PROJECT NOTIFICATION FORM

KENMORE SQUARE REDEVELOPMENT

Submitted to:
Boston Planning & Development Agency One City Hall Square . Boston, MA 02201

Submitted by:
RREF II Kenmore Lessor II LCC and RREF II Kenmore Lessor III LLC
c/o Related Beal 177 Milk Street . Boston, MA 02109

Prepared by:
Epsilon Associates, Inc. 3 Mill and Main Place, Suite 250 . Maynard, MA 01754

In Association with:
Roger Ferris + Partners
Kyle Zick Landscape Architecture, Inc.
Stantec
VHB
Nutter McClennen & Fish LLC
WSP

May 10, 2018

Epsilon ASSOCIATES INC.

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Chapter 1

Project Information

1.0 PROJECT INFORMATION

1.1 Introduction

Related Beal (the "Proponent") on behalf of its affiliates, RREF II Kenmore Lessor II LLC and RREF II Kenmore Lessor III LLC, proposes the Kenmore Square Redevelopment project, which includes the redevelopment of an approximately 47,500 square foot (sf) site (the "Project Site") in the heart of Kenmore Square, into a vibrant mix of commercial uses, including office, retail and restaurant.

The Project Site includes seven buildings, beginning at the corner of Deerfield Street with frontage wrapping along the northern side of Commonwealth Avenue and Beacon Street to the east. The project consists of two distinct parcels or components, the Commonwealth Building and the Beacon Building, each a "component" of the Project Site (all as defined below). Six of the seven existing buildings are proposed to be demolished, while the seventh building, 660 Beacon Street which is home to the Citgo sign, will be renovated and joined to new construction on its east side encompassing approximately 142,000 sf of adaptive re-use space. Directly adjacent to the west is the proposed construction of a new, approximately 140,000 sf, eight-story building at the corner of Commonwealth Avenue (collectively, the "Project"). The Project includes new and renovated ground floor retail space with office space on upper floors. The pedestrian realm along Commonwealth Avenue and Beacon Street will be enhanced with improved sidewalks, street trees, and benches. A new parking garage will be located underground beneath the proposed Commonwealth Building. Parking access and loading to the new buildings will occur on the rear of the Project Site (further described below).

The Project will provide a new point of reference within Kenmore Square that further enhances the activity and prominence of Kenmore Square as one of Boston's centers of urban life, while expanding the mix of uses to welcome new office tenants. The redevelopment will reinvigorate the underutilized and partially vacant buildings, and will further enrich this iconic block. With this development, the Project will provide a number of public benefits, including a new diverse mix of office and retail tenants, increased tax revenues, improved public infrastructure, landscape and street trees, and a design that complements the existing context and acknowledges the history of the area.

This PNF is being submitted to the Boston Redevelopment Authority (BRA) doing business as the Boston Planning & Development Agency (herein, the "BPDA") to initiate review of the Project under Article 80B, Large Project Review, of the Boston Zoning Code (the "Code").

1.2 Project Description

1.2.1 Project Site

The approximately 47,500 sf Project Site is located at the center of Kenmore Square, and includes seven buildings: 650 Beacon Street, 652-654 Beacon Street, 656 Beacon Street, 660 Beacon Street (which includes the Citgo sign), 533 Commonwealth Avenue, 535-539 Commonwealth Avenue, and 541 Commonwealth Avenue (see Figure 1-1). The buildings' current uses include retail and institutional office spaces and a residential space on the upper floors of 541 Commonwealth Avenue which has been vacant for more than 30 years. The existing buildings include approximately 194,055 sf. Loading and service areas are located behind the buildings adjacent to a surface parking lot not owned by the Proponent. Affiliates of the Proponent are also undertaking limited internal renovations and upgrades to abutting properties at 11-19 Deerfield Street and 642-648 Beacon Street. In accordance with Article 80B, these limited internal renovations and upgrades are not included within the scope of this Project's review, but will undergo review as appropriate. The survey of the Project Site is included in Appendix A.

1.2.2 Area Context

The Project Site is surrounded by a mix of uses and activity and has convenient transit, bicycle, pedestrian and vehicular access to the rest of Boston and surrounding areas. Kenmore Station, at the heart of Kenmore Square, is a major Massachusetts Bay Transportation Authority (MBTA) station where the B, C, and D branches of the Green Line merge, and also includes connections to five bus routes. In addition, the nearby commuter rail station, which is served by the MBTA's Framingham/Worcester Commuter Rail line, is a short walking distance from the Project Site. Kenmore Square is located on the western end of the Commonwealth Avenue Mall, a 32-acre greenway that connects to the Public Garden and Back Bay Fens. Kenmore Square is also easily accessible from Storrow Drive, Beacon Street, Massachusetts Avenue, and the Massachusetts Turnpike.

The Project Site benefits from its proximity to Boston University and its significant number of students, faculty, staff and visitors frequenting nearby restaurants and shops. Kenmore Station is the main station for access to Fenway Park and Lansdowne Street to the south of the Project Site, both of which generate significant activity throughout the year. To the east is the Back Bay, and further to the south is the Longwood Medical and Academic Area, both of which are major economic centers.

Kenmore Square Redevelopment Boston, Massachusetts

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Figure 1-1
Aerial Locus Map

1.2.3 Proposed Project

The modest redevelopment of the Project Site will focus upon the seven parcels known as 533-541 Commonwealth Avenue (the "Commonwealth Building Site") and 650-660 Beacon Street (the "Beacon Building Site") (see Figure 1-2). Six of the existing buildings will be demolished, and one will be renovated and expanded, to construct two new, mixed-use buildings. Table 1-1 provides the Project program.

Table 1-1 Project Program

Project Element	Approximate Dimension
Commonwealth Building	
Office	129,720 sf
Retail	10,280 sf
TOTAL	*140,000 sf*
Height	8 stories / 110 feet
Parking	60 spaces
Beacon Building	
Office (renovation)	52,015 sf
Office (new construction)	72,000 sf
Retail (renovation)	13,985 sf
Retail (new construction)	4,500 sf
Total (renovation)	66,000 sf
Total (new construction)	76,500 sf
TOTAL	*142,500 sf*
Height (existing)	6 stories / 83 feet
Height (new construction)	7 stories / 93 feet
TOTAL NEW CONSTRUCTION AND RENOVATION	
Office	**253,735 sf**
Retail	**28,765 sf**
TOTAL	***282,500 sf***

Existing Space to be Demolished	128,059 sf
New Construction	216,500 sf
NET NEW SPACE	***88,441 sf***

The Commonwealth Building Site located at 533-541 Commonwealth Avenue at the northeast corner of Commonwealth Avenue and Deerfield Street, will be redeveloped to include the construction of an eight-story, approximately 110-foot tall commercial building (the "Commonwealth Building"). The Commonwealth Building will include approximately 10,280 sf of ground floor retail and approximately 129,720 sf of office space above. The ground floor retail space will span from the existing driveway on the east side of the building around the corner to Deerfield Street. The office lobby will be located at the northwest corner of the building on Deerfield Street. The Commonwealth Building will include several terraces, formed by the building's upper-level setbacks. Two floors of below-grade parking, including approximately 60 spaces, will be at the basement levels

with access via a ramp behind the building. Figures 1-3 to 1-5 include a site plan, upper level floor plan and section.

The redevelopment of the Beacon Building Site located at 650-660 Beacon Street, will include the approximately 66,000 sf renovation of 660 Beacon Street which will be connected to an approximately 76,500 sf new building that will be constructed in place of 650-656 Beacon Street (collectively referred to as the "Beacon Building"). The new construction portion of the building will be approximately seven stories and approximately 93 feet tall (see Figure 1-5). In total, the Beacon Building will include approximately 124,015 sf of office space above approximately 18,485 sf of ground floor and below grade retail space (see Figures 1-3 and 1-4). The office lobby will be located in the middle of the Beacon Building, with ground floor retail on both sides. There is one terrace located on the seventh floor facing Beacon Street, and the Proponent is also evaluating the feasibility of a green roof. The ground floor retail spaces in the Beacon Building will be appropriately designed as to allow interaction with the enhanced pedestrian realm.

Vehicular and truck access to and from the Project Site will be from the existing driveway between the Commonwealth Building and Beacon Building (see Figure 1-3). A secondary existing access is located between 642-648 Beacon Street and 636-638 Beacon Street. It is anticipated that trucks will only access the site from the driveway between the Commonwealth Building and the Beacon Building.

A loading area for the Commonwealth Building will be located off of the driveway on the northeast corner of the building. As noted above, behind the Commonwealth Building will be a ramp for the proposed below-grade parking garage. A loading area for the Beacon Building will be constructed as part of the new building. Both loading areas will offer sufficient room for trucks to back up without blocking vehicular traffic on the driveways and behind the buildings.

This PNF is being submitted to the BPDA to initiate review of the Project under Article 80B, Large Project Review, of the Code. Although the Project is being presented as a unified development to allow for the most comprehensive review of the Project including its possible impacts when evaluated in its entirety, the Project will be comprised of both the Commonwealth Building and the Beacon Building, each a component for the purposes of this Article 80 review. As such, each individual Project Component may be developed by individual developers who will obtain individual certifications of compliance and consistency and execute on its specific plan, including development agreements, with the BPDA and other city agencies to the extent required.

Figures 1-6 and 1-7 include perspectives of the Project.

Kenmore Square Redevelopment **Boston, Massachusetts**

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Figure 1-2
Project Buildings

Kenmore Square Redevelopment **Boston, Massachusetts**

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Figure 1-3
Site Plan

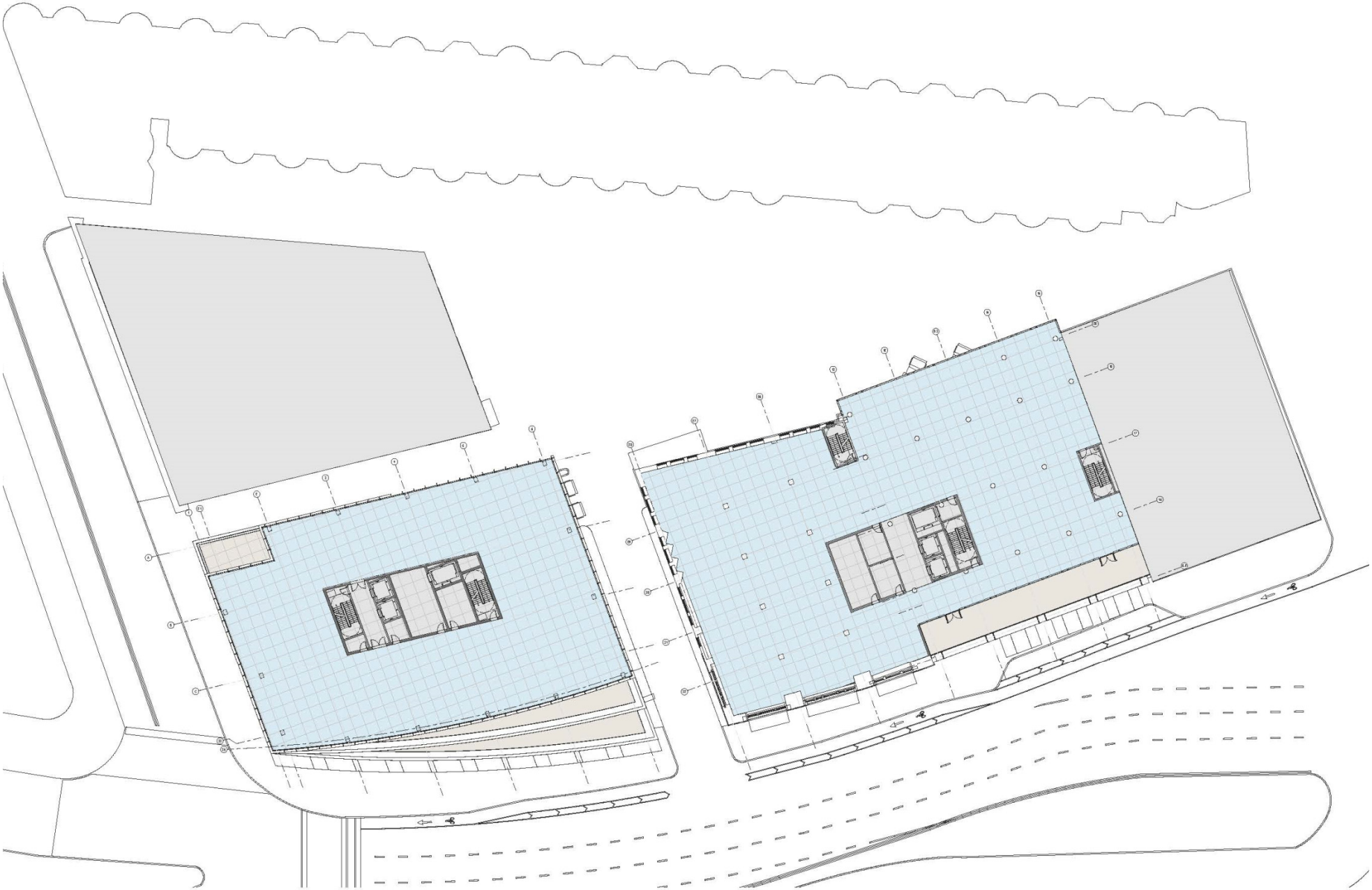

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Figure 1-4
Upper Level Floor Plan

