
Design Center NB left/thru/right	D	26.9	0.20	19
Garage SB left/thru/right	B	13.3	0.09	7
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	3.7	0.11	9
Drydock WB left/thru/right	A	0.0	0.00	0
Parking NB left/thru/right	C	16.2	0.10	8
Tide SB left/thru/right	E	37.7	0.78	165
Northern Avenue/Tide Street				
Northern EB left/thru/right	C	21.0	0.69	136
Alley WB left/thru/right	A	0.0	0.00	0
Tide NB left/thru/right	A	6.4	0.15	14
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.6	0.06	5
Northern WB thru/right	A	0.0	0.14	0
Seafood SB left/right	B	12.0	0.12	10
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.51	0
Northern WB left/thru	A	1.4	0.04	3
Harbor NB left/right	F	>50.0	0.82	154
Unsignalized Roundabouts				
Northern Avenue/Haul Road				
Northern EB left/thru	C	16.4	0.71	100
Northern EB right	A	5.1	0.13	9
Northern WB left	A	6.6	0.11	7
Northern WB thru/right	A	8.8	0.36	28
Haul NB left/thru	B	10.8	0.21	17
Haul NB right	C	15.7	0.43	45
Parking SB left/thru/right	A	7.2	0.04	3

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m = 95th percentile queue is metered by upstream traffic signal.
* = defacto lane

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	12	13
Storage Length (ft)	0		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.972			0.971			0.993				0.850
Flt Protected	0.950			0.950				0.975			0.960	
Satd. Flow (prot)	1490	2673	0	1438	3074	0	0	1601	0	0	1354	1231
Flt Permitted	0.100			0.100				0.625			0.621	
Satd. Flow (perm)	157	2673	0	151	3074	0	0	1026	0	0	876	1231
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		44			35			2				159
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.01	1.14	1.14	1.14	1.10
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1228			692			321			611	
Travel Time (s)		27.9			15.7			7.3			13.9	
Volume (vph)	326	440	72	17	1203	314	58	46	6	75	16	132
Peak Hour Factor	0.80	0.91	0.64	0.50	0.83	0.90	0.74	0.69	0.75	0.66	0.67	0.83
Heavy Vehicles (%)	9%	17%	23%	13%	3%	1%	15%	14%	0%	23%	13%	22%
Adj. Flow (vph)	408	484	112	34	1449	349	78	67	8	114	24	159
Lane Group Flow (vph)	408	596	0	34	1798	0	0	153	0	0	138	159
Turn Type	D.P+P			Perm			Perm			Perm		custom
Protected Phases	4	1 4			1			3			3	4
Permitted Phases	1			1			3			3		3 4
Detector Phases	4	1 4		1	1		3	3		3	3	4
Minimum Initial (s)	8.0			8.0	8.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	12.0			20.0	20.0		20.0	20.0		20.0	20.0	12.0
Total Split (s)	15.0	59.0	0.0	44.0	44.0	0.0	20.0	20.0	0.0	20.0	20.0	15.0
Total Split (%)	15.0%	59.0%	0.0%	44.0%	44.0%	0.0%	20.0%	20.0%	0.0%	20.0%	20.0%	15.0%
Maximum Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
Yellow Time (s)	3.0			4.0	4.0		4.0	4.0		4.0	4.0	3.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lag			Lead	Lead		Lead	Lead		Lead	Lead	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	None			Min	Min		None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	51.5	55.5		40.4	40.4			16.1			16.1	31.3
Actuated g/C Ratio	0.62	0.67		0.49	0.49			0.19			0.19	0.38
v/c Ratio	1.48	0.33		0.47	1.19			0.77			0.81	0.28
Control Delay	259.1	7.1		43.9	115.8			58.8			69.6	5.4
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0

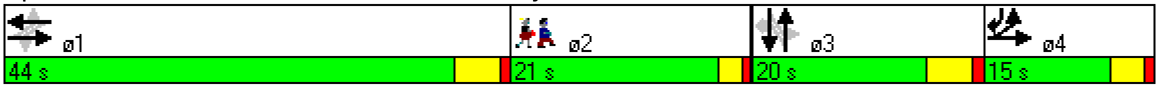
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	3.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	12.0
Flash Dont Walk (s)	6.0
Pedestrian Calls (#/hr)	13
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	259.1	7.1		43.9	115.8			58.8			69.6	5.4
LOS	F	A		D	F			E			E	A
Approach Delay		109.5			114.5			58.8			35.2	
Approach LOS		F			F			E			D	
90th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
90th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
70th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
70th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
50th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
50th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
30th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
30th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
10th %ile Green (s)	11.0			39.0	39.0		15.0	15.0		15.0	15.0	11.0
10th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
Stops (vph)	182	191		12	1205			88			73	17
Fuel Used(gal)	21	7		0	51			2			2	1
CO Emissions (g/hr)	1491	468		22	3538			145			149	61
NOx Emissions (g/hr)	290	91		4	688			28			29	12
VOC Emissions (g/hr)	345	108		5	820			34			34	14
Dilemma Vehicles (#)	0	0		0	0			0			0	0
Queue Length 50th (ft)	~235	45		10	~553			70			65	0
Queue Length 95th (ft)	#461	139		25	#853			#142			#133	35
Internal Link Dist (ft)		1148			612			241			531	
Turn Bay Length (ft)				150								
Base Capacity (vph)	275	1797		73	1509			200			170	562
Starvation Cap Reductn	0	0		0	0			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	1.48	0.33		0.47	1.19			0.77			0.81	0.28

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 83.2
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.48
Intersection Signal Delay: 103.2 Intersection LOS: F
Intersection Capacity Utilization 91.5% ICU Level of Service F
Analysis Period (min) 15
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 79
50th %ile Actuated Cycle: 79
30th %ile Actuated Cycle: 79
10th %ile Actuated Cycle: 79
~ 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: Summer Street & Drydock Avenue



Lane Group	ø2
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	18.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	147	519	15	6	155	23	11	1	15	29	11	59
Peak Hour Factor	0.79	0.92	0.63	0.38	0.80	0.71	0.69	0.25	0.54	0.61	0.55	0.72
Hourly flow rate (vph)	186	564	24	16	194	32	16	4	28	48	20	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		611										
pX, platoon unblocked												
vC, conflicting volume	226			564			1282	1206	294	926	1178	210
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	226			564			1282	1206	294	926	1178	210
tC, single (s)	4.3			4.1			8.0	8.5	8.4	7.6	7.4	7.6
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.8	5.0	4.0	3.5	4.5	3.7
p0 queue free %	85			98			76	94	95	73	83	88
cM capacity (veh/h)	1283			1018			67	72	530	176	115	698

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	468	306	242	20	28	149
Volume Left	186	0	16	16	0	48
Volume Right	0	24	32	0	28	82
cSH	1283	1700	1018	68	530	266
Volume to Capacity	0.15	0.18	0.02	0.29	0.05	0.56
Queue Length 95th (ft)	13	0	1	27	4	79
Control Delay (s)	4.2	0.0	0.7	78.7	12.2	34.5
Lane LOS	A		A	F	B	D
Approach Delay (s)	2.5		0.7	40.0		34.5
Approach LOS				E		D

Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	183	293	23	3	134	7	17	2	7	5	0	29
Peak Hour Factor	0.67	0.91	0.50	0.38	0.89	0.58	0.70	0.50	0.50	0.63	0.25	0.88
Hourly flow rate (vph)	273	322	46	8	151	12	24	4	14	8	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	163			368			1097	1070	345	1080	1087	157
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	163			368			1097	1070	345	1080	1087	157
tC, single (s)	4.1			4.1			7.2	6.5	6.7	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.8	3.5	4.0	3.3
p0 queue free %	81			99			84	98	98	95	100	96
cM capacity (veh/h)	1428			1202			152	179	601	161	175	894

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	641	171	42	41
Volume Left	273	8	24	8
Volume Right	46	12	14	33
cSH	1428	1202	206	475
Volume to Capacity	0.19	0.01	0.20	0.09
Queue Length 95th (ft)	18	0	19	7
Control Delay (s)	4.6	0.4	26.9	13.3
Lane LOS	A	A	D	B
Approach Delay (s)	4.6	0.4	26.9	13.3
Approach LOS			D	B

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	127	157	9	0	55	68	11	6	4	190	14	78
Peak Hour Factor	0.96	0.79	0.45	0.92	0.69	0.78	0.88	0.38	0.50	0.89	0.88	0.83
Hourly flow rate (vph)	132	199	20	0	80	87	12	16	8	213	16	94
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	167			219			699	640	209	613	607	123
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	167			219			699	640	209	613	607	123
tC, single (s)	4.4			4.1			7.1	6.7	6.5	7.2	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.2	3.5	3.6	4.0	3.5
p0 queue free %	89			100			96	95	99	38	96	89
cM capacity (veh/h)	1253			1363			284	335	777	342	370	874

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	351	167	36	323
Volume Left	132	0	12	213
Volume Right	20	87	8	94
cSH	1253	1363	357	417
Volume to Capacity	0.11	0.00	0.10	0.78
Queue Length 95th (ft)	9	0	8	165
Control Delay (s)	3.7	0.0	16.2	37.7
Lane LOS	A		C	E
Approach Delay (s)	3.7	0.0	16.2	37.7
Approach LOS			C	E

Intersection Summary			
Average Delay	16.0		
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	107	1	275	0	0	0	152	54	4	0	16	46
Peak Hour Factor	0.78	0.25	0.84	0.92	0.92	0.92	0.76	0.83	0.50	0.92	0.60	0.69
Hourly flow rate (vph)	137	4	327	0	0	0	200	65	8	0	27	67
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	529	533	60	858	562	69	93			73		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	529	533	60	858	562	69	93			73		
tC, single (s)	7.1	6.5	6.3	7.1	6.5	6.2	4.5			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.6			2.2		
p0 queue free %	66	99	66	100	100	100	85			100		
cM capacity (veh/h)	403	385	975	161	369	994	1298			1527		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	469	0	273	93
Volume Left	137	0	200	0
Volume Right	327	0	8	67
cSH	683	1700	1298	1527
Volume to Capacity	0.69	0.00	0.15	0.00
Queue Length 95th (ft)	136	0	14	0
Control Delay (s)	21.0	0.0	6.4	0.0
Lane LOS	C	A	A	
Approach Delay (s)	21.0	0.0	6.4	0.0
Approach LOS	C	A		

Intersection Summary			
Average Delay	13.9		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	60	662	194	6	3	52
Peak Hour Factor	0.81	0.91	0.84	0.50	0.75	0.78
Hourly flow rate (vph)	74	727	231	12	4	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	243				1113	237
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	243				1113	237
tC, single (s)	4.5				6.7	6.8
tC, 2 stage (s)						
tF (s)	2.5				3.8	3.9
p0 queue free %	94				98	90
cM capacity (veh/h)	1148				188	674

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	802	243	71
Volume Left	74	0	4
Volume Right	0	12	67
cSH	1148	1700	588
Volume to Capacity	0.06	0.14	0.12
Queue Length 95th (ft)	5	0	10
Control Delay (s)	1.6	0.0	12.0
Lane LOS	A		B
Approach Delay (s)	1.6	0.0	12.0
Approach LOS			B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	690	72	19	231	113	38
Peak Hour Factor	0.90	0.72	0.79	0.84	0.82	0.75
Hourly flow rate (vph)	767	100	24	275	138	51
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			867		1140	817
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			867		1140	817
tC, single (s)			4.6		6.5	6.4
tC, 2 stage (s)						
tF (s)			2.7		3.6	3.5
p0 queue free %			96		33	85
cM capacity (veh/h)			598		206	348

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	867	299	188
Volume Left	0	24	138
Volume Right	100	0	51
cSH	1700	598	231
Volume to Capacity	0.51	0.04	0.82
Queue Length 95th (ft)	0	3	154
Control Delay (s)	0.0	1.4	65.3
Lane LOS		A	F
Approach Delay (s)	0.0	1.4	65.3
Approach LOS			F

Intersection Summary			
Average Delay	9.4		
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: Build_AM