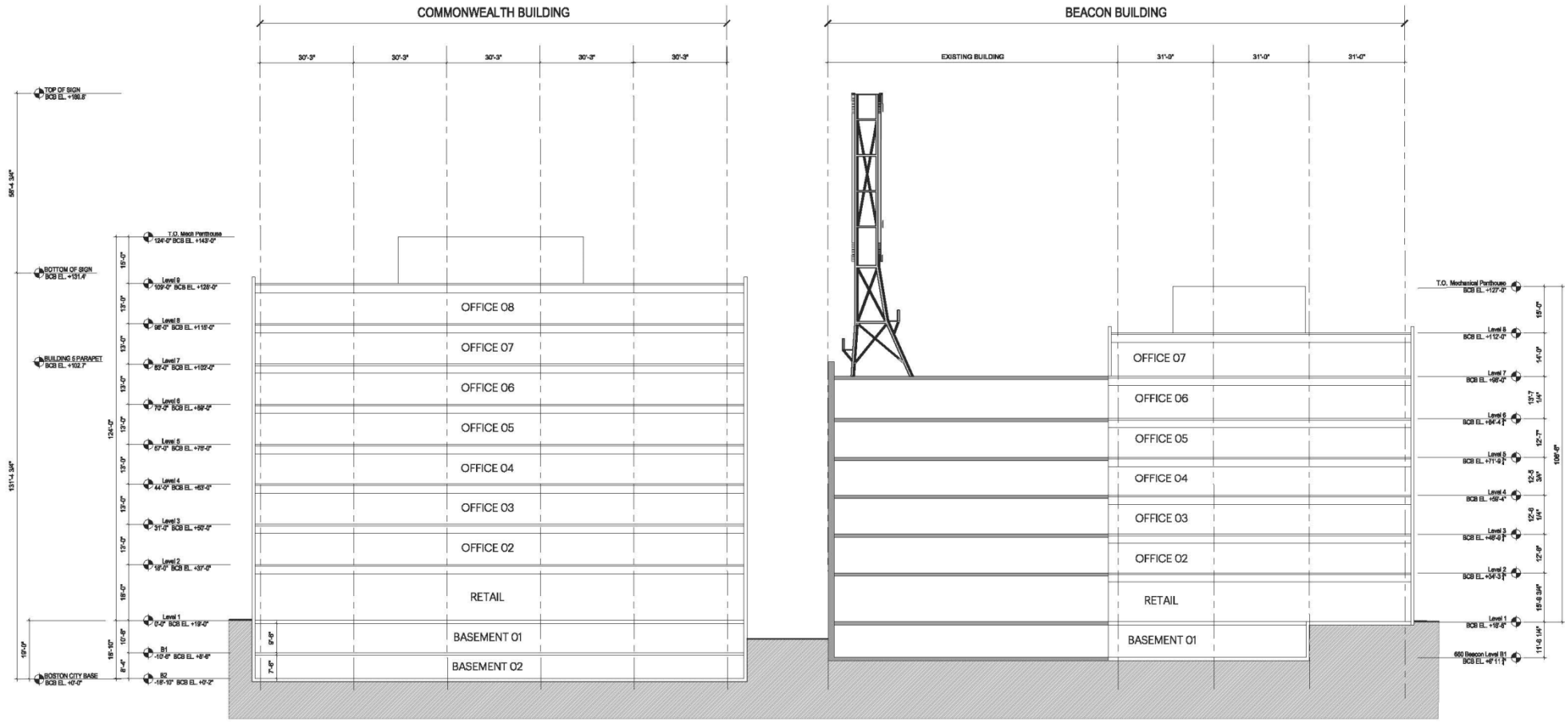

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Figure 1-5
Building Sections

Kenmore Square Redevelopment **Boston, Massachusetts**

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Figure 1-6
Commonwealth Building - Northeast

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Figure 1-7
Beacon Building - Northwest

Public Realm

The composition of the Commonwealth Building and the Beacon Building lends influence to the pedestrian activity at street level, specifically defining the ground-level as a sensitively scaled, pedestrian-focused space finished with devoted lighting, sculptural seating and landscaping.

The Project will include a number of public realm enhancements (see Figure 1-8 to 1-10), including:

- Additional sidewalk square footage will be provided including an approximately 1,380 sf on Deerfield Street and approximately 1,300 sf on Beacon Street. At a minimum, an eight-foot wide pedestrian zone is maintained throughout the Project Site.
- New street trees and seating.
- An increase in greenscape and furnishing zones.
- Improved multi-modal connections, including a buffered bike lane, increased bike access and wayfinding signage.
- Incorporation of Boston Complete Streets best practices.

1.2.4 Evolution of Design

Initial design schemes encompassed a variety of massing options, including a single massing wrapping from Deerfield Street across the site to Beacon Street, and a scheme with two single height buildings oriented toward the square. After further consideration, it was determined that the monolithic nature of the large massing would depart from the urban context. The design shifted to reflect the urban context and maintain the fluid pedestrian experience in the square when closer to the building. Further study of the Commonwealth Building design determined that the massing needed to not only respond to the pedestrian levels, but the view corridors created by the sweeping nature of the primary thoroughfares converging at the site. This approach created variations in height which step back to grant viewing angles of the Citgo sign atop 660 Beacon Street, while maintaining the lower, two-story scale of the neighboring building's base.

Another important factor in the design was the vehicle and fire access to the middle of the block (behind the buildings). Two-way access from Beacon Street, one-way access from Beacon Street and two-way access from Deerfield Street were analyzed. Each was studied in conjunction with the intent to promote the pedestrian and vehicular flow in and around the Project Site. By minimizing curb cuts, loading and service areas, and drop-off areas along the adjacent streets, the design is intended to support the pedestrian experience along Deerfield Street, Commonwealth Avenue and Beacon Street.

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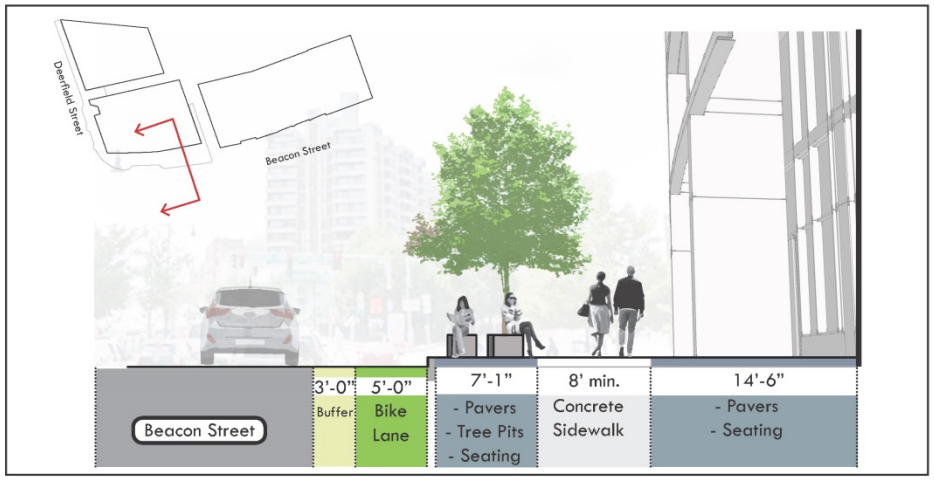
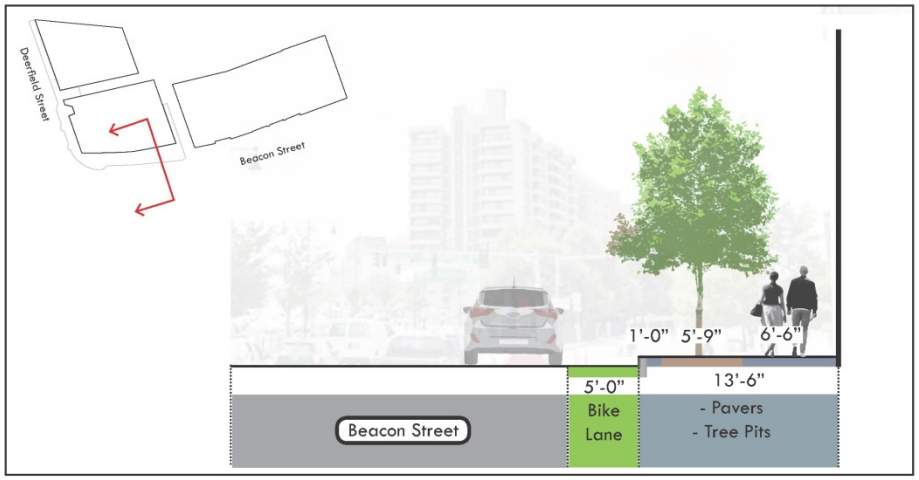
Figure 1-8
Public Realm Plan

proposed w/ buffered bike lane

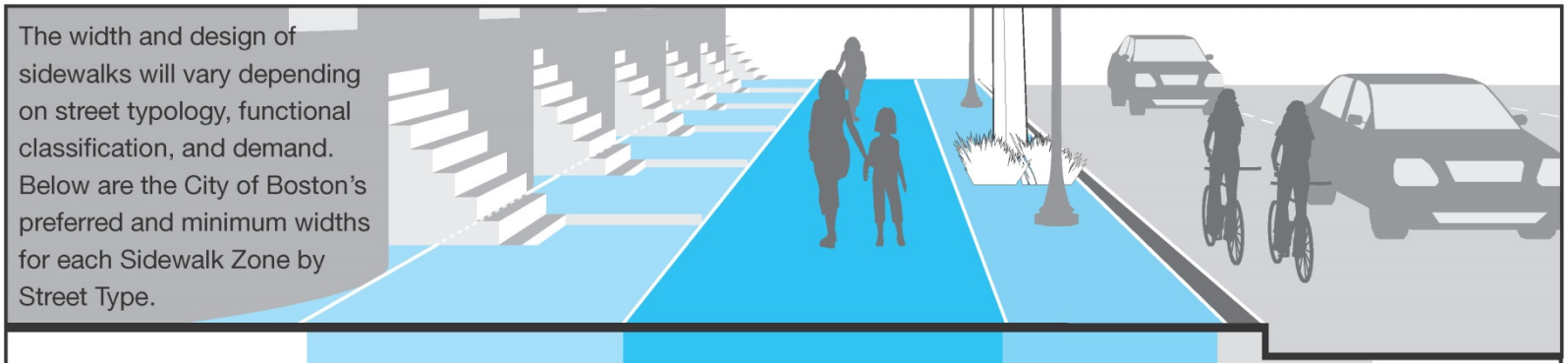


existing condition



Preferred and Minimum Widths for Sidewalk Zones

The width and design of sidewalks will vary depending on street typology, functional classification, and demand. Below are the City of Boston's preferred and minimum widths for each Sidewalk Zone by Street Type.



Street Type	Frontage Zone		Pedestrian Zone*		Greenscape/ Furnishing Zone		Curb Zone	Total Width	
	Preferred	Minimum	Preferred	Minimum	Preferred	Minimum		Preferred	Minimum
Downtown Mixed-Use	2'	0'	10'	8'	6'	1'-6"	6"	18'-6"	10'

Kenmore Square Redevelopment **Boston, Massachusetts**

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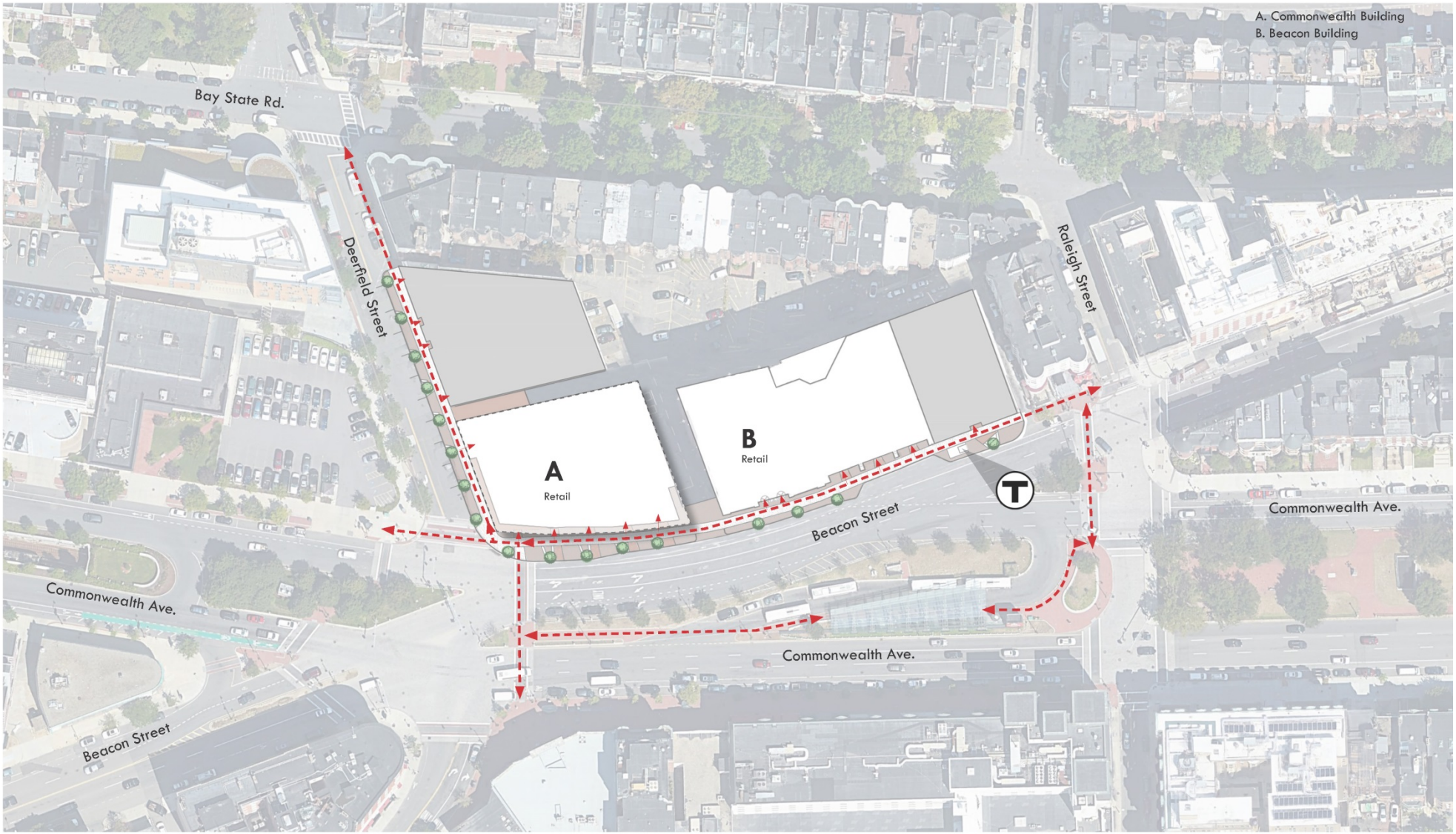
Figure 1-9
Public Realm Sections



Kenmore Square Redevelopment **Boston, Massachusetts**

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Figure 1-10
Pedestrian Circulation

Early design considerations of the Beacon Building only contemplated interior renovations with limited connections between the existing buildings. After further study of the existing façades as well as the buildings structural capacity, it was determined that new construction in the place of 650-656 Beacon Street connected to a renovated 660 Beacon Street was more practical for modern office tenants. The Beacon Building knits together the streetwall providing a cohesive experience while balancing a modern form and material against a historic context.

Early conceptual schemes comprised of a mostly glass façade transformed into a composition of opaque and transparent materials to better tie into this context, with specific setbacks aimed at opening up views guided by the pedestrian experience below.

1.3 Public Benefits

The Project will generate many public benefits both during construction and on an ongoing basis upon its completion.

Smart Growth/Transit-Oriented Development

The Project is consistent with smart-growth and transit-oriented development principles. The Project Site is adjacent to Kenmore Station which is served by three MBTA Green Line branches and five bus routes. The nearby commuter rail station, which is served by the Framingham/Worcester Commuter Rail line, is within walking distance of the site. The Project will expand the site's ability to offer commercial uses by upgrading and expanding existing spaces, as well as adding additional commercial space on an underutilized gateway parcel well served by transit and supported by existing infrastructure and commercial activity.

Improved Street and Pedestrian Environment

The Project will include the expansion of both the Deerfield Street and Beacon Street curb lines, which will benefit the urban context by allowing pedestrians and site users places to travel across the Project Site efficiently, while also providing spaces to gather, rest, and relax. A myriad of improvements to the way people access the Project Site via protected bike lanes, public transportation, and ride sharing have been integrated into the design.

Improved Urban Design and View Corridors

The massing of the Commonwealth Building and Beacon Building are designed to create a dynamic addition to Kenmore Square that does not overwhelm the existing view corridors from key street-level approaches. To achieve this, each additional level angles back toward the Charles River to minimize the perception of the height, thereby granting defined visibility of the Citgo Sign. Overall, the additions complement the heights of the surrounding buildings. The Commonwealth Building steps down to reflect the curvature of

the vehicular intersection, creating opportunities for outdoor space at these roof levels with direct views of Kenmore Square.

Sustainable Design/Green Building

The Proponent is committed to building a LEED certifiable project with a target of the Silver level, incorporating sustainable design features into the Project to preserve and protect the environment.

Increased Employment

The Project will create approximately 500 construction jobs and approximately 1,200 permanent jobs upon stabilization.

New Property Tax

The Project will result in increased tax revenues compared to the existing condition.

Linkage

The Project will contribute to the Housing and Jobs linkage funds.

1.4 Legal Information

1.4.1 Legal Judgments Adverse to the Proposed Project

The Proponent is not aware of any legal judgments or pending actions against the proposed Project.

1.4.2 History of Tax Arrears on Property

The Proponent does not own any property in Boston on which the property taxes are in arrears.

1.4.3 Site Control/Public Easements

The Proponent holds long term ground lease interests in the Project Site, for an initial term of 99 years subject to extension, by virtue of long term leases (collectively or individually, a "Lease") from the Trustees of Boston University (Boston University), the owner of the fee interest in the Project Site. Notices of the Lease have been recorded and filed with the Suffolk County Registry of Deeds and the Suffolk County Registry District of the Land Court as appropriate. The Proponent owns the existing improvements and will own the future Commonwealth Building and Beacon Building in fee simple, subject to the terms of the Lease.

There are no recorded easements held by any public entities on any portion of the Project Site. Other private parties have rights of passage on portions of the Project Site, and such

rights will be observed, amended or modified as appropriate to enable the Project to proceed. The Proponent, in turn, has the benefit of such passage rights over the land of other private parties.

1.5 City of Boston Zoning

The Project Site is located within the B-4 (General Business) Zoning Subdistrict of the Boston Proper Zoning District, the Groundwater Conservation Overlay District, and the Restricted Parking Overlay District. The Proponent will obtain the appropriate zoning relief for the Project as a whole, while enabling each of the components described above to be developed individually, coordinating with the review by the BPDA and other city agencies to the extent required. The Proponent will also seek other permits and approvals, if and as required, including coordination of voluntary accelerated design review by the Boston Landmarks Commission.

The Proponent will also seek to establish a Planned Development Area to encompass the Project Site in accordance with Article 80C of the Code, to obtain the zoning relief as necessary for the Project. The Project components will be reviewed in a coordinated process for the purposes of both Article 80B and Article 80C review. As such, each individual Project Component may be developed by individual developers who will obtain individual certifications of compliance and consistency and execute on its specific plan, including development agreements, with the BPDA and other city agencies to the extent required.

1.6 Anticipated Permits and Approvals

Table 1-2 presents a preliminary list of permits and approvals from governmental agencies that are expected to be required for the Project, based on currently available information. It is possible that only some of these permits or actions will be required, or that additional permits or actions will be required.

Table 1-2 Anticipated Permits and Approvals

Agency	Approval
Local	
Boston Air Pollution Control Commission	Parking Freeze Permit (if required)
Boston Civic Design Commission	Design Review
Boston Employment Commission	Construction Employment Plan
Boston Fire Department	Approval of Fire Safety Equipment; Fuel Oil Storage Permit (if required)

Table 1-2 Anticipated Permits and Approvals (continued)

Agency	Approval
Local (continued)	
Boston Inspectional Services Department	Building Permit; Demolition Permit; Other construction-related permits; Certificates of Occupancy
Boston Landmarks Commission	Article 85 Demolition Delay Review and other Review as required in connection with pending Landmark Petition
Boston Planning and Development Agency	Review under Article 80, including Large Project Review, as required pursuant to Article 80B of the Code and PDA Plan Review, as required pursuant to Article 80C of the Code; Cooperation Agreement; Boston Residents Construction Employment Plan Agreement; Certifications of Consistency and Compliance
Boston Public Safety Commission, Committee on Licenses	Parking Garage Permit; License for Storage of Inflammables
Boston Public Works Department	Street Opening Permits; Street/Sidewalk Occupancy Permits (as required)
Boston Transportation Department	Transportation Access Plan Agreement; Review and Approval of Construction Management Plan(s)
Boston Water and Sewer Commission	Sewer Extension/Connection Permit; Sewer Use Discharge Permit; Site Plan Approval; Temporary Construction Dewatering Permit (if required); Cross Connection/Backflow Prevention Approval
Office of Jobs and Community Services	Permanent Employment Agreement (as required)
Public Improvement Commission	Specific Repair Approvals
Boston Zoning Commission	Zoning Approval subject to BPDA recommendation and approval under Article 80C of the Code, including PDA Plan Approval
Interagency Green Building Council	Article 37 Compliance
State	
Department of Environmental Protection	Notification of Demolition and Construction; Fossil Fuel Utilization Permit (as required)
Massachusetts Water Resources Authority	Construction Dewatering Permit (if required); Temporary Construction Dewatering Permit (if required); Sewer Use Discharge Permit (if required)
Federal	
Environmental Protection Agency	NPDES General Construction Permit

1.7 Public Participation

A Letter of Intent was filed with the BPDA on January 26, 2018 beginning the Project's formal public review process. The Proponent looks forward to a comprehensive review process, including meetings with neighbors, local groups, elected officials and other interested parties.

1.8 Schedule

Construction is anticipated to start in the first quarter of 2019, with completion by the first quarter of 2021.

1.9 Project Identification and Team

Address/Location:	650-660 Beacon Street and 533-541 Commonwealth Avenue
Proponent:	RREF II Kenmore Lessor II LLC and RREF II Kenmore Lessor III LLC c/o Related Beal, LLC 177 Milk Street Boston, MA 02109 (617) 451-2100 Andrew Hayes Alex Provost
Architect:	Roger Ferris + Partners 11 Wilton Road Westport, CT 06880 (203) 222-4848 Katherine Dinneen
Executive Architect:	Stantec 311 Summer Street Boston, MA 02210 (617) 234-3100 Larry Grossman, AIA
Landscape Architect:	Kyle Zick Landscape Architecture, Inc. 36 Bromfield Street, Suite 202 Boston, MA 02108 (617) 451-1018 Kyle Zick, ASLA

Legal Counsel:	Nutter McClennen & Fish, LLP Seaport West 155 Seaport Boulevard Boston, MA 02210 (617) 439-2000 Mary Marshall
Article 80 and Historic Resources Consultant:	Epsilon Associates, Inc. 3 Mill & Main Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Article 80: Geoff Starsiak Historic Resources: Geoff Melhuish
Transportation Consultant and Civil Engineer:	VHB 99 High Street Boston, MA 02110 (617) 728-7777 Transportation: Sean Manning Civil Engineer: Mark Junghans
LEED Consultant:	WSP 88 Black Falcon Avenue, Suite 210 Boston, MA 02210 (617) 210-1600 Jeremy Pinkham

Chapter 2

Transportation

2.0 TRANSPORTATION

2.1 Introduction

This chapter provides a detailed and comprehensive evaluation of existing and proposed transportation conditions, and identifies potential Project impacts and proposed mitigation. This study has been developed to conform with the Boston Transportation Department's (BTD) "Transportation Access Plans Guidelines" and uses standard methodologies, including the Institute of Transportation Engineers' (ITE) Trip Generation Manual (9th Edition) and local travel characteristics as defined in Access Boston 2000-2010. The Study analyzes the following as part of this evaluation:

- Vehicle traffic on study area roadways and intersections;
- Parking conditions;
- Loading and service activities;
- Pedestrian and bicycle operations; and
- Public transportation services.

The purposes of these analyses are to:

- Define and quantify existing transportation conditions in the Project study area as defined by BTD;
- Estimate the transportation impacts that will be generated under future conditions based on the anticipated program for the Project;
- Develop a set of mitigation strategies and improvement measures which will help to lessen the transportation effects of the Project; and
- Demonstrate that these transportation mitigation efforts will meet or exceed BPDA and BTD requirements, and will serve as public benefits.

2.1.1 Summary of Findings

The additional traffic generated by the Project will produce very limited incremental impacts to the surrounding transportation infrastructure. The location of the Project affords the opportunity for it to operate as a highly-effective transit-oriented development that is well served by public transit via the MBTA Green Line, extensive bus options via Kenmore Square Station, nearby Commuter Rail, and other options which will foster a reduced share of trips that would be generated by automobile, resulting in reduced impacts on surrounding streets. The Project is not expected to result in any measurable changes to

peak hour operating conditions at study area intersections. As shown previously in Chapter 1, Figure 1-3 provides an illustrative Project Site Plan, indicating its key transportation-oriented provisions. Key findings and actions include the following:

- The Project Site is currently well served by public transportation infrastructure, including nearby public transit (MBTA Green Line, Commuter Rail, and other local bus routes).