Northern Avenue at Trilling Road
Roundabout

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
Movement Performance - Vehicles											
South: Trilling Road											
3	L	91	16.6	0.206	10.8	LOS B	0.6	17.3	0.59	0.89	24.4
8	T	4	0.0	0.206	10.8	LOS B	0.6	17.3	0.59	0.78	26.1
18	R	201	16.0	0.433	15.7	LOS C	1.6	45.2	0.66	0.92	23.7
Approach		297	15.9	0.433	14.1	LOS B	1.6	45.2	0.64	0.91	23.9
East: Northern Avenue											
1	L	70	52.0	0.105	6.6	LOS A	0.2	6.6	0.21	0.70	26.3
6	T	290	25.0	0.366	8.8	LOS A	0.9	28.4	0.24	0.57	27.5
16	R	7	33.0	0.366	8.8	LOS A	0.9	28.4	0.24	0.72	26.9
Approach		366	30.3	0.366	8.4	LOS A	0.9	28.4	0.24	0.60	27.3
North East: Parking Lot											
1X	L	13	33.3	0.044	7.2	LOS A	0.1	2.6	0.39	0.84	26.4
16X	R	11	40.0	0.044	7.2	LOS A	0.1	2.6	0.39	0.65	28.3
Approach		24	36.4	0.044	7.2	LOS A	0.1	2.6	0.39	0.75	27.2
West: Northern Avenue											
5	L	30	35.4	0.710	16.4	LOS C	3.7	100.3	0.38	0.84	22.3
2	T	625	11.0	0.710	16.4	LOS C	3.7	100.3	0.38	0.59	23.9
12	R	117	12.0	0.128	5.1	LOS A	0.3	8.9	0.19	0.60	29.1
Approach		773	12.1	0.710	14.7	LOS B	3.7	100.3	0.35	0.60	24.5
All Vehicles		1460	17.8	0.710	12.9	LOS B	3.7	100.3	0.38	0.67	25.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	11	15	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.963			0.986						0.944	
Flt Protected		0.997			0.994						0.981	
Satd. Flow (prot)	0	2815	0	0	2812	0	0	0	0	0	1266	0
Flt Permitted		0.735			0.578						0.981	
Satd. Flow (perm)	0	2075	0	0	1635	0	0	0	0	0	1266	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)					16						30	
Headway Factor	1.14	1.22	1.14	1.01	1.19	1.01	1.14	1.14	1.14	1.14	1.14	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		450			148			271			263	
Travel Time (s)		10.2			3.4			6.2			6.0	
Volume (vph)	34	435	151	84	567	65	0	0	0	40	19	31
Peak Hour Factor	0.84	0.80	0.79	0.86	0.92	0.88	0.92	0.92	0.92	0.75	0.75	0.55
Heavy Vehicles (%)	15%	5%	4%	10%	8%	21%	2%	2%	2%	28%	37%	17%
Parking (#/hr)		0	0									
Adj. Flow (vph)	40	544	191	98	616	74	0	0	0	53	25	56
Lane Group Flow (vph)	0	775	0	0	788	0	0	0	0	0	134	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					14.0	14.0	
Total Split (s)	25.0	25.0	0.0	35.0	25.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0
Total Split (%)	25.0%	25.0%	0.0%	35.0%	25.0%	0.0%	0.0%	0.0%	0.0%	19.0%	19.0%	0.0%
Maximum Green (s)	20.0	20.0		30.0	20.0					14.0	14.0	
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	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	C-Max					None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		44.1			67.0						12.6	
Actuated g/C Ratio		0.44			0.67						0.13	
v/c Ratio		0.85			0.58						0.72	
Control Delay		40.3			7.9						53.8	
Queue Delay		0.0			0.8						0.9	
Total Delay		40.3			8.7						54.6	

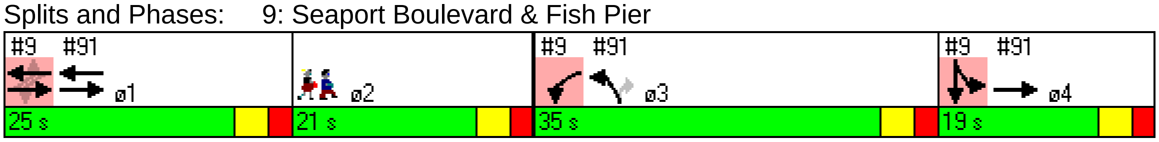
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	16.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		D			A						D	
Approach Delay		40.3			8.7						54.6	
Approach LOS		D			A						D	
90th %ile Green (s)	20.0	20.0		30.0	20.0					14.0	14.0	
90th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
70th %ile Green (s)	24.1	24.1		25.9	24.1					14.0	14.0	
70th %ile Term Code	Coord	Coord		Gap	Coord					Max	Max	
50th %ile Green (s)	49.7	49.7		22.5	49.7					12.8	12.8	
50th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
30th %ile Green (s)	56.2	56.2		19.0	56.2					9.8	9.8	
30th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
10th %ile Green (s)	65.6	65.6		11.8	65.6					7.6	7.6	
10th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
Stops (vph)		346			241						65	
Fuel Used(gal)		9			3						2	
CO Emissions (g/hr)		641			231						106	
NOx Emissions (g/hr)		125			45						21	
VOC Emissions (g/hr)		149			54						25	
Dilemma Vehicles (#)		0			0						0	
Queue Length 50th (ft)		195			31						63	
Queue Length 95th (ft)		#436			126						99	
Internal Link Dist (ft)		370			68			191			183	
Turn Bay Length (ft)												
Base Capacity (vph)		916			1369						215	
Starvation Cap Reductn		0			287						0	
Spillback Cap Reductn		1			0						11	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.85			0.73						0.66	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 26.7 Intersection LOS: C
Intersection Capacity Utilization 57.9% ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Seaport Boulevard & Fish Pier



Lane Group	ø2
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	16.0
90th %ile Term Code	Ped
70th %ile Green (s)	16.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

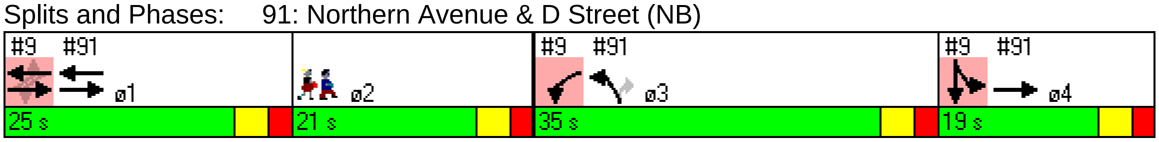
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	16	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00		
Frt						0.850		
Flt Protected					0.950			
Satd. Flow (prot)	3094	0	0	2855	1450	1172		
Flt Permitted					0.950			
Satd. Flow (perm)	3094	0	0	2855	1450	1172		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						215		
Headway Factor	1.14	0.97	1.14	1.19	1.14	1.14		
Link Speed (mph)	30			30	30			
Link Distance (ft)	148			788	266			
Travel Time (s)	3.4			17.9	6.0			
Volume (vph)	462	0	0	427	216	129		
Peak Hour Factor	0.80	0.92	0.92	0.92	0.83	0.60		
Heavy Vehicles (%)	5%	2%	2%	10%	12%	24%		
Adj. Flow (vph)	578	0	0	464	260	215		
Lane Group Flow (vph)	578	0	0	464	260	215		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	14.0
Total Split (s)	44.0	0.0	0.0	25.0	35.0	35.0	21.0	19.0
Total Split (%)	44.0%	0.0%	0.0%	25.0%	35.0%	35.0%	21%	19%
Maximum Green (s)				20.0	30.0	30.0	16.0	14.0
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?								
Vehicle Extension (s)				2.0	2.0	2.0	2.0	2.0
Recall Mode				C-Max	None	None	None	None
Walk Time (s)							7.0	
Flash Dont Walk (s)							9.0	
Pedestrian Calls (#/hr)							20	
Act Effct Green (s)	60.8			44.1	22.8	22.8		
Actuated g/C Ratio	0.61			0.44	0.23	0.23		
v/c Ratio	0.31			0.37	0.79	0.50		
Control Delay	5.7			25.2	46.6	6.6		
Queue Delay	1.9			0.0	0.1	0.0		
Total Delay	7.6			25.3	46.7	6.6		
LOS	A			C	D	A		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Approach Delay	7.6			25.3	28.5			
Approach LOS	A			C	C			
90th %ile Green (s)				20.0	30.0	30.0	16.0	14.0
90th %ile Term Code				Coord	Max	Max	Ped	Max
70th %ile Green (s)				24.1	25.9	25.9	16.0	14.0
70th %ile Term Code				Coord	Gap	Gap	Ped	Max
50th %ile Green (s)				49.7	22.5	22.5	0.0	12.8
50th %ile Term Code				Coord	Gap	Gap	Skip	Gap
30th %ile Green (s)				56.2	19.0	19.0	0.0	9.8
30th %ile Term Code				Coord	Gap	Gap	Skip	Gap
10th %ile Green (s)				65.6	11.8	11.8	0.0	7.6
10th %ile Term Code				Coord	Gap	Gap	Skip	Gap
Stops (vph)	48			293	190	19		
Fuel Used(gal)	1			6	4	1		
CO Emissions (g/hr)	93			450	248	38		
NOx Emissions (g/hr)	18			88	48	7		
VOC Emissions (g/hr)	22			104	57	9		
Dilemma Vehicles (#)	0			0	0	0		
Queue Length 50th (ft)	7			87	147	6		
Queue Length 95th (ft)	36			#211	m175	6		
Internal Link Dist (ft)	68			708	186			
Turn Bay Length (ft)								
Base Capacity (vph)	1863			1260	450	512		
Starvation Cap Reductn	1087			0	0	0		
Spillback Cap Reductn	0			78	8	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.74			0.39	0.59	0.42		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 39 (39%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 19.5 Intersection LOS: B
Intersection Capacity Utilization 34.2% ICU Level of Service A
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: 91: Northern Avenue & D Street (NB)



Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	12	13	12	11	12	12	12	14
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50		50	50		50	50
Trailing Detector (ft)	0	0	0	0	0	0		0	0		0	0
Turning Speed (mph)	9	15		9	15		9	15		9	15	
Lane Util. Factor	0.95	0.95	0.91	0.91	0.95	0.95	0.95	0.91	0.91	0.95	0.95	0.95
Ped Bike Factor			0.92	0.58		0.90		0.97	0.98			0.98
Frt				0.850		0.948			0.968			0.985
Flt Protected			0.979			0.991		0.950	0.985			0.991
Satd. Flow (prot)	0	0	2567	1277	0	2693	0	1276	2463	0	0	2625
Flt Permitted			0.979			0.991		0.950	0.985			0.991
Satd. Flow (perm)	0	0	2366	737	0	2606	0	1242	2443	0	0	2579
Right Turn on Red				Yes			Yes			Yes		
Satd. Flow (RTOR)				557		80			32			10
Headway Factor	1.14	1.14	1.14	1.10	1.14	1.10	1.14	1.19	1.22	1.14	1.14	1.13
Link Speed (mph)			30			30			30			30
Link Distance (ft)			665			205			225			206
Travel Time (s)			15.1			4.7			5.1			4.7
Volume (vph)	6	190	303	529	78	129	79	412	183	53	36	191
Confl. Peds. (#/hr)		58		239	239		58	11		60	60	
Peak Hour Factor	0.25	0.83	0.89	0.95	0.91	0.55	0.47	0.84	0.64	0.41	0.63	0.82
Heavy Vehicles (%)	0%	35%	9%	7%	5%	12%	6%	12%	16%	6%	8%	25%
Parking (#/hr)									0	0	0	0
Adj. Flow (vph)	24	229	340	557	86	235	168	490	286	129	57	233
Lane Group Flow (vph)	0	0	593	557	0	489	0	304	601	0	0	323
Turn Type	Perm	Split		Perm	Split			Split			Split	
Protected Phases		1	1		4	4		2	2		3	3
Permitted Phases	1			1								
Detector Phases	1	1	1	1	4	4		2	2		3	3
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0
Total Split (s)	28.0	28.0	28.0	28.0	19.0	19.0	0.0	32.0	32.0	0.0	21.0	21.0
Total Split (%)	28.0%	28.0%	28.0%	28.0%	19.0%	19.0%	0.0%	32.0%	32.0%	0.0%	21.0%	21.0%
Maximum Green (s)	22.0	22.0	22.0	22.0	13.0	13.0		26.0	26.0		15.0	15.0
Yellow Time (s)	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		3.0	3.0
Lead/Lag								Lead	Lead		Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max		None	None		None	None
Walk Time (s)	7.0	7.0	7.0	7.0							7.0	7.0
Flash Dont Walk (s)	1.0	1.0	1.0	1.0							1.0	1.0
Pedestrian Calls (#/hr)	0	0	0	0							0	0
Act Effct Green (s)			24.0	24.0		16.7		26.9	26.9			16.4
Actuated g/C Ratio			0.24	0.24		0.17		0.27	0.27			0.16
v/c Ratio			0.96	0.93		0.95		0.89	0.87			0.74
Control Delay			66.8	27.6		64.7		53.5	38.5			53.2