- The Project is expected to generate approximately 69 entering and 10 exiting net-new vehicle trips during the weekday morning peak hour and approximately 9 entering and 54 exiting net-new vehicle trips during the weekday evening peak hour.

- The traffic generated by the Project is expected to have minimal impacts on the area's transportation infrastructure.

- The results of the analysis indicate that there will be only minor incremental increases in delay throughout the study area with the Project in place.

- The Project is expected to generate approximately 79 entering and 7 exiting net-new transit trips during the weekday morning peak hour and 3 entering and 57 exiting net-new transit trips during the weekday evening peak hour.

- The Proponent is committed to providing approximately 60 on-site parking spaces. These will be structured parking spaces within the new building.

- There will be dedicated off-street loading docks to ensure that loading and service operations are handled internal to the building site and not on any public streets or other adjacent private streets. The loading docks will have enclosed bays in the building for deliveries and trash removal.

- The Project will improve pedestrian sidewalks adjacent to the Project Site. New sidewalks will meet Americans with Disabilities Act and Architectural Access Board (ADA/AAB) standards. Street trees, where feasible, will also be provided along these new sidewalks.

- The Proponent will provide covered bicycle storage capacity on-site in accordance with the City of Boston Bicycle Guidelines. The Project will also include public bikes racks to support ground floor retail space and visitors.

- The Proponent will implement a proactive transportation demand management (TDM) plan to encourage its employees to use transit and other alternative forms of transportation.

2.1.2 Project Description

The Proposed Project consists of approximately 253,735 sf of office and approximately 28,765 sf of retail space produced in combination of renovation and new construction. The Commonwealth Building will be new construction, and the Beacon Building will include new construction and renovation. The existing buildings are a combination of ground floor retail, office, and abandoned residential units.

A summary of the Project program is presented in Table 2-1.

Table 2-1 Project Program Summary

Project Component	Proposed	Existing	Net-New
Office	253,735 sf	131,175 sf	122,560 sf
Retail	28,765 sf	47,510 sf	-18,745 sf
Total	282,500 sf	178,680 sf	103,815 sf
Vehicle Parking	60 spaces		

2.1.3 Study Methodology

The transportation analysis in support of the Project conforms to the BTD's "Transportation Access Plans Guidelines" and uses standard methodologies, including the Institute of Transportation Engineers' Trip Generation (9th Edition) and local travel characteristics as defined in Access Boston 2000-2010.

The Transportation Study was conducted in two distinct stages. The first stage (Existing Conditions) involved a survey and compilation of existing transportation conditions within the study area (defined below) including:

- An inventory of the transportation infrastructure within the defined Project study area, including its geometric and operational characteristics;
- Geometric and operational characteristics of study area roadways and intersections;
- Existing traffic control at study area intersections (i.e., traffic signalization, stop signs, one-way streets, etc.);
- Area off-street and on-street parking supply;
- Pedestrian activity along study area roadways, and at study area intersections;

- Bicycle activity and accommodations; and
- Public transportation options within the study area, including the MBTA Green Line, Commuter Rail, and bus options.

In the second stage of the study (Evaluation of Long-Term Transportation Impacts), future transportation conditions were projected within the study area. The future No-Build Condition includes an assessment of future transportation including background growth on area roadways and intersections, planned transportation infrastructure improvements, and growth related to other proposed projects within the study area (without consideration of the Project). The future No-Build Condition takes into consideration many of the projects that are planned and/or under construction within the Kenmore/Fenway area including those listed in Section 4.3.2. The future Build Condition assesses the No-Build Condition plus estimated traffic generated by the Project.

Roadway, pedestrian, and transit capacity for morning and evening peak commuter periods, including traffic counts in 2017, were studied and are summarized for the following conditions:

- 2017 Existing Condition;
- 2022 No-Build Condition; and
- 2022 Build Condition.

Specific travel demand forecasts for the Project were assessed along with future transportation demands due to background traffic growth and traffic growth from other planned or approved projects within the study area. The year 2022 was selected as the horizon year for the purposes of quantifying and assessing future transportation impacts. The five-year planning horizon is consistent with BTD Guidelines. The analysis of future year conditions considered the following:

- Calculation of vehicular trip generation for the proposed Project and other area planned development identified in the study area.
- Establishment of trip generation estimates based on the Institute of Transportation Engineers (ITE) Trip Generation Manual (9th Edition), as well as approved background projects.
- Distribution and assignment of all development-generated traffic onto study area intersections in accordance with current travel patterns, previous studies of the area, data provided for other projects, and anticipated travel behavior changes that can be quantified and substantiated.

- Assessment of 2017 Existing Condition, 2022 No-Build Condition, and 2022 Build Condition traffic based on capacity analyses, reported levels of service, and queuing output derived for the defined study area intersections.

- Appropriate mitigation and improvement actions to meet or exceed BPDA and BTD requirements, and will serve as public benefits.

2.2 2017 Existing Condition

This section describes existing transportation conditions, including an overview of roadway conditions, transit operations, pedestrian and bicycle facilities, and general site conditions. A discussion of existing on- and off-street public parking supply is also provided.

2.2.1 Vehicle Conditions

The Project Site is in the Kenmore Square neighborhood of Boston with direct access to the major roadway arterials, public transit alternatives and a vast system of sidewalks and bike lanes to connect the site with the surrounding community and adjacent neighborhoods. The site borders the highly active Kenmore Station which serves seven MBTA bus routes and the MBTA Green Line, making this Project an ideal transit oriented development. The following sections provide details on the existing transportation infrastructure supporting the Project Site.

2.2.1.1 Roadway Network

The Project is bounded by Commonwealth Avenue and Brookline Avenue to the south, Deerfield Street to the west, Bay State Road to the north, and Raleigh Street to the east. The existing site accommodates direct access to a rear surface parking lot off Beacon Street/Commonwealth Avenue via two driveways, and a third driveway is provided on Deerfield Street.

Commonwealth Avenue – Commonwealth Avenue is an east/west roadway along the southern border of the Project Site that extends from the Boston Public Garden to the east to Packards Corner in Allston to the west. The roadway accommodates two-way traffic separated by a median of varying widths and median uses. To the east of the Project Site, Commonwealth Avenue is separated by green space, and to the west of the Project Site, Commonwealth Avenue is separated by the MBTA Green Line B Branch. The segment of road adjacent to the Project Site is separated by an MBTA busway. Sidewalks are provided along the northern edge of Commonwealth Avenue westbound and along the southern edge of Commonwealth Avenue eastbound. Crosswalks are available at all signalized intersections.

Beacon Street – Beacon Street is an east/west roadway that extends from Tremont Street to the east and through the Longwood Medical and Academic Area to I-95 in Newton. The roadway from Tremont Street to Raleigh Street is one-way westbound, and after merging with Commonwealth Avenue westbound through the Kenmore Square intersection, Beacon Street becomes a two-way road separated by a median and the MBTA Green Line C Branch. Sidewalks are provided along both sides of Beacon Street, and crosswalks are available at all signalized intersections.

Brookline Avenue – Brookline Avenue is a northeast/southwest roadway to the southwest of the Project Site that intersects with the Kenmore Square intersection and extends to the southwest to Washington Street in Brookline. This two-way roadway passes through the heart of Fenway and the Longwood Medical and Academic Area. Sidewalks are provided along both sides of Brookline Avenue. Crosswalks are available at all signalized intersections.

Deerfield Street – Deerfield Street is a north/south roadway along the western border of the Project Site that extends from the Kenmore Square intersection to the south to Back Street along Storrow Drive to the north. The roadway allows two-way traffic with a segment of angled parking in front of the United States Postal Service building. Sidewalks are provided along both sides of Deerfield Street, and crosswalks are available at the Kenmore Square and Bay State Road intersections.

Bay State Road – Bay State Road is a one-way westbound roadway north of the Project Site that extends from Charlesgate West to the east to Boston University to the west. The roadway passes through a residential area that runs parallel to Commonwealth Avenue to the south. Parking is allowed on both sides of the street with a mix of metered and residential parking. Sidewalks are provided along both sides of Bay State Road, and crosswalks are available at all intersections except Raleigh Street.

Raleigh Street/Kenmore Street – Raleigh Street is a north/south roadway that extends from Beacon Street to the south to Back Street along Storrow Drive to the north. It is a two-way roadway with segments of on-street parking. South of the Beacon Street intersection, Raleigh Street becomes Kenmore Street. Kenmore Street is one-way northbound between Commonwealth Avenue westbound and Commonwealth Avenue eastbound. South of Commonwealth Avenue eastbound, Kenmore Street is a two-way roadway and extends south to Newbury Street. Sidewalks are provided along both sides of Raleigh Street and Kenmore Street, and crosswalks are available at all intersections.

2.2.1.2 Study Area Intersections

The Project study area includes nine key intersections, as illustrated in Figure 2-1 and listed below.

- Bay State Road at Deerfield Street (unsignalized);

- Bay State Road at Raleigh Street (unsignalized);
- Kenmore Square: Commonwealth Avenue at Beacon Street/Deerfield Street/ Brookline Avenue (signalized);
- Brookline Avenue at Newbury Street (unsignalized);
- Commonwealth Avenue westbound at western site driveway (unsignalized);
- Commonwealth Avenue westbound at eastern site driveway (unsignalized);
- Beacon Street westbound at Raleigh Street/Kenmore Street (signalized);
- Commonwealth Avenue westbound at Kenmore Street (signalized); and
- Commonwealth Avenue eastbound at Kenmore Street (signalized).

2.2.1.3 Existing Traffic Volumes

Existing traffic data was collected for all the study area intersections for the morning and evening peak hours on Tuesday, May 16, 2017. Based on the compiled vehicular traffic data from the study area intersections, the existing weekday morning peak hour occurs between 7:30 a.m. and 8:30 a.m., while the existing weekday evening peak hour occurs between 5:00 p.m. and 6:00 p.m.

Figures 2-2a and 2-2b represent the 2017 Existing Conditions weekday peak hour traffic volumes for morning and evening, respectively.

2.2.1.4 Parking

The existing surface parking lot behind the Project Site is served by three entry/exit driveways located on Beacon Street/Commonwealth Avenue and Deerfield Street. These driveways are narrow for two-way traffic, yet they are not marked with one-way traffic restrictions. There are several off-street parking options available within a quarter-mile radius. The location of these indoor garages and outdoor surface lots as well as their approximate capacity are provided in Figure 2-3. Although parking at Hotel Buckminster is included, the parking availability may change due to the proposed project on their site.

The on-street parking regulations within the study area are mostly comprised of no stopping, residential parking, and metered parking. A more detailed depiction of the existing on-street parking and curb use inventory for the quarter-mile radius surrounding the site is provided in Figure 2-4. Within the quarter-mile radius study area, there are no Zipcar or other car share locations.