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	26
Confl. Peds. (#/hr)	11
Peak Hour Factor	0.79
Heavy Vehicles (%)	23%
Parking (#/hr)	
Adj. Flow (vph)	33
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay			0.0	0.0		0.0		31.2	20.3			0.0
Total Delay			66.8	27.6		64.7		84.7	58.8			53.2
LOS			E	C		E		F	E			D
Approach Delay			47.8			64.7			67.5			53.2
Approach LOS			D			E			E			D
90th %ile Green (s)	22.0	22.0	22.0	22.0	13.0	13.0		26.0	26.0		15.0	15.0
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
70th %ile Green (s)	22.0	22.0	22.0	22.0	13.0	13.0		26.0	26.0		15.0	15.0
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
50th %ile Green (s)	22.0	22.0	22.0	22.0	13.0	13.0		26.0	26.0		15.0	15.0
50th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
30th %ile Green (s)	22.0	22.0	22.0	22.0	13.0	13.0		26.0	26.0		15.0	15.0
30th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
10th %ile Green (s)	22.0	22.0	22.0	22.0	21.6	21.6		20.6	20.6		11.8	11.8
10th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Gap	Gap		Gap	Gap
Stops (vph)			440	42		201		191	272			234
Fuel Used(gal)			12	6		5		4	5			4
CO Emissions (g/hr)			825	416		373		299	368			310
NOx Emissions (g/hr)			161	81		73		58	72			60
VOC Emissions (g/hr)			191	96		86		69	85			72
Dilemma Vehicles (#)			0	0		0		0	0			0
Queue Length 50th (ft)			206	0		~153		115	104			107
Queue Length 95th (ft)			#317	#282		102		#307	96			m134
Internal Link Dist (ft)			585			125			145			126
Turn Bay Length (ft)												
Base Capacity (vph)			616	600		517		357	713			455
Starvation Cap Reductn			0	0		0		64	121			0
Spillback Cap Reductn			0	0		0		0	0			0
Storage Cap Reductn			0	0		0		0	0			0
Reduced v/c Ratio			0.96	0.93		0.95		1.04	1.02			0.71

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 28 (28%), Referenced to phase 4:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 57.5 Intersection LOS: E
Intersection Capacity Utilization 73.0% ICU Level of Service D
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: 10: Congress Street & D Street

Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	13	12	12	12	16	16	12	16	12	11	13
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50	50	50	50	50		50	50
Trailing Detector (ft)	0	0		0	0	0	0	0	0		0	0
Turning Speed (mph)	15		9	9	15		9	15		9	15	
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95	1.00	0.95
Ped Bike Factor	0.99	0.97					0.94	0.99	0.98		0.96	0.99
Frt		0.957					0.850		0.961			0.943
Flt Protected	0.950					0.986		0.950			0.950	
Satd. Flow (prot)	1540	2715	0	0	0	3260	1525	1477	2914	0	1454	2901
Flt Permitted	0.176					0.569		0.950			0.950	
Satd. Flow (perm)	283	2715	0	0	0	1881	1440	1464	2914	0	1402	2901
Right Turn on Red			Yes				No			Yes		
Satd. Flow (RTOR)		80							45			120
Headway Factor	1.19	1.17	1.14	1.14	1.14	0.97	0.97	1.14	1.04	1.14	1.19	1.10
Link Speed (mph)		30				30			30			30
Link Distance (ft)		523				1228			316			323
Travel Time (s)		11.9				27.9			7.2			7.3
Volume (vph)	194	305	139	30	90	434	597	120	305	103	244	270
Confl. Peds. (#/hr)	27		63		63		27	10		45	45	
Peak Hour Factor	0.87	0.82	0.92	0.30	0.78	0.84	0.94	0.65	0.89	0.86	0.78	0.90
Heavy Vehicles (%)	2%	10%	8%	0%	23%	11%	8%	10%	12%	16%	8%	11%
Parking (#/hr)		0	0						0	0		
Adj. Flow (vph)	223	372	151	100	115	517	635	185	343	120	313	300
Lane Group Flow (vph)	223	523	0	0	0	732	635	185	463	0	313	485
Turn Type	D.P+P			Perm	Perm		pm+ov	Split			Split	
Protected Phases	4	1 4				1	2	3	3		2	2
Permitted Phases	1			1	1		1					
Detector Phases	4	1 4		1	1	1	2	3	3		2	2
Minimum Initial (s)	6.0			10.0	10.0	10.0	6.0	6.0	6.0		6.0	6.0
Minimum Split (s)	12.0			28.0	28.0	28.0	24.0	26.0	26.0		24.0	24.0
Total Split (s)	16.0	49.0	0.0	33.0	33.0	33.0	25.0	26.0	26.0	0.0	25.0	25.0
Total Split (%)	16.0%	49.0%	0.0%	33.0%	33.0%	33.0%	25.0%	26.0%	26.0%	0.0%	25.0%	25.0%
Maximum Green (s)	11.0			28.0	28.0	28.0	20.0	21.0	21.0		20.0	20.0
Yellow Time (s)	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	2.0			2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0
Lead/Lag							Lead	Lag	Lag		Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Recall Mode	None			C-Max	C-Max	C-Max	Ped	Ped	Ped		Ped	Ped
Walk Time (s)				7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)				16.0	16.0	16.0	11.0	13.0	13.0		11.0	11.0
Pedestrian Calls (#/hr)				0	0	0	0	0	0		0	0
Act Effct Green (s)	41.5	45.5				29.5	50.5	21.5	21.5		21.0	21.0
Actuated g/C Ratio	0.42	0.46				0.30	0.50	0.22	0.22		0.21	0.21
v/c Ratio	0.83	0.41				3.07dl	0.85	0.58	0.70		1.03	0.69
Control Delay	46.4	16.4				186.8	32.6	43.6	39.1		92.6	25.4

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	163
Confl. Peds. (#/hr)	10
Peak Hour Factor	0.88
Heavy Vehicles (%)	3%
Parking (#/hr)	
Adj. Flow (vph)	185
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay	0.0	0.0				0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	46.4	16.4				186.8	32.6	43.6	39.1		92.6	25.4
LOS	D	B				F	C	D	D		F	C
Approach Delay		25.4				115.2			40.4			51.8
Approach LOS		C				F			D			D
90th %ile Green (s)	11.0			28.0	28.0	28.0	20.0	21.0	21.0		20.0	20.0
90th %ile Term Code	Max			Coord	Coord	Coord	Max	Max	Max		Max	Max
70th %ile Green (s)	11.0			28.0	28.0	28.0	20.0	21.0	21.0		20.0	20.0
70th %ile Term Code	Max			Coord	Coord	Coord	Max	Max	Max		Max	Max
50th %ile Green (s)	11.0			28.7	28.7	28.7	20.0	20.3	20.3		20.0	20.0
50th %ile Term Code	Max			Coord	Coord	Coord	Max	Gap	Gap		Max	Max
30th %ile Green (s)	11.0			29.0	29.0	29.0	20.0	20.0	20.0		20.0	20.0
30th %ile Term Code	Max			Coord	Coord	Coord	Max	Ped	Ped		Max	Max
10th %ile Green (s)	11.0			29.0	29.0	29.0	20.0	20.0	20.0		20.0	20.0
10th %ile Term Code	Max			Coord	Coord	Coord	Max	Ped	Ped		Max	Max
Stops (vph)	117	243				434	492	106	334		207	307
Fuel Used(gal)	3	5				29	12	2	6		6	5
CO Emissions (g/hr)	229	324				2011	867	136	426		445	352
NOx Emissions (g/hr)	44	63				391	169	26	83		86	68
VOC Emissions (g/hr)	53	75				466	201	32	99		103	81
Dilemma Vehicles (#)	0	0				0	0	0	0		0	0
Queue Length 50th (ft)	87	94				~317	297	107	131		~216	112
Queue Length 95th (ft)	#196	121				#397	#540	120	183		#313	184
Internal Link Dist (ft)		443				1148			236			243
Turn Bay Length (ft)												
Base Capacity (vph)	269	1280				555	746	325	676		305	704
Starvation Cap Reductn	0	0				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	0.83	0.41				1.32	0.85	0.57	0.68		1.03	0.69

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 1:EBWB, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 68.5 Intersection LOS: E

Intersection Capacity Utilization 89.4% ICU Level of Service E

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.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 11: Summer Street & D Street

Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Build Conditions with Mitigation (2019) Level of Service Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Signalized Intersections				
Summer Street/Drydock Avenue	**C**	**33.5**		
Summer EB left	C	25.3	0.61	#92
Summer EB thru | thru/right	C	21.6	0.79	#538
Summer WB left	C	35.1	0.32	27
Summer WB thru | thru/right	C	26.0	0.68	260
Pappas NB left/thru/right	C	30.5	0.43	52
Drydock SB left/thru	F	>80.0	>1.00	#360
Drydock SB right	A	6.1	0.58	55
Seaport Boulevard/Northern Avenue/D Street (southbound)/Fish Pier Street	**D**	**38.9**		
Seaport EB left/thru | thru/right	D	51.2	0.95	#447
Seaport WB left/thru | thru/right	C	30.5	0.79	#244
Fish Pier SB left/thru/right	C	30.5	0.59	39
Northern Avenue/D Street (northbound)	**C**	**27.6**		
Northern EB thru | thru	A	7.3	0.23	m25
Northern WB thru | thru	C	28.8	0.61	#388
D NB left	E	60.0	0.85	m201
D NB right	B	11.5	0.29	m18
Congress Street/D Street	**F**	**>80.0**		
Congress EB left/thru | thru/right	E	72.0	1.00	192
Congress EB right	D	40.6	0.98	#364
Congress WB left/thru | thru/right	E	64.3	0.95	145
D NB left	F	>80.0	0.89	#232
D NB left/thru | thru/right	F	>80.0	0.90	#210
D SB left/thru | thru/right	F	>80.0	>1.00	m#378
Summer Street/D Street	**D**	**48.2**		
Summer EB left	E	79.8	>1.00	#310
Summer EB thru | thru/right	C	21.4	0.54	215
Summer WB left/thru | thru	E	71.6	>1.00dl	#225
Summer WB right	C	22.2	0.66	242
D NB left	D	37.6	0.40	96
D NB thru | thru/right	D	51.2	0.86	188
D SB left	E	70.7	0.96	m#393
D SB thru | thru/right	D	51.1	0.96	#335
Unsignalized Intersections				
Drydock Avenue/Harbor Street				
Drydock EB left/thru | thru/right	A	3.3	0.14	13
Drydock WB left/thru/right	A	0.2	0.01	0
Harbor NB left/thru	F	>50.0	0.89	70
Harbor NB right	B	10.1	0.02	2
Harbor SB left/thru/right	F	>50.0	0.98	226

Intersection	LOS	Delay (seconds)	V/C Ratio	95% Queue Length (feet)
Drydock Avenue/Design Center Place				
Drydock EB left/thru/right	A	4.8	0.11	9
Drydock WB left/thru/right	A	0.5	0.02	1
Design Center NB left/thru/right	F	> 50.0	> 1.00	415
Garage SB left/thru/right	C	22.0	0.62	104
Drydock Avenue/Tide Street				
Drydock EB left/thru/right	A	5.4	0.10	8
Drydock WB left/thru/right	A	0.3	0.01	1
Parking NB left/thru/right	C	22.3	0.21	20
Tide SB left/thru/right	C	21.6	0.56	86
Northern Avenue/Tide Street				
Northern EB left/thru/right	E	47.4	0.87	225
Alley WB left/thru/right	C	20.8	0.08	7
Tide NB left/thru/right	A	7.7	0.20	18
Tide SB left/thru/right	A	0.0	0.00	0
Northern Avenue/Seafood Way				
Northern EB left/thru	A	1.1	0.03	2
Northern WB thru/right	A	0.0	0.42	0
Seafood SB left/right	C	18.5	0.25	24
Northern Avenue/Harbor Street				
Northern EB thru/right	A	0.0	0.23	0
Northern WB left/thru	A	0.8	0.03	2
Harbor NB left/right	D	30.5	0.44	52
Unsignalized Roundabouts				
Northern Avenue/Haul Road				
Northern EB left/thru	A	10.0	0.43	37
Northern EB right	A	5.2	0.10	7
Northern WB left	A	7.4	0.28	22
Northern WB thru/right	B	14.0	0.65	89
Haul NB left/thru	A	6.3	0.13	11
Haul NB right	A	8.8	0.12	10
Parking SB left/thru/right	A	8.0	0.05	3

\# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m = 95th percentile queue is metered by upstream traffic signal.
* = defacto lane

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	15	12	12	12	13
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.985			0.972			0.972				0.850
Flt Protected	0.950			0.950				0.967			0.959	
Satd. Flow (prot)	1377	3068	0	1624	2946	0	0	1633	0	0	1601	1444
Flt Permitted	0.201			0.129				0.292			0.724	
Satd. Flow (perm)	291	3068	0	221	2946	0	0	493	0	0	1209	1444
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			29			13				464
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.01	1.14	1.14	1.14	1.10
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1228			692			321			611	
Travel Time (s)		27.9			15.7			7.3			13.9	
Volume (vph)	122	1043	96	16	499	97	39	5	12	314	43	421
Peak Hour Factor	0.77	0.92	0.76	0.65	0.85	0.72	0.75	0.63	0.75	0.79	0.64	0.76
Heavy Vehicles (%)	18%	4%	7%	0%	7%	8%	9%	20%	0%	2%	5%	4%
Adj. Flow (vph)	158	1134	126	25	587	135	52	8	16	397	67	554
Lane Group Flow (vph)	158	1260	0	25	722	0	0	76	0	0	464	554
Turn Type	D.P+P			Perm			Perm			Perm		custom
Protected Phases	4	1 4			1			3			3	4
Permitted Phases	1			1			3			3		3 4
Detector Phases	4	1 4		1	1		3	3		3	3	4
Minimum Initial (s)	8.0			8.0	8.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	12.0			20.0	20.0		20.0	20.0		20.0	20.0	12.0
Total Split (s)	13.0	48.0	0.0	35.0	35.0	0.0	31.0	31.0	0.0	31.0	31.0	13.0
Total Split (%)	13.0%	48.0%	0.0%	35.0%	35.0%	0.0%	31.0%	31.0%	0.0%	31.0%	31.0%	13.0%
Maximum Green (s)	9.0			30.0	30.0		26.0	26.0		26.0	26.0	9.0
Yellow Time (s)	3.0			4.0	4.0		4.0	4.0		4.0	4.0	3.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lead/Lag	Lag			Lead	Lead		Lead	Lead		Lead	Lead	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	2.0			2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	None			Min	Min		None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	37.6	41.7		28.5	28.5			27.4			27.4	40.6
Actuated g/C Ratio	0.47	0.52		0.35	0.35			0.34			0.34	0.50
v/c Ratio	0.61	0.79		0.32	0.68			0.43			1.13	0.58
Control Delay	25.3	21.6		35.1	26.0			30.5			113.5	6.1
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	25.3	21.6		35.1	26.0			30.5			113.5	6.1
LOS	C	C		D	C			C			F	A

Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	3.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	18.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	12.0
Flash Dont Walk (s)	6.0
Pedestrian Calls (#/hr)	7
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		22.0			26.3			30.5			55.1	
Approach LOS		C			C			C			E	
90th %ile Green (s)	9.0			30.0	30.0		26.0	26.0		26.0	26.0	9.0
90th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
70th %ile Green (s)	9.0			30.0	30.0		26.0	26.0		26.0	26.0	9.0
70th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
50th %ile Green (s)	9.0			30.0	30.0		26.0	26.0		26.0	26.0	9.0
50th %ile Term Code	Max			Max	Max		Max	Max		Max	Max	Max
30th %ile Green (s)	9.0			27.2	27.2		26.0	26.0		26.0	26.0	9.0
30th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
10th %ile Green (s)	9.0			19.6	19.6		26.0	26.0		26.0	26.0	9.0
10th %ile Term Code	Max			Gap	Gap		Max	Max		Max	Max	Max
Stops (vph)	62	819		14	462			40			268	70
Fuel Used(gal)	2	20		0	9			1			11	3
CO Emissions (g/hr)	150	1429		19	624			50			799	204
NOx Emissions (g/hr)	29	278		4	121			10			155	40
VOC Emissions (g/hr)	35	331		5	145			11			185	47
Dilemma Vehicles (#)	0	0		0	0			0			0	0
Queue Length 50th (ft)	36	224		8	140			23			~268	22
Queue Length 95th (ft)	#92	#538		27	260			52			#360	55
Internal Link Dist (ft)		1148			612			241			531	
Turn Bay Length (ft)												
Base Capacity (vph)	259	1644		83	1126			176			411	958
Starvation Cap Reductn	0	0		0	0			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	0.61	0.77		0.30	0.64			0.43			1.13	0.58

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 80.6

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 33.5 Intersection LOS: C

Intersection Capacity Utilization 79.3% ICU Level of Service D

Analysis Period (min) 15

90th %ile Actuated Cycle: 100

70th %ile Actuated Cycle: 79

50th %ile Actuated Cycle: 79

30th %ile Actuated Cycle: 76.2

10th %ile Actuated Cycle: 68.6

~ 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: Summer Street & Drydock Avenue

Lane Group	ø2
Approach Delay	
Approach LOS	
90th %ile Green (s)	18.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	59	149	10	6	618	32	15	1	10	9	3	150
Peak Hour Factor	0.58	0.84	0.50	0.75	0.74	0.69	0.75	0.25	0.69	0.44	0.25	0.74
Hourly flow rate (vph)	102	177	20	8	835	46	20	4	14	20	12	203
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		611										
pX, platoon unblocked												
vC, conflicting volume	882			177			1474	1288	99	1183	1255	858
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	882			177			1474	1288	99	1183	1255	858
tC, single (s)	4.3			4.1			7.6	6.5	8.7	8.3	6.6	6.9
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.6	4.0	4.2	3.9	4.0	3.3
p0 queue free %	86			99			14	97	98	77	92	33
cM capacity (veh/h)	703			1411			23	141	715	91	142	304

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	190	109	890	24	14	235
Volume Left	102	0	8	20	0	20
Volume Right	0	20	46	0	14	203
cSH	703	1700	1411	27	715	241
Volume to Capacity	0.14	0.06	0.01	0.89	0.02	0.98
Queue Length 95th (ft)	13	0	0	70	2	226
Control Delay (s)	6.7	0.0	0.2	345.4	10.1	95.7
Lane LOS	A		A	F	B	F
Approach Delay (s)	4.2		0.2	219.2		95.7
Approach LOS				F		F

Intersection Summary			
Average Delay	22.1		
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	44	91	8	13	337	4	82	0	35	4	1	211
Peak Hour Factor	0.38	0.79	1.00	0.65	0.69	0.50	0.60	0.50	0.69	0.33	0.25	0.67
Hourly flow rate (vph)	116	115	8	20	488	8	137	0	51	12	4	315
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	496			123			1200	887	119	934	887	492
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	496			123			1200	887	119	934	887	492
tC, single (s)	4.1			4.7			7.1	6.5	6.8	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.8	3.5	4.0	3.3
p0 queue free %	89			98			0	100	94	94	98	46
cM capacity (veh/h)	1078			1164			67	250	799	211	250	578

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	239	516	187	331
Volume Left	116	20	137	12
Volume Right	8	8	51	315
cSH	1078	1164	89	536
Volume to Capacity	0.11	0.02	2.11	0.62
Queue Length 95th (ft)	9	1	415	104
Control Delay (s)	4.8	0.5	614.8	22.0
Lane LOS	A	A	F	C
Approach Delay (s)	4.8	0.5	614.8	22.0
Approach LOS			F	C

Intersection Summary			
Average Delay	97.3		
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	69	56	1	3	182	150	10	12	5	62	1	144
Peak Hour Factor	0.77	0.72	0.25	0.25	0.75	0.74	0.50	0.43	0.63	0.82	0.25	0.75
Hourly flow rate (vph)	90	78	4	12	243	203	20	28	8	76	4	192
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	445			82			821	728	80	649	629	344
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	445			82			821	728	80	649	629	344
tC, single (s)	4.6			4.1			7.3	6.5	6.4	7.5	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.6			2.2			3.7	4.0	3.5	3.8	4.0	3.5
p0 queue free %	90			99			88	91	99	74	99	71
cM capacity (veh/h)	913			1528			174	315	933	288	359	664

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	171	457	56	272
Volume Left	90	12	20	76
Volume Right	4	203	8	192
cSH	913	1528	263	482
Volume to Capacity	0.10	0.01	0.21	0.56
Queue Length 95th (ft)	8	1	20	86
Control Delay (s)	5.4	0.3	22.3	21.6
Lane LOS	A	A	C	C
Approach Delay (s)	5.4	0.3	22.3	21.6
Approach LOS			C	C

Intersection Summary			
Average Delay	8.5		
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	53	0	169	1	4	0	213	19	0	0	41	119
Peak Hour Factor	0.31	0.25	0.78	0.25	0.25	0.92	0.85	0.58	0.50	0.92	0.55	0.93
Hourly flow rate (vph)	171	0	217	4	16	0	251	33	0	0	75	128
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	680	672	139	889	736	33	203			33		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	680	672	139	889	736	33	203			33		
tC, single (s)	7.3	6.5	6.5	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.6	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	39	100	74	98	94	100	80			100		
cM capacity (veh/h)	278	305	845	168	281	1047	1285			1592		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	388	20	283	203
Volume Left	171	4	251	0
Volume Right	217	0	0	128
cSH	445	248	1285	1592
Volume to Capacity	0.87	0.08	0.20	0.00
Queue Length 95th (ft)	225	7	18	0
Control Delay (s)	47.4	20.8	7.7	0.0
Lane LOS	E	C	A	
Approach Delay (s)	47.4	20.8	7.7	0.0
Approach LOS	E	C		

Intersection Summary			
Average Delay	23.5		
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	16	211	625	0	5	62
Peak Hour Factor	0.80	0.88	0.87	0.50	0.63	0.78
Hourly flow rate (vph)	20	240	718	0	8	79
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	718				998	718
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	718				998	718
tC, single (s)	4.7				7.2	6.5
tC, 2 stage (s)						
tF (s)	2.7				4.2	3.6
p0 queue free %	97				96	79
cM capacity (veh/h)	680				191	387

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	260	718	87
Volume Left	20	0	8
Volume Right	0	0	79
cSH	680	1700	354
Volume to Capacity	0.03	0.42	0.25
Queue Length 95th (ft)	2	0	24
Control Delay (s)	1.1	0.0	18.5
Lane LOS	A		C
Approach Delay (s)	1.1	0.0	18.5
Approach LOS			C

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	217	111	19	666	77	9
Peak Hour Factor	0.89	0.78	0.59	0.94	0.84	0.56
Hourly flow rate (vph)	244	142	32	709	92	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			386		1088	315
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			386		1088	315
tC, single (s)			4.2		6.5	6.8
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.8
p0 queue free %			97		59	97
cM capacity (veh/h)			1125		223	616

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	386	741	108
Volume Left	0	32	92
Volume Right	142	0	16
cSH	1700	1125	246
Volume to Capacity	0.23	0.03	0.44
Queue Length 95th (ft)	0	2	52
Control Delay (s)	0.0	0.8	30.5
Lane LOS		A	D
Approach Delay (s)	0.0	0.8	30.5
Approach LOS			D