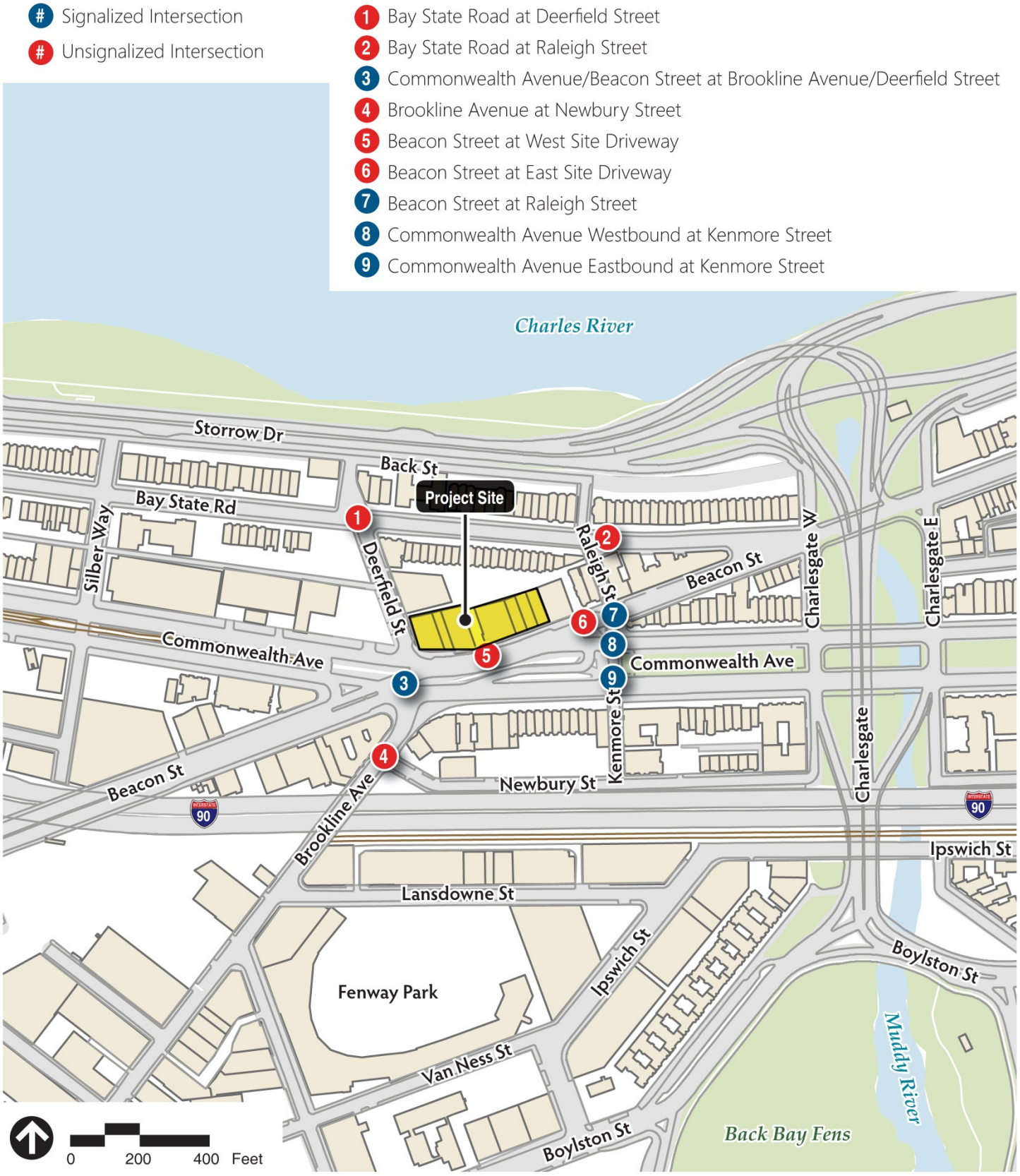

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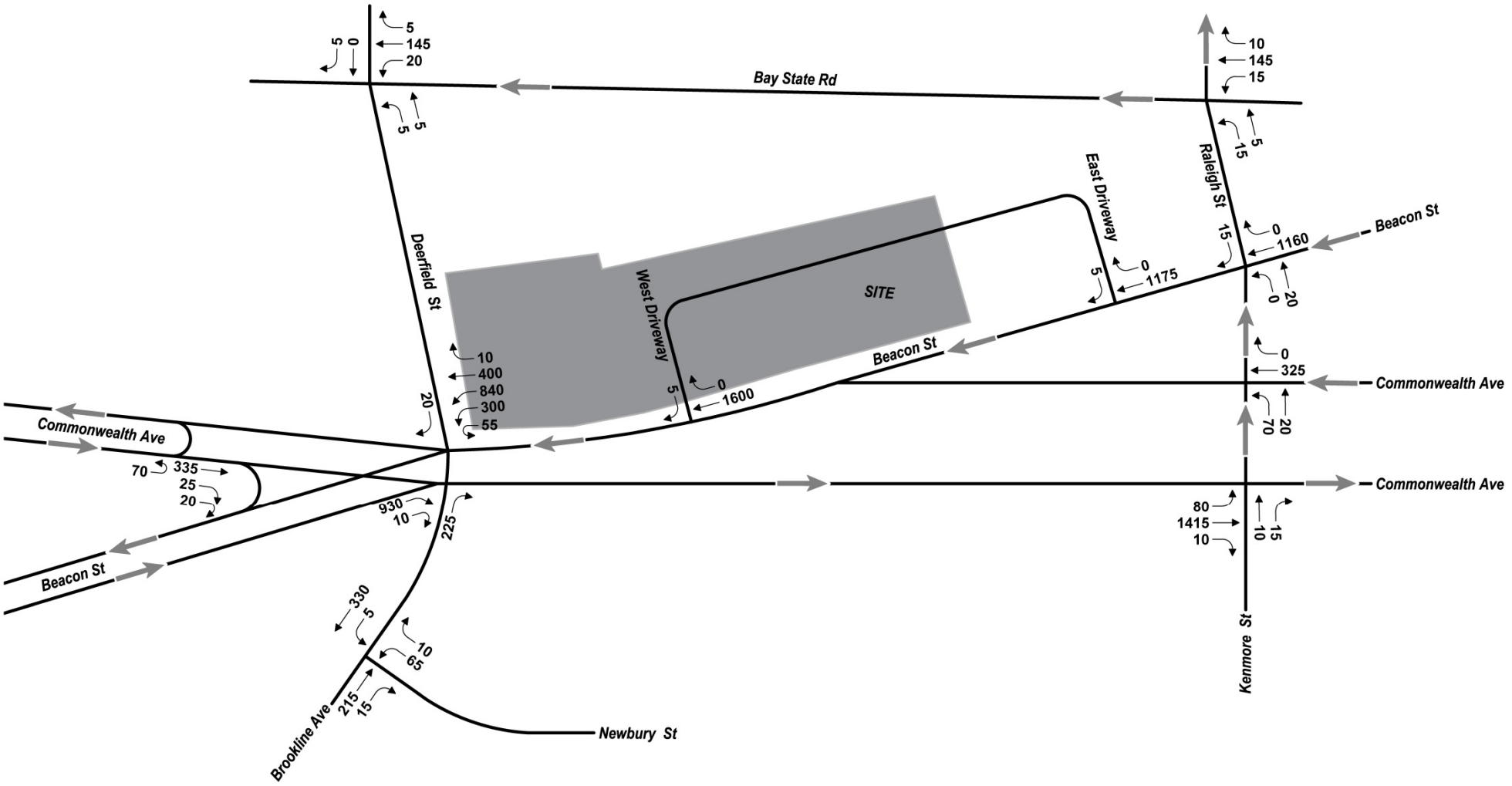
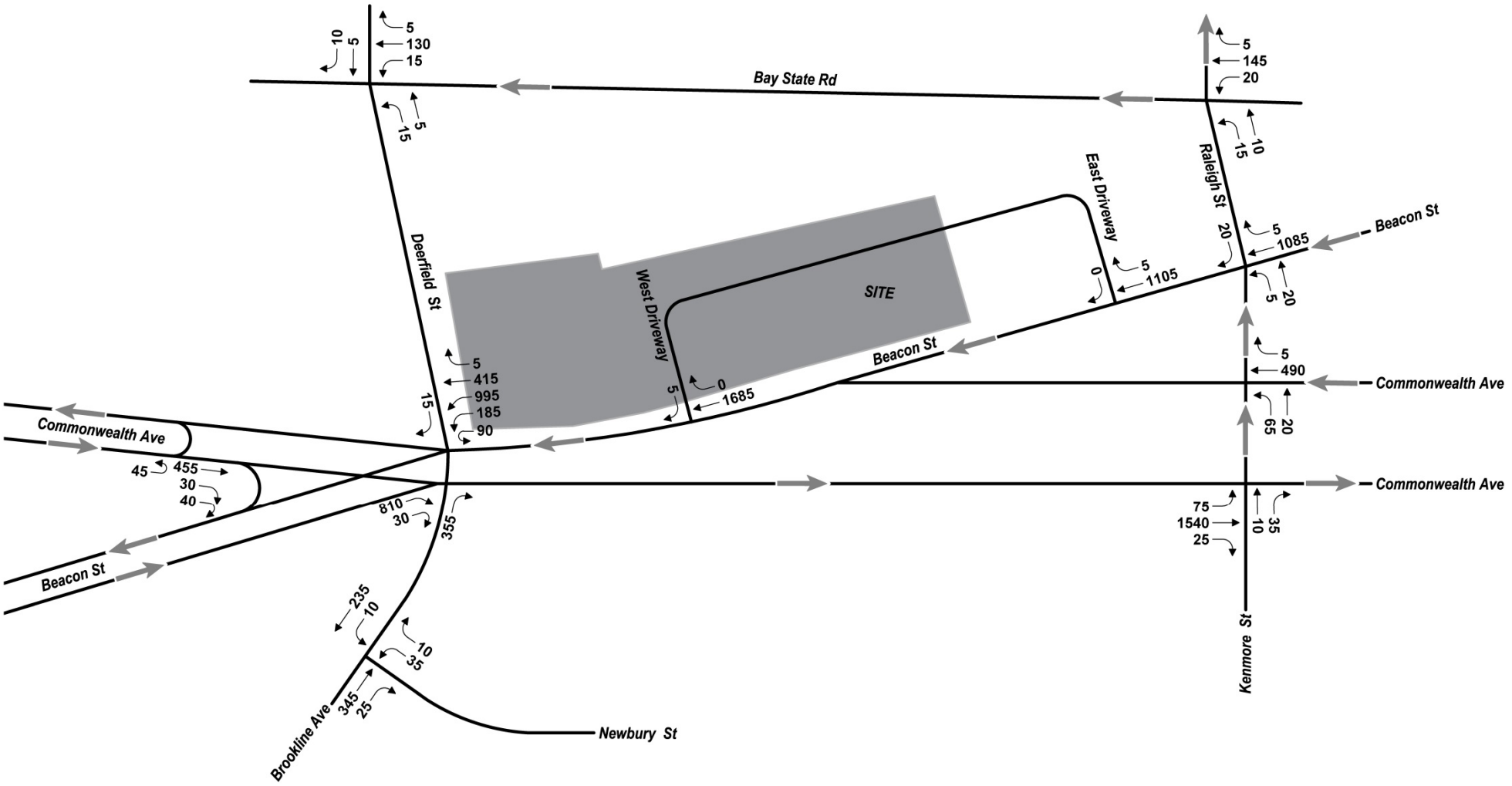
Figure 2-1
Study Area Intersections



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-2a
2017 Existing Condition Vehicle Volumes AM Peak Hour (7:30-8:30 a.m.)



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-2b
2017 Existing Condition Vehicle Volumes PM Peak Hour (5:00-6:00 p.m.)