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: Build_PM

Northern Avenue at Trilling Road
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Trilling Road											
3	L	90	3.9	0.127	6.3	LOS A	0.4	11.2	0.45	0.80	26.4
8	T	2	0.0	0.127	6.3	LOS A	0.4	11.2	0.45	0.65	28.6
18	R	61	52.0	0.122	8.8	LOS A	0.3	9.8	0.44	0.72	26.9
Approach		153	23.0	0.127	7.3	LOS A	0.4	11.2	0.45	0.77	26.7
East: Northern Avenue											
1	L	232	21.0	0.279	7.4	LOS A	0.7	21.6	0.25	0.72	25.9
6	T	612	7.0	0.654	14.0	LOS B	3.4	89.1	0.41	0.62	24.9
16	R	7	17.0	0.654	14.0	LOS B	3.4	89.1	0.41	0.73	24.5
Approach		850	10.9	0.654	12.2	LOS B	3.4	89.1	0.36	0.65	25.2
North East: Parking Lot											
1X	L	16	6.5	0.051	8.0	LOS A	0.1	3.1	0.54	0.90	26.1
16X	R	9	13.0	0.051	8.0	LOS A	0.1	3.1	0.54	0.76	27.7
Approach		25	8.8	0.051	8.0	LOS A	0.1	3.1	0.54	0.85	26.6
West: Northern Avenue											
5	L	49	25.6	0.434	10.0	LOS A	1.4	37.3	0.38	0.92	24.6
2	T	303	11.0	0.434	10.0	LOS A	1.4	37.3	0.38	0.67	26.8
12	R	84	6.0	0.098	5.2	LOS A	0.3	6.7	0.30	0.66	29.0
Approach		436	11.7	0.434	9.1	LOS A	1.4	37.3	0.37	0.69	26.9
All Vehicles		1464	12.4	0.654	10.7	LOS B	3.4	89.1	0.38	0.68	25.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	15	11	15	12	12	12	12	12	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50					50	50	
Trailing Detector (ft)	0	0		0	0					0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.934			0.993						0.915	
Flt Protected		0.998			0.990						0.993	
Satd. Flow (prot)	0	2739	0	0	2831	0	0	0	0	0	1262	0
Flt Permitted		0.671			0.535						0.993	
Satd. Flow (perm)	0	1842	0	0	1530	0	0	0	0	0	1262	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)					8						73	
Headway Factor	1.14	1.22	1.14	1.01	1.19	1.01	1.14	1.14	1.14	1.14	1.14	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		450			148			271			263	
Travel Time (s)		10.2			3.4			6.2			6.0	
Volume (vph)	31	333	278	181	736	47	0	0	0	12	21	42
Peak Hour Factor	0.84	0.80	0.79	0.86	0.92	0.88	0.92	0.92	0.92	0.75	0.75	0.55
Heavy Vehicles (%)	15%	5%	4%	10%	8%	21%	2%	2%	2%	28%	37%	17%
Parking (#/hr)		0	0									
Adj. Flow (vph)	37	416	352	210	800	53	0	0	0	16	28	76
Lane Group Flow (vph)	0	805	0	0	1063	0	0	0	0	0	120	0
Turn Type	Perm			pm+pt						Split		
Protected Phases		1		3	1					4	4	
Permitted Phases	1			1								
Detector Phases	1	1		3	1					4	4	
Minimum Initial (s)	4.0	4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0					19.0	19.0	
Total Split (s)	29.0	29.0	0.0	31.0	29.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0
Total Split (%)	29.0%	29.0%	0.0%	31.0%	29.0%	0.0%	0.0%	0.0%	0.0%	19.0%	19.0%	0.0%
Maximum Green (s)	24.0	24.0		26.0	24.0					14.0	14.0	
Yellow Time (s)	3.0	3.0		3.0	3.0					3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0					2.0	2.0	
Lead/Lag	Lead	Lead		Lead	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	C-Max					None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		46.1			68.6						11.0	
Actuated g/C Ratio		0.46			0.69						0.11	
v/c Ratio		0.95			0.79						0.59	
Control Delay		51.2			16.4						30.5	
Queue Delay		0.0			14.1						0.0	
Total Delay		51.2			30.5						30.5	

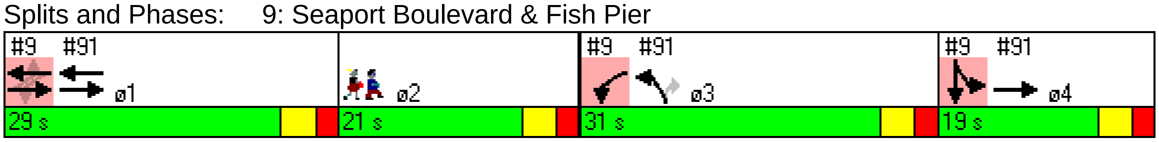
Lane Group	ø2
Lane Configurations	
Ideal Flow (vphpl)	
Lane Width (ft)	
Total Lost Time (s)	
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Headway Factor	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	
Peak Hour Factor	
Heavy Vehicles (%)	
Parking (#/hr)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phases	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	21.0
Total Split (%)	21%
Maximum Green (s)	16.0
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lead/Lag	Lag
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	9.0
Pedestrian Calls (#/hr)	20
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS		D			C						C	
Approach Delay		51.2			30.5						30.5	
Approach LOS		D			C						C	
90th %ile Green (s)	24.0	24.0		26.0	24.0					14.0	14.0	
90th %ile Term Code	Coord	Coord		Max	Coord					Max	Max	
70th %ile Green (s)	27.0	27.0		26.0	27.0					11.0	11.0	
70th %ile Term Code	Coord	Coord		Max	Coord					Gap	Gap	
50th %ile Green (s)	51.8	51.8		22.8	51.8					10.4	10.4	
50th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
30th %ile Green (s)	58.4	58.4		19.0	58.4					7.6	7.6	
30th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
10th %ile Green (s)	64.2	64.2		14.0	64.2					6.8	6.8	
10th %ile Term Code	Coord	Coord		Gap	Coord					Gap	Gap	
Stops (vph)		372			307						33	
Fuel Used(gal)		11			6						1	
CO Emissions (g/hr)		769			422						56	
NOx Emissions (g/hr)		150			82						11	
VOC Emissions (g/hr)		178			98						13	
Dilemma Vehicles (#)		0			0						0	
Queue Length 50th (ft)		215			92						28	
Queue Length 95th (ft)		#447			#244						59	
Internal Link Dist (ft)		370			68			191			183	
Turn Bay Length (ft)												
Base Capacity (vph)		849			1346						251	
Starvation Cap Reductn		0			285						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.95			1.00						0.48	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 50 (50%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 38.9 Intersection LOS: D
Intersection Capacity Utilization 66.1% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Seaport Boulevard & Fish Pier



Lane Group	ø2
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	16.0
90th %ile Term Code	Ped
70th %ile Green (s)	16.0
70th %ile Term Code	Ped
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

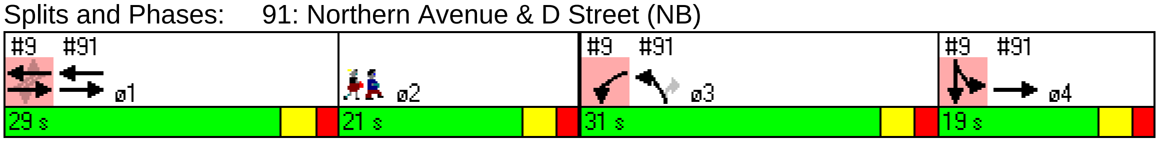
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	12	16	12	11	12	12		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Leading Detector (ft)	50			50	50	50		
Trailing Detector (ft)	0			0	0	0		
Turning Speed (mph)		9	15		15	9		
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00		
Frt						0.850		
Flt Protected					0.950			
Satd. Flow (prot)	3154	0	0	2991	1593	1346		
Flt Permitted					0.950			
Satd. Flow (perm)	3154	0	0	2991	1593	1346		
Right Turn on Red		Yes				Yes		
Satd. Flow (RTOR)						114		
Headway Factor	1.14	0.97	1.14	1.19	1.14	1.14		
Link Speed (mph)	30			30	30			
Link Distance (ft)	148			788	266			
Travel Time (s)	3.4			17.9	6.0			
Volume (vph)	355	0	0	691	216	74		
Peak Hour Factor	0.80	0.92	0.92	0.82	0.71	0.65		
Heavy Vehicles (%)	3%	2%	2%	5%	2%	8%		
Adj. Flow (vph)	444	0	0	843	304	114		
Lane Group Flow (vph)	444	0	0	843	304	114		
Turn Type						Perm		
Protected Phases	1 4			1	3		2	4
Permitted Phases						3		
Detector Phases	1 4			1	3	3		
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	21.0	19.0
Total Split (s)	48.0	0.0	0.0	29.0	31.0	31.0	21.0	19.0
Total Split (%)	48.0%	0.0%	0.0%	29.0%	31.0%	31.0%	21%	19%
Maximum Green (s)				24.0	26.0	26.0	16.0	14.0
Yellow Time (s)				3.0	3.0	3.0	3.0	3.0
All-Red Time (s)				2.0	2.0	2.0	2.0	2.0
Lead/Lag				Lead	Lead	Lead	Lag	Lag
Lead-Lag Optimize?								
Vehicle Extension (s)				2.0	2.0	2.0	2.0	2.0
Recall Mode				C-Max	None	None	None	None
Walk Time (s)							7.0	
Flash Dont Walk (s)							9.0	
Pedestrian Calls (#/hr)							20	
Act Effct Green (s)	61.0			46.1	22.6	22.6		
Actuated g/C Ratio	0.61			0.46	0.23	0.23		
v/c Ratio	0.23			0.61	0.85	0.29		
Control Delay	4.4			27.9	60.0	11.5		
Queue Delay	2.9			0.9	0.0	0.0		
Total Delay	7.3			28.8	60.0	11.5		
LOS	A			C	E	B		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø2	ø4
Approach Delay	7.3			28.8	46.8			
Approach LOS	A			C	D			
90th %ile Green (s)				24.0	26.0	26.0	16.0	14.0
90th %ile Term Code				Coord	Max	Max	Ped	Max
70th %ile Green (s)				27.0	26.0	26.0	16.0	11.0
70th %ile Term Code				Coord	Max	Max	Ped	Gap
50th %ile Green (s)				51.8	22.8	22.8	0.0	10.4
50th %ile Term Code				Coord	Gap	Gap	Skip	Gap
30th %ile Green (s)				58.4	19.0	19.0	0.0	7.6
30th %ile Term Code				Coord	Gap	Gap	Skip	Gap
10th %ile Green (s)				64.2	14.0	14.0	0.0	6.8
10th %ile Term Code				Coord	Gap	Gap	Skip	Gap
Stops (vph)	34			439	203	25		
Fuel Used(gal)	1			11	4	0		
CO Emissions (g/hr)	64			741	294	32		
NOx Emissions (g/hr)	12			144	57	6		
VOC Emissions (g/hr)	15			172	68	8		
Dilemma Vehicles (#)	0			0	0	0		
Queue Length 50th (ft)	7			176	187	10		
Queue Length 95th (ft)	m25			#388	m201	m18		
Internal Link Dist (ft)	68			708	186			
Turn Bay Length (ft)								
Base Capacity (vph)	1916			1378	430	447		
Starvation Cap Reductn	1336			0	0	0		
Spillback Cap Reductn	0			268	0	0		
Storage Cap Reductn	0			0	0	0		
Reduced v/c Ratio	0.77			0.76	0.71	0.26		

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 50 (50%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 27.6 Intersection LOS: C
Intersection Capacity Utilization 41.2% ICU Level of Service A
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: 91: Northern Avenue & D Street (NB)



Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	13	12	13	12	11	12	12	12	14
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50		50	50		50	50
Trailing Detector (ft)	0	0	0	0	0	0		0	0		0	0
Turning Speed (mph)	9	15		9	15		9	15		9	15	
Lane Util. Factor	0.95	0.95	0.91	0.91	0.95	0.95	0.95	0.91	0.91	0.95	0.95	0.95
Ped Bike Factor			0.93	0.69		0.95		0.98	0.99			0.99
Frt			0.988	0.850		0.977			0.988			0.986
Flt Protected			0.981			0.986		0.950	0.988			0.997
Satd. Flow (prot)	0	0	2396	1353	0	3118	0	1374	2730	0	0	3150
Flt Permitted			0.981			0.986		0.950	0.988			0.997
Satd. Flow (perm)	0	0	2285	931	0	3012	0	1343	2716	0	0	3132
Right Turn on Red				Yes			Yes			Yes		
Satd. Flow (RTOR)			9	498		18			7			9
Headway Factor	1.14	1.14	1.14	1.10	1.14	1.10	1.14	1.19	1.22	1.14	1.14	1.13
Link Speed (mph)			30			30			30			30
Link Distance (ft)			665			205			225			206
Travel Time (s)			15.1			4.7			5.1			4.7
Volume (vph)	8	149	221	577	138	195	41	261	260	25	34	540
Confl. Peds. (#/hr)		44		88	88		44	16		43	43	
Peak Hour Factor	0.50	0.63	0.64	0.88	0.83	0.56	0.45	0.76	0.81	0.68	0.71	0.91
Heavy Vehicles (%)	0%	17%	31%	1%	0%	3%	0%	4%	6%	0%	18%	1%
Parking (#/hr)									0	0	0	0
Adj. Flow (vph)	16	237	345	656	166	348	91	343	321	37	48	593
Lane Group Flow (vph)	0	0	652	602	0	605	0	232	469	0	0	707
Turn Type	Perm	Split		Perm	Split			Split			Split	
Protected Phases		1	1		4	4		2	2		3	3
Permitted Phases	1			1								
Detector Phases	1	1	1	1	4	4		2	2		3	3
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	16.0	16.0		22.0	22.0		21.0	21.0
Total Split (s)	31.0	31.0	31.0	31.0	24.0	24.0	0.0	23.0	23.0	0.0	22.0	22.0
Total Split (%)	31.0%	31.0%	31.0%	31.0%	24.0%	24.0%	0.0%	23.0%	23.0%	0.0%	22.0%	22.0%
Maximum Green (s)	25.0	25.0	25.0	25.0	18.0	18.0		17.0	17.0		16.0	16.0
Yellow Time (s)	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		3.0	3.0
Lead/Lag								Lead	Lead		Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max		None	None		None	None
Walk Time (s)	7.0	7.0	7.0	7.0							7.0	7.0
Flash Dont Walk (s)	1.0	1.0	1.0	1.0							1.0	1.0
Pedestrian Calls (#/hr)	0	0	0	0							0	0
Act Effct Green (s)			27.0	27.0		20.0		19.0	19.0			18.0
Actuated g/C Ratio			0.27	0.27		0.20		0.19	0.19			0.18
v/c Ratio			1.00	0.98		0.95		0.89	0.90			1.23
Control Delay			72.0	40.6		64.3		65.4	51.2			144.2

Lane Group	SBR
Lane Configurations	
Ideal Flow (vphpl)	1900
Lane Width (ft)	12
Total Lost Time (s)	4.0
Leading Detector (ft)	
Trailing Detector (ft)	
Turning Speed (mph)	9
Lane Util. Factor	0.95
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Right Turn on Red	Yes
Satd. Flow (RTOR)	
Headway Factor	1.14
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Volume (vph)	48
Confl. Peds. (#/hr)	16
Peak Hour Factor	0.73
Heavy Vehicles (%)	0%
Parking (#/hr)	
Adj. Flow (vph)	66
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Detector Phases	
Minimum Initial (s)	
Minimum Split (s)	
Total Split (s)	0.0
Total Split (%)	0.0%
Maximum Green (s)	
Yellow Time (s)	
All-Red Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	
Recall Mode	
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	

Lane Group	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Queue Delay			0.0	0.0		0.0		32.3	31.4			0.0
Total Delay			72.0	40.6		64.3		97.7	82.7			144.2
LOS			E	D		E		F	F			F
Approach Delay			56.9			64.3			87.7			144.2
Approach LOS			E			E			F			F
90th %ile Green (s)	25.0	25.0	25.0	25.0	18.0	18.0		17.0	17.0		16.0	16.0
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
70th %ile Green (s)	25.0	25.0	25.0	25.0	18.0	18.0		17.0	17.0		16.0	16.0
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
50th %ile Green (s)	25.0	25.0	25.0	25.0	18.0	18.0		17.0	17.0		16.0	16.0
50th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
30th %ile Green (s)	25.0	25.0	25.0	25.0	18.0	18.0		17.0	17.0		16.0	16.0
30th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
10th %ile Green (s)	25.0	25.0	25.0	25.0	18.0	18.0		17.0	17.0		16.0	16.0
10th %ile Term Code	Max	Max	Max	Max	Coord	Coord		Max	Max		Max	Max
Stops (vph)			368	112		324		149	324			501
Fuel Used(gal)			10	8		7		3	6			22
CO Emissions (g/hr)			733	541		509		243	440			1540
NOx Emissions (g/hr)			143	105		99		47	86			300
VOC Emissions (g/hr)			170	125		118		56	102			357
Dilemma Vehicles (#)			0	0		0		0	0			0
Queue Length 50th (ft)			225	86		196		157	157			~288
Queue Length 95th (ft)			192	#364		145		#232	#210			m#378
Internal Link Dist (ft)			585			125			145			126
Turn Bay Length (ft)												
Base Capacity (vph)			653	615		638		261	524			574
Starvation Cap Reductn			0	0		0		39	79			0
Spillback Cap Reductn			0	0		0		0	0			0
Storage Cap Reductn			0	0		0		0	0			0
Reduced v/c Ratio			1.00	0.98		0.95		1.05	1.05			1.23

Intersection Summary

Area Type: CBD

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 96 (96%), Referenced to phase 4:WBTL, Start of Green

Natural Cycle: 105

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.23

Intersection Signal Delay: 83.8 Intersection LOS: F

Intersection Capacity Utilization 79.7% ICU Level of Service D

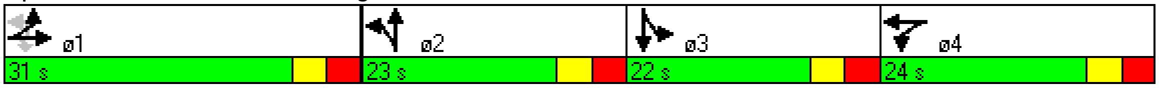
Analysis Period (min) 15

~ 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: 10: Congress Street & D Street



Lane Group	SBR
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	
90th %ile Term Code	
70th %ile Green (s)	
70th %ile Term Code	
50th %ile Green (s)	
50th %ile Term Code	
30th %ile Green (s)	
30th %ile Term Code	
10th %ile Green (s)	
10th %ile Term Code	
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	13	12	12	16	16	12	16	12	11	13	12
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95	0.91	0.91	0.95
Ped Bike Factor	0.99	0.99				0.96	0.99	0.99		0.98	0.99	
Frt		0.974				0.850		0.978			0.965	
Flt Protected	0.950				0.991		0.950			0.950	0.991	
Satd. Flow (prot)	1540	2887	0	0	3493	1584	1518	3297	0	1415	2960	0
Flt Permitted	0.324				0.532		0.950			0.950	0.991	
Satd. Flow (perm)	519	2887	0	0	1875	1513	1508	3297	0	1387	2949	0
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)		31						18			34	
Headway Factor	1.19	1.17	1.14	1.14	0.97	0.97	1.14	1.04	1.14	1.19	1.10	1.14
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		523			1228			316			323	
Travel Time (s)		11.9			27.9			7.2			7.3	
Volume (vph)	322	548	110	72	328	384	92	371	52	371	338	111
Confl. Peds. (#/hr)	20		43	43		20	10		32	32		10
Peak Hour Factor	0.93	0.95	0.92	0.83	0.80	0.76	0.70	0.69	0.57	0.89	0.89	0.74
Heavy Vehicles (%)	2%	5%	13%	2%	5%	4%	7%	2%	8%	1%	4%	3%
Parking (#/hr)		0	0					0	0			
Adj. Flow (vph)	346	577	120	87	410	505	131	538	91	417	380	150
Lane Group Flow (vph)	346	697	0	0	497	505	131	629	0	299	648	0
Turn Type	D.P+P			Perm		pm+ov	Split			Split		
Protected Phases	4	1 4			1	2	3	3		2	2	
Permitted Phases	1			1		1						
Detector Phases	4	1 4		1	1	2	3	3		2	2	
Minimum Initial (s)	6.0			10.0	10.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	12.0			28.0	28.0	24.0	26.0	26.0		24.0	24.0	
Total Split (s)	17.0	48.0	0.0	31.0	31.0	26.0	26.0	26.0	0.0	26.0	26.0	0.0
Total Split (%)	17.0%	48.0%	0.0%	31.0%	31.0%	26.0%	26.0%	26.0%	0.0%	26.0%	26.0%	0.0%
Maximum Green (s)	12.0			26.0	26.0	21.0	21.0	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	
All-Red Time (s)	2.0			2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lead/Lag						Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None			C-Max	C-Max	Ped	Ped	Ped		Ped	Ped	
Walk Time (s)				7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)				16.0	16.0	11.0	13.0	13.0		11.0	11.0	
Pedestrian Calls (#/hr)				0	0	0	0	0		0	0	
Act Effct Green (s)	40.2	44.2			27.2	49.2	21.8	21.8		22.0	22.0	
Actuated g/C Ratio	0.40	0.44			0.27	0.49	0.22	0.22		0.22	0.22	
v/c Ratio	1.01	0.54			1.13dl	0.66	0.40	0.86		0.96	0.96	
Control Delay	78.1	21.4			71.6	22.2	37.6	49.6		70.7	50.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	1.7	0.0			0.0	0.0	0.0	1.6		0.0	0.2	
Total Delay	79.8	21.4			71.6	22.2	37.6	51.2		70.7	51.1	
LOS	E	C			E	C	D	D		E	D	
Approach Delay		40.8			46.7			48.8			57.3	
Approach LOS		D			D			D			E	
90th %ile Green (s)	12.0			26.0	26.0	21.0	21.0	21.0		21.0	21.0	
90th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
70th %ile Green (s)	12.0			26.0	26.0	21.0	21.0	21.0		21.0	21.0	
70th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
50th %ile Green (s)	12.0			26.0	26.0	21.0	21.0	21.0		21.0	21.0	
50th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
30th %ile Green (s)	12.0			26.0	26.0	21.0	21.0	21.0		21.0	21.0	
30th %ile Term Code	Max			Coord	Coord	Max	Max	Max		Max	Max	
10th %ile Green (s)	12.0			27.0	27.0	21.0	20.0	20.0		21.0	21.0	
10th %ile Term Code	Max			Coord	Coord	Max	Ped	Ped		Max	Max	
Stops (vph)	210	447			346	279	77	375		207	424	
Fuel Used(gal)	8	8			12	7	1	7		6	9	
CO Emissions (g/hr)	531	561			809	486	95	516		394	663	
NOx Emissions (g/hr)	103	109			157	95	18	100		77	129	
VOC Emissions (g/hr)	123	130			188	113	22	120		91	154	
Dilemma Vehicles (#)	0	0			0	0	0	0		0	0	
Queue Length 50th (ft)	~160	159			165	211	72	198		172	175	
Queue Length 95th (ft)	#310	215			#225	242	96	188		m#393	#335	
Internal Link Dist (ft)		443			1148			236			243	
Turn Bay Length (ft)												
Base Capacity (vph)	341	1294			510	760	334	739		311	678	
Starvation Cap Reductn	0	0			0	0	0	0		0	1	
Spillback Cap Reductn	2	0			0	0	0	32		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	1.02	0.54			0.97	0.66	0.39	0.89		0.96	0.96	

Intersection Summary

Area Type: CBD
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 58 (58%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 48.2 Intersection LOS: D
Intersection Capacity Utilization 88.2% ICU Level of Service E
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.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 11: Summer Street & D Street

Trip Generation

Innovation and Design Building (IDB) - Trip Generation - Proposed Weekday Daily (Net New)