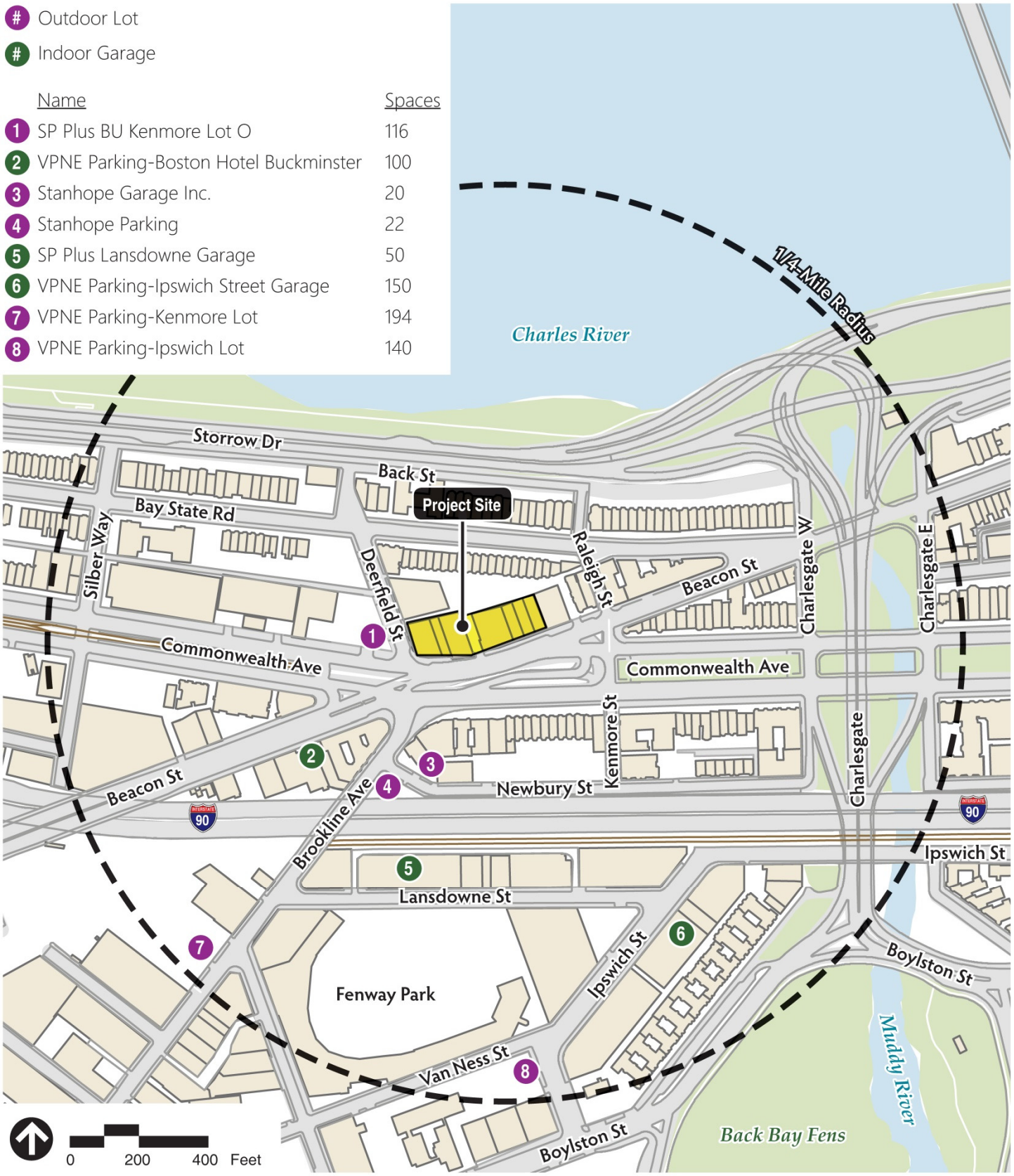


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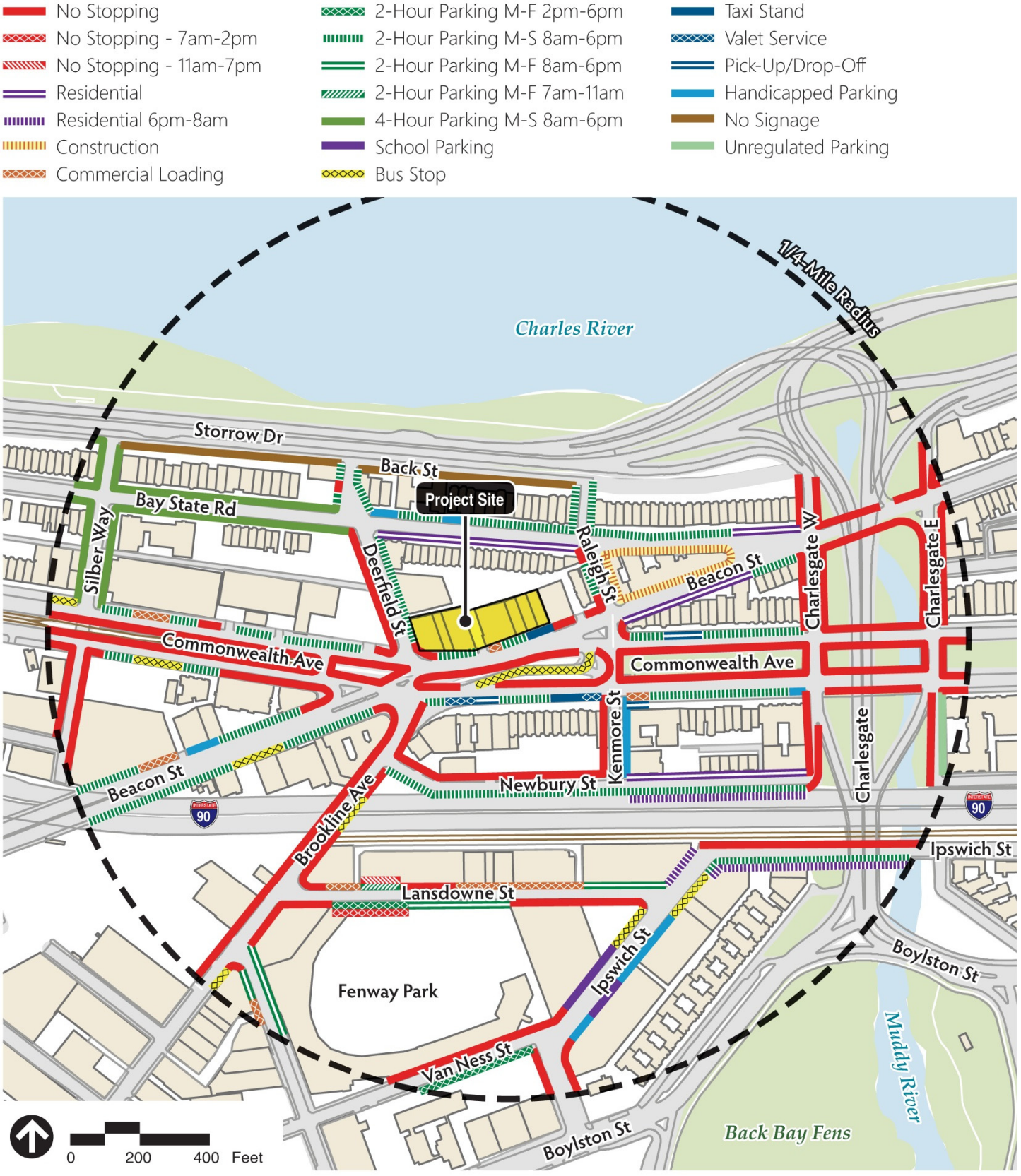
Figure 2-3
Summary of Off-Street Parking



Kenmore Square Redevelopment Boston, Massachusetts

Figure 2-4
On-Street Parking Regulations

2.2.1.5 Freight Network

According to an interactive map of the trucking network within Massachusetts (per MassDOT website), there a 24-hour freight restriction for all vehicles 2.5 tons and over along Bay State Road from Charlesgate West to the east to Granby Street to the west. This may impact the study area intersections of Bay State Road at Deerfield Street and Bay State Road at Raleigh Street. No other roadways in the study area have exclusions.

2.2.2 Transit Conditions

The Project Site is well-served by the MBTA Green Line and the MBTA bus system. The MBTA routes #8, 9, 19, 57, 57A, 60, and 65 are within walking distance of the Project Site. These routes are shown in Figure 2-5 and are described in more detail in Table 2-2.

Table 2-2 Transit Service Summary

MBTA Service	Origin/Destination	Major Stops	Stop Closest to Project Site	Peak Hour Frequency (minutes)	Hours of Service
Green Line B Branch	Park Street – Boston College	Boston University Packards Corner Chestnut Hill Boston College	Kenmore Station	6	Weekdays: 5:01 a.m. – 12:52 a.m. Saturday: 4:45 a.m. – 12:52 a/m/ Sunday: 5:20 a.m. – 12:52 a.m.
Green Line C Branch	North Station – Cleveland Circle	Coolidge Corner Washington Square Cleveland Circle	Kenmore Station	6 – 7	Weekdays: 5:01 a.m. – 12:46 a.m. Saturday: 4:50 a.m. – 12:46 a.m. Sunday: 5:30 a.m. – 12:46 a.m.
Green Line D Branch	Government Center – Riverside	Longwood Newton Centre Riverside	Kenmore Station	6	Weekdays: 4:56 a.m. – 12:49 a.m. Saturday: 4:55 a.m. – 12:49 a.m. Sunday: 5:25 a.m. – 12:49 a.m.
Bus Route 8	Harbor Point/UMass – Kenmore Station via B.U. Medical Center & Dudley Station	South Bay Center Wentworth Institute Longwood Medical Area	Kenmore Station	14 – 19	Weekdays: 5:15 a.m. – 12:56 a.m. Saturday: 6:30 a.m. – 1:01 a.m. Sunday: 6:30 a.m. – 1:01 a.m.

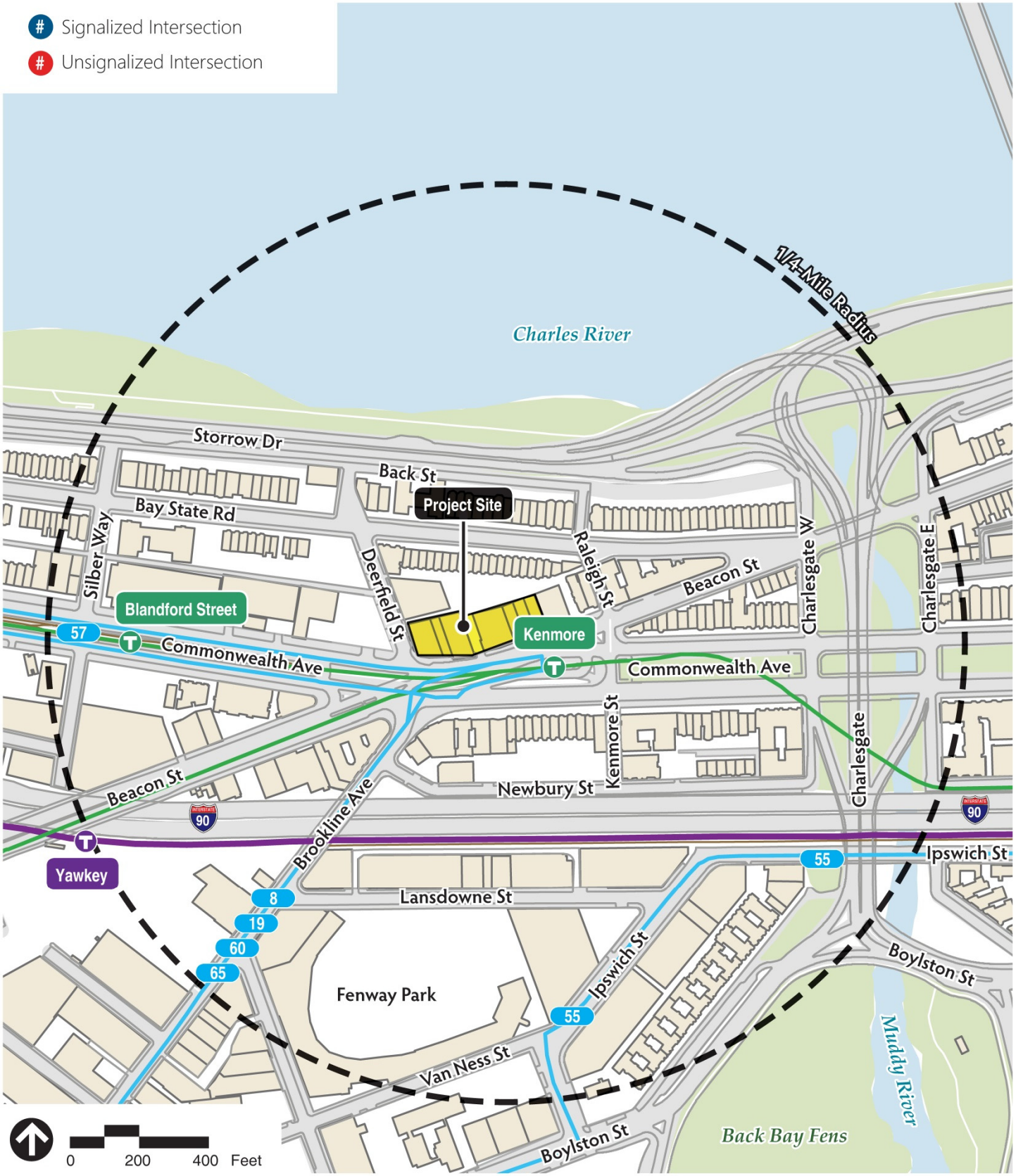
Table 2-2 Transit Service Summary (continued)

MBTA Service	Origin/Destination	Major Stops	Stop Closest to Project Site	Peak Hour Frequency (minutes)	Hours of Service
Bus Route 9	City Point – Copley Square via Broadway Station	City Point Broadway Copley Square	Kenmore Station	5 – 10	Weekdays: 5:13 a.m. – 1:13a.m. Saturday: 5:10 a.m. – 1:14 a.m. Sunday: 6:00 a.m. – 1:12 a.m.
Bus Route 19	Fields Corner – Kenmore Station or Ruggles Station	Fields Corner Uphams Corner Fenway	Kenmore Station	16 – 35	Weekdays: 5:50 a.m. – 7:45 p.m. No weekend service
Bus Route 57	Watertown Yard – Kenmore Station	Watertown Yard Newton Corner Brighton Center Union Square (Allston)	Kenmore Station	10 – 14	Weekdays: 4:33 a.m. – 1:30 a.m. Saturday: 4:33 a.m. – 1:21 a.m. Sunday: 6:00 a.m. – 1:32 a.m.
Bus Route 57A	Oak Square – Kenmore Station	Oak Square Brighton Center Union Square (Allston)	Kenmore Station	11 – 16	Weekdays: 6:42 a.m. – 7:06 p.m. No weekend service
Bus Route 60	Chestnut Hill – Kenmore Station	Chestnut Hill Brookline Village Longwood Medical Area	Kenmore Station	24 – 30	Weekdays: 4:55 a.m. – 12:18 a.m. Saturday: 4:55 a.m. – 1:01 a.m. Sunday: 6:00 a.m. – 9:51 p.m.
Bus Route 65	Brighton Center – Kenmore Station	Brighton Center Washington Square Longwood Medical Area	Kenmore Station	10 – 20	Weekdays: 5:58 a.m. – 8:58 p.m. Saturday: 6:45 a.m. – 6:39 p.m. Sunday: No Service

Source: MBTA Spring 2018 Schedule

2.2.3 Bicycle Conditions

The Project Site is served by bicycle lanes and shared lane markings on the surrounding major roadways. Beacon Street and Commonwealth Avenue westbound provide bicycle lanes on the roadway segment directly south of the site and west of the Kenmore Square intersection. Commonwealth Avenue eastbound also provides bicycle lanes through the study area. Figure 2-6 displays the existing bicycle facilities within the study area.