HOWARD/STEIN-HUDSON ASSOCIATES

27-Mar-14

Combined - Daily				Unadjusted Vehicle Trips					Person Trips		Transit		Walk/Bike		Adjusted Vehicle Trips			
Land Use	Units/SF	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal Trips	Pass-By Trip %	Total Pass-By Trips	Unadjusted Vehicle Trips w/o internal & pass-by	National vehicle occupancy rate[1]	Converted to Person trips	Transit Share[2]	Transit Trips	Walk/Bike Share[2]	Walk/ Bike Trips	Vehicle Share[2]	Vehicle Person Trips	National vehicle occupancy rate[1]	Total Adjusted Vehicle Trips
BUILD - DAILY																		
General Office	70.4	Total		777	0	0%	0	777	1.13	878	49%	430	20%	176	31%	272	1.13	**241**
ITE: General Office LUC 710	KSF	In		388	0	0%	0	388	1.13	439	49%	215	20%	88	31%	136	1.13	**120**
		Out		388	0	0%	0	388	1.13	439	49%	215	20%	88	31%	136	1.13	**120**
Industrial Office	166.7	Total		1138	0	0%	0	1,138	1.13	1,286	49%	630	20%	257	31%	399	1.13	**353**
ITE: Industrial Park LUC 130	KSF	In		569	0	0%	0	569	1.13	643	49%	315	20%	129	31%	199	1.13	**176**
		Out		569	0	0%	0	569	1.13	643	49%	315	20%	129	31%	199	1.13	**176**
Light Manufacturing	75.5	Total		288	0	0%	0	288	1.13	326	39%	128	16%	52	45%	147	1.13	**130**
ITE: Manufacturing LUC 140	KSF	In		144	0	0%	0	144	1.13	163	39%	64	16%	26	45%	73	1.13	**65**
		Out		144	0	0%	0	144	1.13	163	39%	64	16%	26	45%	73	1.13	**65**
Local Retail Business	83.7	Total		3572	0	0%	0	3,572	1.78	6,358	34%	2,162	27%	1,717	39%	2,480	1.78	**1,393**
ITE: Shopping Center LUC 820	KSF	In		1786	0	0%	0	1,786	1.78	3,179	34%	1,081	27%	858	39%	1,240	1.78	**697**
		Out		1786	0	0%	0	1,786	1.78	3,179	34%	1081	27%	858	39%	1,240	1.78	**697**
Maritime-dependent industrial	73.9	Total		816	0	0%	0	816	1.13	922	49%	452	20%	184	31%	286	1.13	**253**
ITE: General Office LUC 710	KSF	In		408	0	0%	0	408	1.13	461	49%	226	20%	92	31%	143	1.13	**126**
		Out		408	0	0%	0	408	1.13	461	49%	226	20%	92	31%	143	1.13	**126**
Research and Development	133.3	Total		1081	0	0%	0	1,081	1.13	1,221	49%	599	20%	244	31%	379	1.13	**335**
ITE: Research and Development LUC 760	KSF	In		540	0	0%	0	540	1.13	611	49%	299	20%	122	31%	189	1.13	**168**
		Out		540	0	0%	0	540	1.13	611	49%	299	20%	122	31%	189	1.13	**168**
Restaurant	3.0	Total		1714	0	75%	1,286	429	1.78	763	34%	259	27%	206	39%	298	1.78	**167**
ITE: Coffee/Donut Shop LUC 936 [1)]	KSF	In		857	0	75%	643	214	1.78	381	34%	130	27%	103	39%	149	1.78	**84**
		Out		857	0	75%	643	214	1.78	381	34%	130	27%	103	39%	149	1.78	**84**
Restaurant	13.2	Total		1684	0	43%	724	960	1.78	1,708	34%	581	27%	461	39%	666	1.78	**374**
932	KSF	In		842	0	43%	362	480	1.78	854	34%	290	27%	231	39%	333	1.78	**187**
		Out		842	0	43%	362	480	1.78	854	34%	290	27%	231	39%	333	1.78	**187**
Warehousing	-69.0	Total		-246	0	0%	0	-246	1.13	-278	39%	-109	16%	-44	45%	-125	1.13	**-111**
ITE: Warehousing LUC 150	KSF	In		-123	0	0%	0	-123	1.13	-139	39%	-54	16%	-22	45%	-62	1.13	**-55**
		Out		-123	0	0%	0	-123	1.13	-139	39%	-54	16%	-22	45%	-62	1.13	**-55**
Vacant	-550.7	Total		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
	KSF	In		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
		Out		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
Existing Subtotal																		
Total	0.0	sf		10,825	0		2,010	8,815		13,185		5,132		3,253				**3,135**
In				5,412	0		1,005	4,407		6,593		2,566		1,627				**1,568**
Out				5,412	2		4,020	4,407		6,593		2,566		1,627				**1,568**

All rates adopted from ITE Trip Generation Rate, 9th Edition

LUC 130 (Industrial Park), average rate
LUC 140 (Manufacturing), average rate
LUC 150 (Warehousing), average rate
LUC 710 (General Office), average rate
LUC 760 (Research and Development), average rate
LUC 820 (Shopping Center), average rate
LUC 932 (High-Turnover (Sit-Down) Restaurant)
LUC 936 (Coffee/Donut Shop without Drive-Through Window), factor of AM trip rate

1) Daily trip rate was obtained by multiplying the proportion of the AM trip rate/daily rate for LUC 937 by the AM rate for LUC 936.

Pass-by % at LUC 936 based on assumed market base (mostly BMIP trips)
Pass-by % at LUC 932 based on Table 5-22 of the ITE Trip Generation Handbook, 2nd edition.

For LUC 140 and LUC 150, mode shares were revised to account for truck activity. Per LUC 150 description in ITE Trip Generation Manual, truck share = 80%. Therefore, other modes were prorated to incorporate this level of truck activity. In the table above, truck trips are included in vehicle trips.

Innovation and Design Building (IDB) - Trip Generation - Proposed Weekday AM Peak Hour (Net New)

HOWARD/STEIN-HUDSON ASSOCIATES

27-Mar-14

Combined - AM Peak				Unadjusted Vehicle Trips					Person Trips		Transit		Walk/Bike		Adjusted Vehicle Trips			
Land Use	Units/SF	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal Trips	Pass-By Trip %	Total Pass-By Trips	Unadjusted Vehicle Trips w/o internal & pass-by	National vehicle occupancy rate[1]	Converted to Person trips	Transit Share[2]	Transit Trips	Walk/Bike Share[2]	Walk/ Bike Trips	Vehicle Share[2]	Vehicle Person Trips	National vehicle occupancy rate[1]	Total Adjusted Vehicle Trips
BUILD - AM PEAK HOUR																		
General Office	70.4	Total		110	0	0%	0	110	1.13	124		64		20		6	1.13	**35**
ITE: General Office LUC 710	KSF	In		97	0	0%	0	97	1.13	109	55%	60	12%	13	33%	4	1.13	**32**
		Out		13	0	0%	0	13	1.13	15	25%	4	48%	7	27%	2	1.13	**4**
Industrial Office	166.7	Total		137	0	0%	0	137	1.13	154		77		29		9	1.13	**44**
ITE: Industrial Park LUC 130	KSF	In		112	0	0%	0	112	1.13	127	55%	70	12%	15	33%	5	1.13	**37**
		Out		25	0	0%	0	25	1.13	28	25%	7	48%	13	27%	4	1.13	**7**
Light Manufacturing	75.5	Total		55	0	0%	0	55	1.13	62		24		10		4	1.13	**25**
ITE: Manufacturing LUC 140	KSF	In		43	0	0%	0	43	1.13	49	44%	21	10%	5	46%	2	1.13	**20**
		Out		12	0	0%	0	12	1.13	14	20%	3	38%	5	42%	2	1.13	**5**
Local Retail Business	83.7	Total		80	0	0%	0	80	1.78	143		80		8		3	1.78	**31**
ITE: Shopping Center LUC 820	KSF	In		50	0	0%	0	50	1.78	89	62%	55	0%	0	38%	0	1.78	**19**
		Out		31	0	0%	0	31	1.78	54	46%	25	15%	8	39%	3	1.78	**12**
Maritime-dependent industrial	73.9	Total		115	0	0%	0	115	1.13	130		67		21		7	1.13	**37**
ITE: General Office LUC 710	KSF	In		102	0	0%	0	102	1.13	115	55%	63	12%	14	33%	5	1.13	**33**
		Out		14	0	0%	0	14	1.13	16	25%	4	48%	8	27%	2	1.13	**4**
Research and Development	133.3	Total		163	0	0%	0	163	1.13	184		92		33		10	1.13	**52**
ITE: Research and Development LUC 760	KSF	In		135	0	0%	0	135	1.13	153	55%	84	12%	18	33%	6	1.13	**45**
		Out		28	0	0%	0	28	1.13	31	25%	8	48%	15	27%	4	1.13	**7**
Restaurant	3.0	Total		325	0	75%	244	81	1.78	145		78		11		4	1.78	**31**
ITE: Coffee/Donut Shop LUC 936 [1)]	KSF	In		166	0	75%	124	41	1.78	74	62%	46	0%	0	38%	0	1.78	**16**
		Out		159	0	75%	119	40	1.78	71	46%	33	15%	11	39%	4	1.78	**16**
Restaurant	13.2	Total		143	0	43%	62	82	1.78	145		80		10		4	1.78	**31**
932	KSF	In		79	0	43%	34	45	1.78	80	62%	50	0%	0	38%	0	1.78	**17**
		Out		64	0	43%	28	37	1.78	65	46%	30	15%	10	39%	4	1.78	**14**
Warehousing	-69.0	Total		-67	0	0%	0	-67	1.13	-76		-30		-12		-5	1.13	**-30**
ITE: Warehousing LUC 150	KSF	In		-53	0	0%	0	-53	1.13	-60	44%	-26	10%	-6	46%	-3	1.13	**-24**
		Out		-14	0	0%	0	-14	1.13	-16	20%	-3	38%	-6	42%	-3	1.13	**-6**
Vacant	-550.7	Total		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
	KSF	In		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
		Out		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
Existing Subtotal																		
Total	0.0	sf		1,061	0		305	756		1,012		531		130				**256**
In				729	0		158	571		734		422		59				**194**
Out				332	2		600	184		278		110		71				**62**

All rates adopted from ITE Trip Generation Rate, 9th Edition

LUC 130 (Industrial Park), average rate
LUC 140 (Manufacturing), average rate
LUC 150 (Warehousing), average rate
LUC 710 (General Office), average rate
LUC 760 (Research and Development), average rate
LUC 820 (Shopping Center), average rate
LUC 932 (High-Turnover (Sit-Down) Restaurant)
LUC 936 (Coffee/Donut Shop without Drive-Through Window), factor of AM trip rate

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Pass-by % at LUC 936 based on assumed market base (mostly BMIP trips)
Pass-by % at LUC 932 based on Table 5-22 of the ITE Trip Generation Handbook, 2nd edition.

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Innovation and Design Building (IDB) - Trip Generation - Proposed Weekday PM Peak Hour (Net New)

HOWARD/STEIN-HUDSON ASSOCIATES

27-Mar-14

Combined - PM Peak				Unadjusted Vehicle Trips					Person Trips		Transit		Walk/Bike		Adjusted Vehicle Trips			
Land Use	Units/SF	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal Trips	Pass-By Trip %	Total Pass-By Trips	Unadjusted Vehicle Trips w/o internal & pass-by	National vehicle occupancy rate[1]	Converted to Person trips	Transit Share[2]	Transit Trips	Walk/Bike Share[2]	Walk/ Bike Trips	Vehicle Share[2]	Vehicle Person Trips	National vehicle occupancy rate[1]	Total Adjusted Vehicle Trips
BUILD - PM PEAK HOUR																		
General Office	70.4	Total		110	0	0%	0	110	1.13	124		66		19		40	1.13	**36**
ITE: General Office LUC 710	KSF	In		19	0	0%	0	19	1.13	21	37%	8	34%	7	29%	6	1.13	**5**
		Out		91	0	0%	0	91	1.13	103	56%	58	11%	11	33%	34	1.13	**30**
Industrial Office	166.7	Total		138	0	0%	0	138	1.13	156		81		25		50	1.13	**44**
ITE: Industrial Park LUC 130	KSF	In		29	0	0%	0	29	1.13	33	37%	12	34%	11	29%	10	1.13	**8**
		Out		109	0	0%	0	109	1.13	124	56%	69	11%	14	33%	41	1.13	**36**
Light Manufacturing	75.5	Total		55	0	0%	0	55	1.13	62		24		10		28	1.13	**25**
ITE: Manufacturing LUC 140	KSF	In		20	0	0%	0	20	1.13	22	30%	7	27%	6	43%	10	1.13	**9**
		Out		35	0	0%	0	35	1.13	40	45%	18	9%	4	46%	18	1.13	**16**
Local Retail Business	83.7	Total		642	0	0%	0	642	1.78	1,143		210		127		215	1.78	**121**
ITE: Shopping Center LUC 820	KSF	In		149	0	0%	0	149	1.78	265	38%	101	23%	61	39%	103	1.78	**58**
		Out		161	0	0%	0	161	1.78	287	38%	109	23%	66	39%	112	1.78	**63**
Maritime-dependent industrial	73.9	Total		115	0	0%	0	115	1.13	130		69		19		42	1.13	**37**
ITE: General Office LUC 710	KSF	In		20	0	0%	0	20	1.13	22	37%	8	34%	8	29%	6	1.13	**6**
		Out		96	0	0%	0	96	1.13	108	56%	61	11%	12	33%	36	1.13	**32**
Research and Development	133.3	Total		167	0	0%	0	167	1.13	189		101		27		61	1.13	**54**
ITE: Research and Development LUC 760	KSF	In		25	0	0%	0	25	1.13	28	37%	11	34%	10	29%	8	1.13	**7**
		Out		142	0	0%	0	142	1.13	161	56%	90	11%	18	33%	53	1.13	**47**
Restaurant	3.0	Total		122	0	75%	92	31	1.78	54		21		13		21	1.78	**12**
ITE: Coffee/Donut Shop LUC 936 [1)]	KSF	In		61	0	75%	46	15	1.78	27	38%	10	23%	6	39%	11	1.78	**6**
		Out		61	0	75%	46	15	1.78	27	38%	10	23%	6	39%	11	1.78	**6**
Restaurant	13.2	Total		130	0	43%	56	74	1.78	132		50		30		52	1.78	**29**
932	KSF	In		78	0	43%	34	45	1.78	79	38%	30	23%	18	39%	31	1.78	**17**
		Out		52	0	43%	22	30	1.78	53	38%	20	23%	12	39%	21	1.78	**12**
Warehousing	-69.0	Total		-21	0	0%	0	-21	1.13	-23		-10		-3		-11	1.13	**-9**
ITE: Warehousing LUC 150	KSF	In		-5	0	0%	0	-5	1.13	-6	30%	-2	27%	-2	43%	-3	1.13	**-2**
		Out		-16	0	0%	0	-16	1.13	-18	45%	-8	9%	-2	46%	-8	1.13	**-7**
Vacant	-550.7	Total		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
	KSF	In		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
		Out		0	0	0%	0	0	1.13	0	0%	0	0%	0	0%	0	1.13	**0**
Existing Subtotal																		
Total	0.0	sf		1,460	0		148	1,312		1,968		612		267				**349**
In				395	0		79	316		493		185		126				**115**
Out				733	2		284	665		885		427		141				**234**

All rates adopted from ITE Trip Generation Rate, 9th Edition

LUC 130 (Industrial Park), average rate
LUC 140 (Manufacturing), average rate
LUC 150 (Warehousing), average rate
LUC 710 (General Office), average rate
LUC 760 (Research and Development), equation
LUC 820 (Shopping Center), average rate
LUC 932 (High-Turnover (Sit-Down) Restaurant)
LUC 936 (Coffee/Donut Shop without Drive-Through Window), factor of AM trip rate

1) Daily trip rate was obtained by multiplying the proportion of the AM trip rate/daily rate for LUC 937 by the AM rate for LUC 936.

Pass-by % at LUC 936 based on assumed market base (mostly BMIP trips)
Pass-by % at LUC 932 based on Table 5-22 of the ITE Trip Generation Handbook, 2nd edition.

For LUC 140 and LUC 150, mode shares were revised to account for truck activity. Per LUC 150 description in ITE Trip Generation Manual, truck share = 80%. Therefore, other modes were prorated to incorporate this level of truck activity. In the table above, truck trips are included in vehicle trips.

Appendix C

Air Quality

AIR QUALITY APPENDIX

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 MOBILE6.2 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 2014 and 2019 for speed limits of 2.5, 10, 15, and 30 mph for use in the microscale analyses. The 10 mph rate was used to estimate parking garage emissions.

CAL3QHC

For the intersections studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOBILE6.2. 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 all intersections. Idle emission rates for queue links were based on 2.5 mph emission rates derived in MOBILE6.2 and converted from grams per mile to grams per hour. Emission rates for speeds of 10, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

Innovation Design Building - Boston, MA
Calculation of Microscale Modeling Emission Factors
Summary of MOBILE6 Output

Carbon Monoxide Only

Queues	Idle
Free Flow	30 mph
Right Turns	10 mph
Left Turns	15 mph

Winter	2014	2019	Units
Idle	52.370	47.270	g/hr
2.5 mph	20.948	18.908	g/mile
10 mph	11.604	10.586	g/mile
15 mph	10.512	9.611	g/mile
30 mph	9.476	8.689	g/mile

Note: Winter CO emission factors are higher than Summer and are conservatively used

Innovation Design Building - Boston, MA
Background Concentrations

Background Concentrations										
POLLUTANT	AVERAGING TIME	Form	2010	2011	2012	Units	ppm to µg/m³ Conversion Factor	Background Concentration (µg/m³)	Location
SO_2 (1)(5)	1-Hour (4)	99th %	21.1	19.3	13.2	ppb	2.6	54.9	Kenmore Sq., Boston
	3-Hour (6)	H2H	25	24.6	13.8	ppb	1.6	40.0	Kenmore Sq., Boston
	24-Hour	H2H	7.9	9.4	5.4	ppb	2.6	24.4	Kenmore Sq., Boston
	Annual	H	2.24	2.36	1.87	ppb	2.6	6.1	Kenmore Sq., Boston
PM-10	24-Hour	H2H	31	34	37	µg/m³	1	37.0	One City Sq. Boston
	Annual	H	15.1	15.9	16.8	µg/m³	1	16.8	One City Sq. Boston
PM-2.5	24-Hour (4)	98th %	24.8	23.9	20.9	µg/m³	1	23.2	174 North St., Boston
	Annual (4)	H	10.03	10.26	9.47	µg/m³	1	9.9	174 North St., Boston
NO_2 (3)	1-Hour (4)	98th %	51.5	52.9	49	ppb	1.88	99.5	Kenmore Sq., Boston
	Annual	H	19.1	20.36	19.1	ppb	1.88	38.3	Kenmore Sq., Boston
CO (2)	1-Hour	H2H	1.8	1.5	1.3	ppm	1140	2052	Kenmore Sq., Boston
	8-Hour	H2H	0.9	1.2	0.9	ppm	1140	1368	Kenmore Sq., Boston

Notes: From 2010-2012 MA DEP Annual Data Summaries

[1] SO_2 reported in ppm or ppb. Converted to µg/m³ using factor of 1 ppm = 2600 µg/m³.

[2] CO reported in ppm or ppb. Converted to µg/m³ using factor of 1 ppm = 1140 µg/m³.

[3] NO_2 reported in ppm or ppb. Converted to µg/m³ using factor of 1 ppm = 1880 µg/m³.

[4] Background level is the average concentration of thethree years.

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

[6] The 2010 - 2012 SO_2 3-hr value is not reported. Per MassDEP, current years' 1-hr Second Highest value is used instead.

Due to excessive size CAL3QHC, and MOBILE6.2 input and output files are available on digital media upon request.

Appendix D

Climate Change Resilience 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:	The Innovation and Design Building
Project Address Primary:	Drydock Avenue
Project Address Additional:	Boston, MA
Project Contact (name / Title / Company / email / phone):	Dana Griffin, Vice President Development & Construction, Jamestown LP Dana.griffin@JamestownLP.com, 617-737-1202

A.2 - Team Description

Owner / Developer:	Jamestown LP
Architect:	Elkus Manfredi Architects
Engineer (building systems):	Cosentini Associates
Sustainability / LEED:	The Green Engineer, Inc
Permitting:	Epsilon Associates, Inc.
Construction Management:	To Be Determined
Climate Change Expert:	

A.3 - Project Permitting and Phase

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

$\boxed{\text{PNF / Expanded PNF Submission}}$	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:	Lease Retail/Commercial Office/Light Industrial
List the First Floor Uses:	Lease Retail/Lobbies

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

Wood Frame	Masonry	Steel Frame	$\boxed{\text{Concrete}}$

Describe the building?

Site Area:	*389,400 SF*	Building Area:	*1.4Million SF*
Building Height:	*185 Ft.*	Number of Stories:	*Eight Flrs.*
First Floor Elevation (reference Boston City Base):	*11.81-12.64 Elev.*	Are there below grade spaces/levels, if yes how many:	*none*

,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: Commercial Interiors
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:	*16,000 Peak (kW); Annual Avg. 3,000*	Heating:	*Peak – 10 (MMBtu/hr)*
What is the planned building Energy Use Intensity:	*40,000 kbut/SF*	Cooling:	*Peak – 3500 (Tons/hr)*

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

Electric:	*4,000 (kW)*	Heating:	*7 (MMBtu/hr)*
		Cooling:	*200 (Tons/hr)*

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

Electrical Generation:	*3000 (kW)*		Fuel Source:	
System Type and Number of Units:	**Combustion Engine**	Gas Turbine	Combine Heat and Power	*(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?

0/ 100 Deg.

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:	%
How is performance determined:	**The project is specific renovations within an existing building. In cases where the HVAC equipment is being replaced the new equipment will be code compliant, (at a minimum) and high efficiency.**

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:	**The project is specific renovations to an existing building. Where building systems upgrades occur, new equipment will be assessed for energy efficiency including new AHUs, Lighting and lighting controls.**			

What are the insulation (R) values for building envelop elements? **Existing Building envelop to remain. Window replacement/upgrade of upper floors under separate contract. New storefront and entries on first floor to meet IECC 2012 U-value requirements.**

Roof:	R = ***existing to remain***	Walls / Curtain Wall Assembly:	R =
Foundation:	R = ***existing to remain***	Basement / Slab:	R = ***existing to remain***
Windows:	R = / U = ***To be replaced under separate contract***	Doors:	R = / U = ***New storefronts will be code compliant at a minimum***

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: **Existing PVS**	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 –** for pedestrian oriented hardscape	**Shade trees & shrubs –**new site plantings	High reflective roof materials	**Vegetated roofs (vegetable garden)**
Describe other strategies:	**Vegetable roof garden planned on portion of Design Center Roof. Much of the existing roof is covered with PV panels**			

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:	**Increased landscaped areas on site to help mitigate stormwater runoff and promote direct absorption**			

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:	**The project is within an existing building and on the associated grounds. No new construction is planned that would enable the project to address extreme storm events and high winds. The first floor/promenade level is approximately 4' above the adjacent parking surface.**			

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 / No

Describe site conditions?

Site Elevation – Low/High Points:	Boston City Base Elev.(Ft.)
Building Proximity to Water:	*240* Ft.

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

Coastal Zone:	Yes / No	Velocity Zone:	Yes / No
Flood Zone:	Yes / No	Area Prone to Flooding:	Yes / 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 / No	Future floodplain delineation updates:	Yes / No

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

280 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:	*7.5* Ft.	Frequency of storms:	*0.01* 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 *18.19/19.37*.(Ft.)	First Floor Elevation:	*18.19/19.37* (Ft.)

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

	Yes / No	If Yes, to what elevation	Boston City Base Elev. (Ft.)

If Yes, describe:	**The project is an existing building with a first floor level that is approx. 4' above adjacent grade. The existing building systems and utilities are located on the first floor and shall remain.**

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:

Yes / No

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

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

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

	Yes / No
If Yes, describe:	

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

Yes / No	If Yes, for how long:	*days*

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

Small pumps will be located in the first floor and basement levels to evacuate stormwater as required during storm surge events.

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 / No*	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:	*Yes / No*	Surrounding site elevation can be raised	Building ground floor can be raised	Construction been engineered
Describe additional strategies:	**The existing first floor is of concrete construction and is approx. 4' above the adjacent parking and landscaped area.**			

Has the building been planned and designed to accommodate future resiliency enhancements?

Select appropriate:	*Yes / No*	Solar PV **Existing**	Solar Thermal	Clean Energy / CHP System(s)
		Potable water storage	Wastewater storage	Back up energy systems & fuel
Describe any specific or additional strategies:	**The project may investigate expanding the existing PV array**			

Thank you for completing the Boston Climate Change Resilience and Preparedness Checklist!

For questions or comments about this checklist or Climate Change Resiliency and Preparedness best practices, please contact: John.Dalzell.BRA@cityofboston.gov