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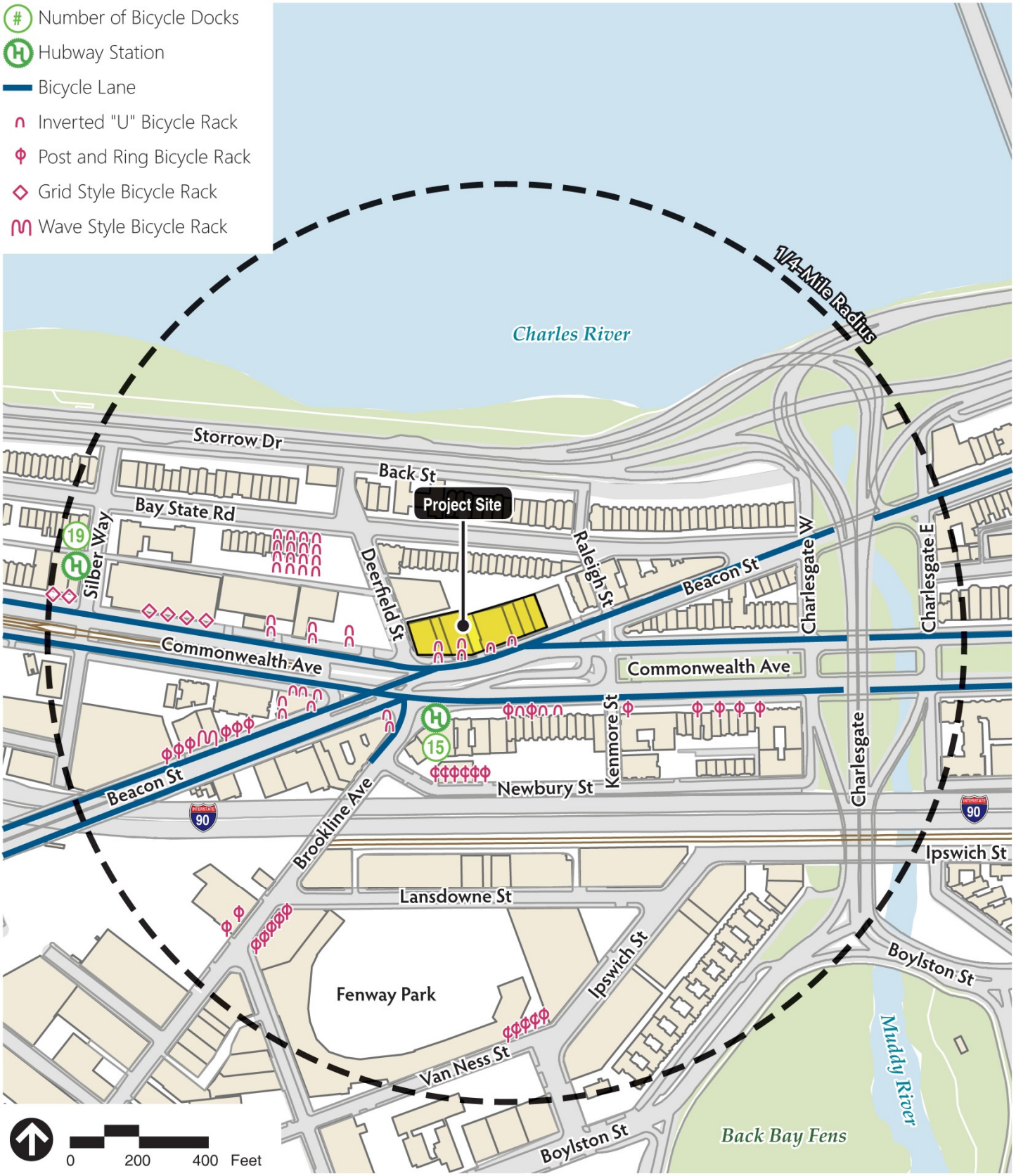

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Figure 2-6

Existing Bicycle Facilities, Bicycle Parking, and Hubway Locations

Bicycle counts were completed during the data collection effort on Tuesday, May 16, 2017. During the morning peak hour, approximately 190 bicyclists merge at Beacon Street eastbound and Commonwealth Avenue eastbound to travel towards downtown Boston. The reverse commute occurs during the evening peak hour when approximately 180 bicyclists merge at Beacon Street westbound and Commonwealth Avenue westbound to travel away from the downtown Boston. Modest bicycle activity occurs on the other roadways within the study area. Figures 2-7a and 2-7b show the 2017 Existing Condition bicycle volumes for the morning and evening peak hour, respectively.

Two Hubway stations are located within a quarter-mile of the site. The closest station is located to the southeast of the Kenmore Square intersection (on the corner of Commonwealth Avenue eastbound and Brookline Avenue), which provides 15 bicycle docks. The second station is located west of the Kenmore Square intersection on Silber Way with 19 bicycle docks. Figure 2-6 also shows the location of this Hubway facility within the bicycle network.

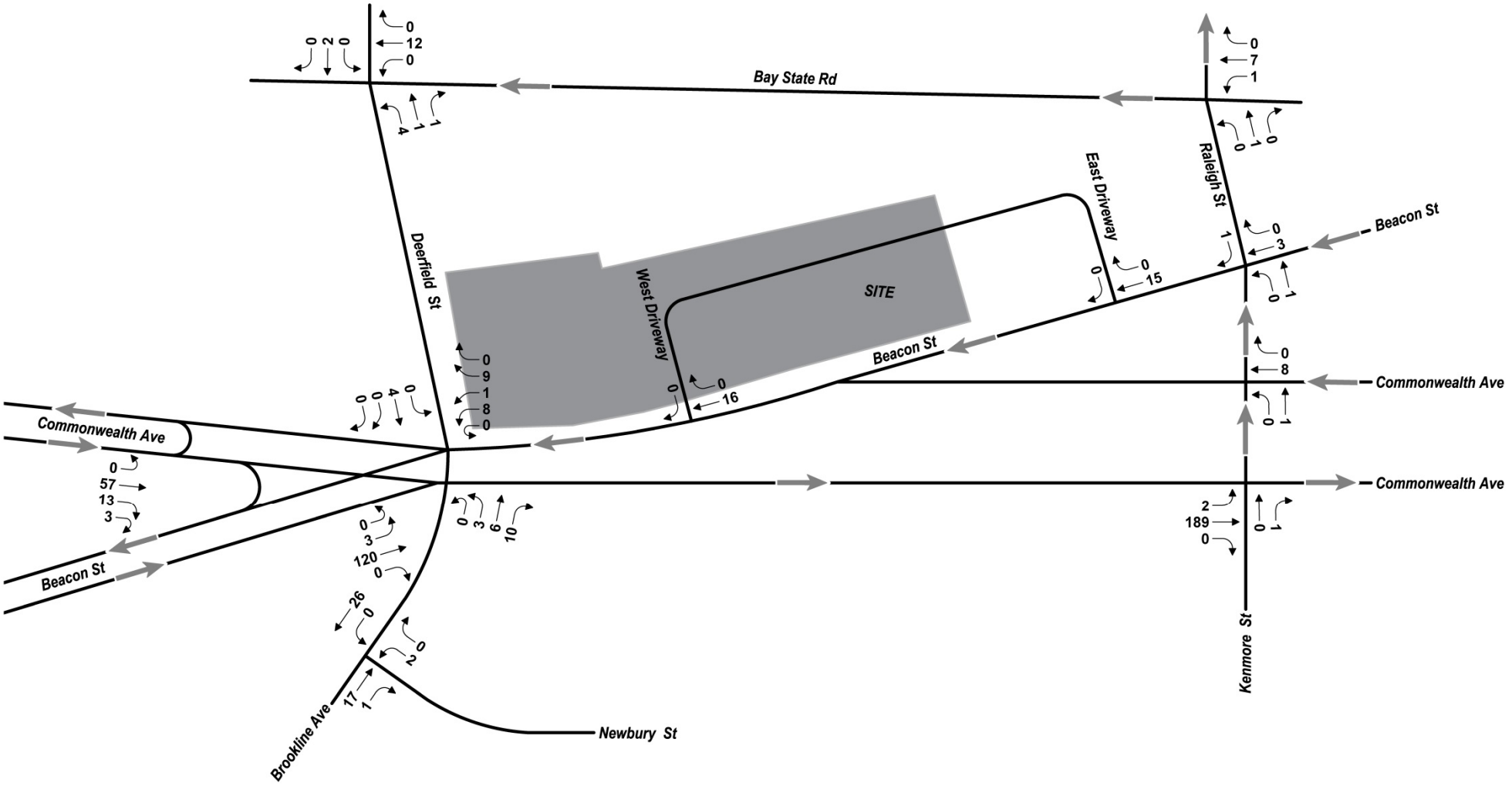
2.2.4 Pedestrian Conditions

The Project Site is well-served by pedestrian facilities including sidewalks along all roadways, crosswalks at all study area intersections, and activated streetscapes and building fronts. Pedestrian counts were conducted as part of the data collection effort on Tuesday, May 16, 2017.

High levels of pedestrian activity were observed along the sidewalk adjacent to the Project Site and at all study area intersections. The pedestrian volumes were especially high during the evening peak hour in comparison to the morning peak hour. Approximately 200 pedestrians travel on the sidewalk adjacent to the Project Site on Beacon Street westbound/Commonwealth Avenue westbound during the morning peak hour, and 500 pedestrians travel along the sidewalk during the evening peak hour. Detailed pedestrian counts at the study area intersections are provided in Figures 2-8a and 2-8b.

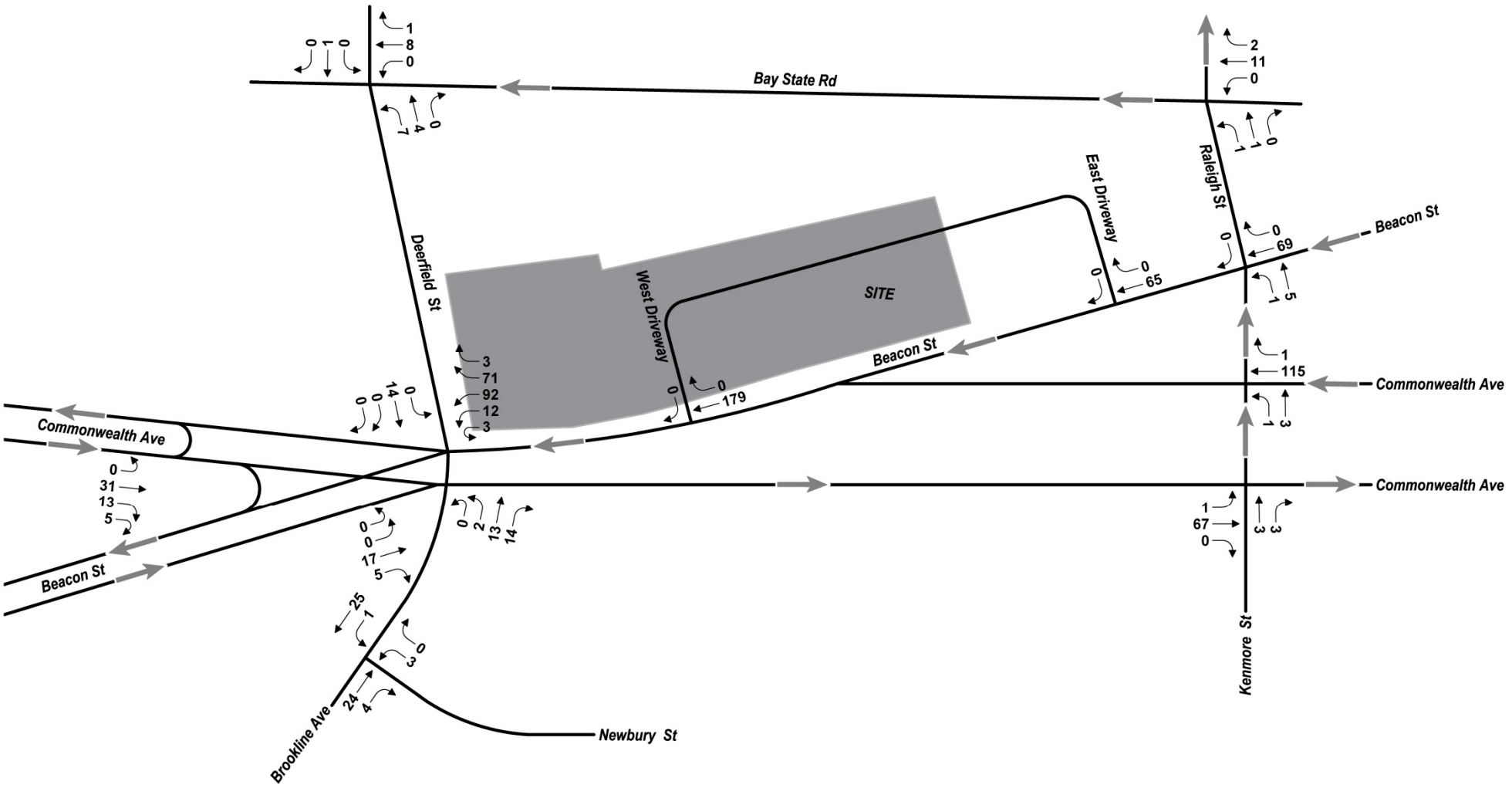
2.2.5 Crash Analysis

A detailed crash analysis was conducted to identify potential vehicle accident trends and/or roadway deficiencies in the traffic study area. The most current vehicle accident data for the study area intersections for the latest five years were obtained from MassDOT from 2011-2015. The MassDOT database is comprised of crash data from the Massachusetts Registry of Motor Vehicles (RMV) Division primarily for use in traffic studies and safety evaluations. Data files are provided for an entire city or town for an entire year, though it is possible that some crash records may be omitted either due to individual crashes not being reported, or the city crash records not being provided in a compatible format for RMV use. It also should be noted that the location for some accidents cannot be precisely determined from the database. A summary of the study area intersections vehicle accident history is presented in Table 2-3.



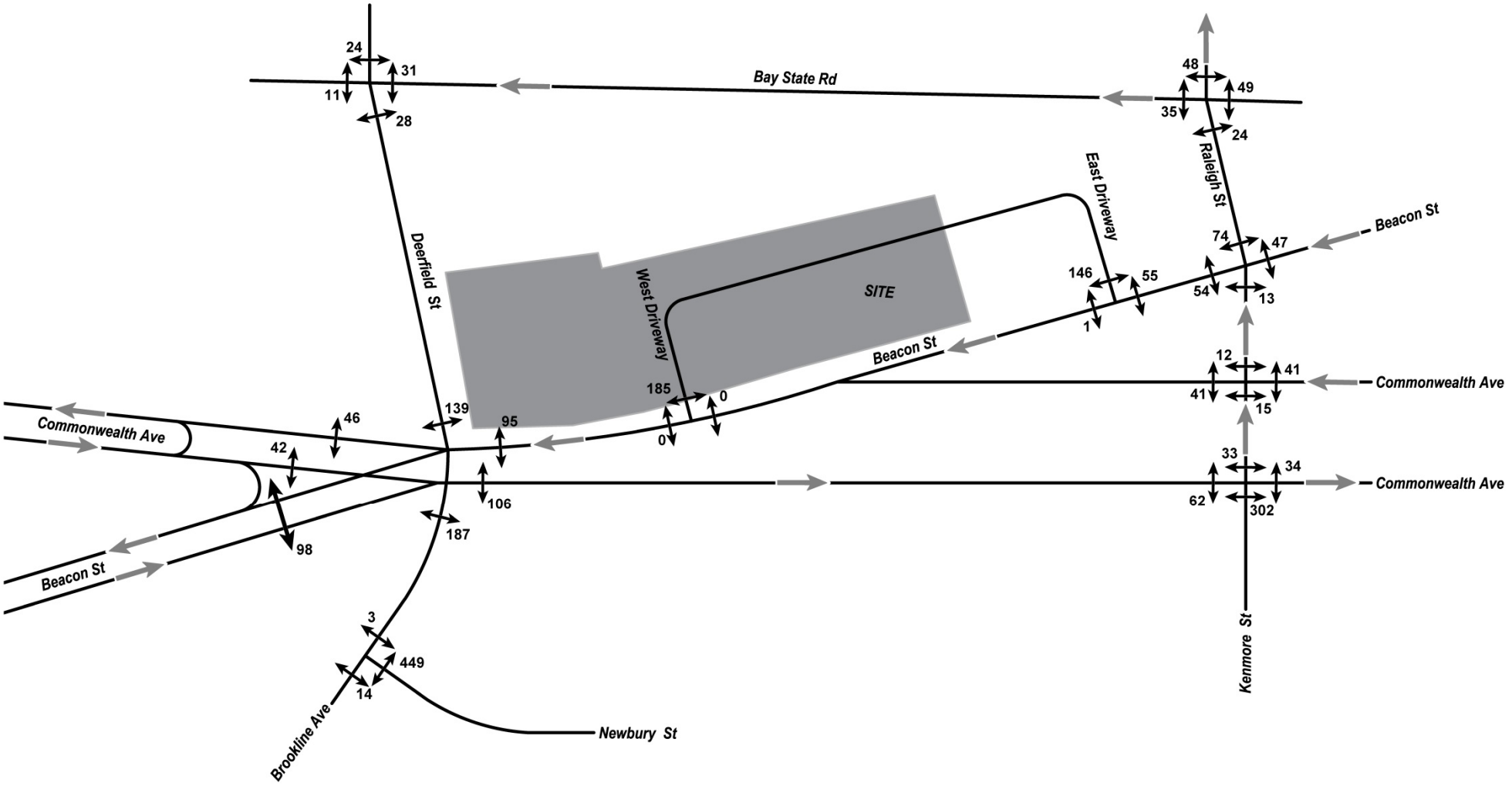
Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-7a
2017 Existing Condition Bicycle Volumes AM Peak Hour (7:30-8:30 a.m.)



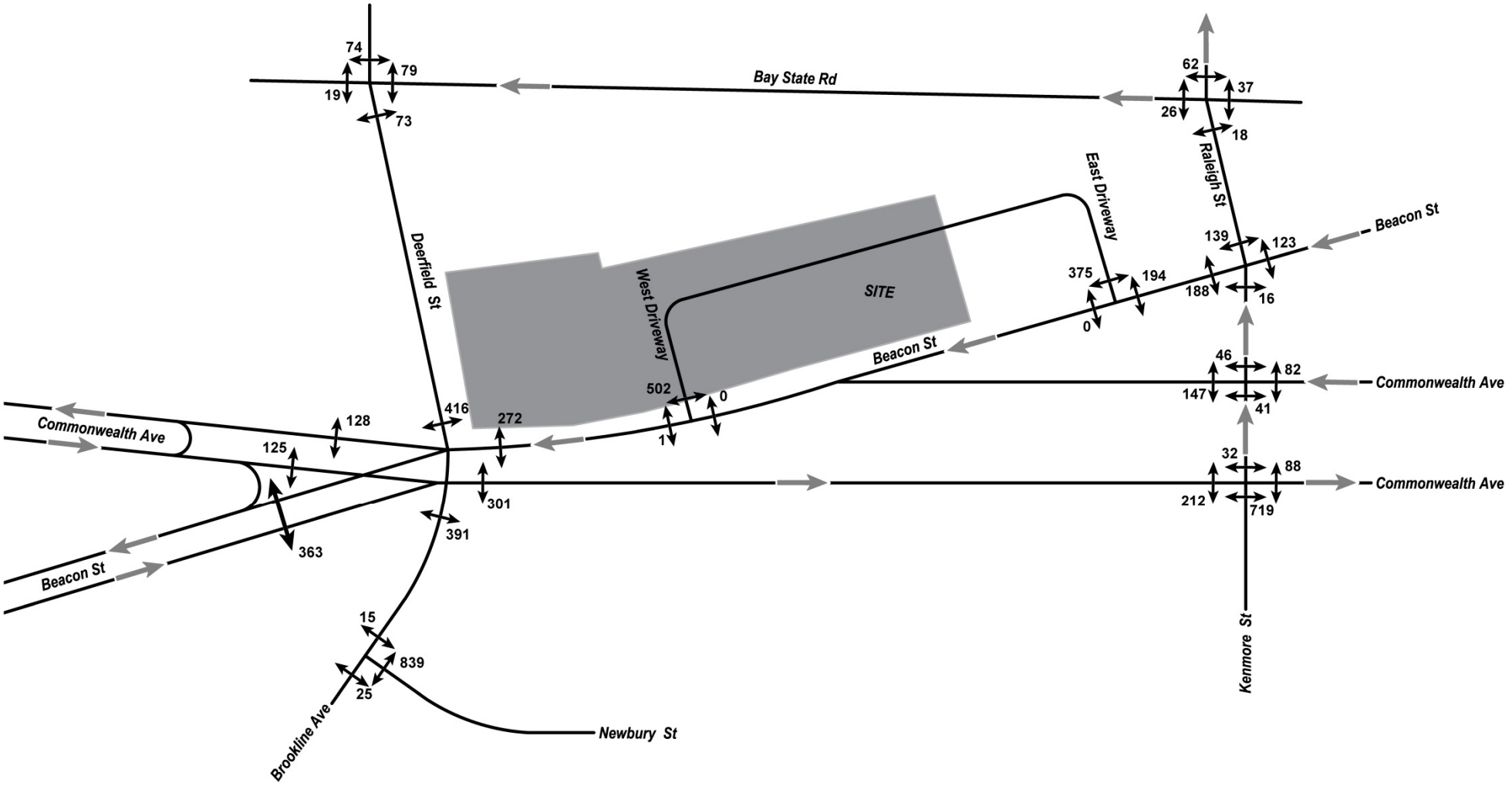
Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-7b
2017 Existing Condition Bicycle Volumes PM Peak Hour (5:00-6:00 p.m.)



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-8a
2017 Existing Condition Pedestrian Volumes AM Peak Hour (7:30-8:30 a.m.)



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-8b
2017 Existing Condition Pedestrian Volumes PM Peak Hour (5:00-6:00 p.m.)

Only three intersections had reported crashes from 2011-2015, as shown in Table 2-3. The crash data does not show any fatal crashes within the study area intersections. Of the four total crashes, three crashes were reported as non-fatal injuries, and one crash did not have an associated crash severity reported.

Table 2-3 Intersection Crash Summary (2011-2015)

	Bay State Rd at Raleigh St	Kenmore Square	Commonwealth Ave WB at Kenmore St
Currently Signalized?	No	Yes	Yes
MassHighway ACR	0.53	0.77	0.77
MassHighway CCR	0.25	0.03	0.09
Exceeds?	No	No	No
Year			
2011	0	0	0
2012	1	2	0
2013	0	0	1
2014	0	0	0
2015	0	0	0
Total	1	2	1
Average	0.4	0.4	0.2
Collision Type			
Angle	0	0	0
Head-on	0	1	0
Rear-end	0	0	1
Rear-to-rear	0	0	0
Sideswipe, opposite direction	0	1	0
Sideswipe, same direction	0	0	0
Single Vehicle Crash	0	0	0
Unknown	1	0	0
Not reported	0	0	0
Total	1	2	1
Crash Severity			
Fatal injury	0	0	0
Non-fatal injury	1	1	1
Property damage only	0	0	0
Not reported	0	1	0
Unknown	0	0	0
Total	1	2	1

Table 2-3 Intersection Crash Summary (2011-2015) (continued)

	Bay State Rd at Raleigh St	Kenmore Square	Commonwealth Ave WB at Kenmore St
Time of Day			
Weekday, 7:00 a.m. - 9:00 a.m.	0	1	0
Weekday, 4:00 p.m. - 6:00 p.m.	0	0	0
Saturday, 11:00 a.m. - 2:00 p.m.	0	0	0
Weekday, other time	1	0	1
Weekend, other time	0	1	0
Total	1	2	1
Pavement Conditions			
Dry	1	2	1
Wet	0	0	0
Snow	0	0	0
Ice	0	0	0
Sand, mud, dirt, oil, gravel	0	0	0
Water (standing, moving)	0	0	0
Slush	0	0	0
Other	0	0	0
Unknown	0	0	0
Not reported	0	0	0
Total	1	2	1
Non-Motorist (Bike, Pedestrian)	**0**	**1**	**0**

MassDOT has six districts within Massachusetts, and the study area falls under District 6[1]. The District 6 average crash rate, per million entering vehicles, for signalized intersections is 0.70, and the average crash rate for unsignalized intersections is 0.53. All crash rates for the three intersections fall well below the District 6 average crash rates. The highest crash rate is observed at the unsignalized intersection of Bay State Road at Raleigh Street with a MassHighway calculated crash rate of 0.25.

The statewide crash rates for signalized and unsignalized intersections are higher than the District 6 rates, 0.77 for signalized and 0.58 for unsignalized. Again, the crash rates at the three intersections are below the statewide crash rates for both signalized and unsignalized intersections.

[1] MassDOT District 6 includes the following cities and towns as defined on the MassDOT website: Boston, Braintree, Brookline, Cambridge, Canton, Chelsea, Dedham, Dover, Milton, Needham, Newton, Quincy, Randolph, Watertown, Wellesley, Weston, Westwood, Weymouth, and Winthrop.

Additionally, the study area intersections were compared to the MassDOT Highway Safety Improvement Plan (HSIP) map of the top crash locations. None of the intersections or roadway segments within the study area were classified as HSIP clusters in recent years per the online interactive top crash locations map.

2.3 2022 Future No-Build Conditions

The 2022 No-Build Condition analyzes the future transportation conditions within the Project study area absent of the proposed Project. This condition projects five years into the future and adjusts the traffic conditions to estimate the vehicle volumes and infrastructure improvements within the area. These conditions are described further below.

2.3.1 General Background Growth

A general area-wide traffic growth rate was applied to the Existing Condition peak hour traffic volumes to reasonably account for general future traffic growth in the Project study area. As confirmed by BTD, an annual growth rate of one-half percent per year for five years was applied to the 2017 Existing Condition vehicle volumes.

2.3.2 Area Development Projects

In addition, vehicular traffic and infrastructure improvements associated with specific planned projects around the Project Site have been incorporated into the 2022 No-Build Condition vehicle volumes. These projects include:

- **Parcel 7/Fenway Center –** involves the construction of a four building and parking garage mixed use development to be built over the Massachusetts Turnpike. The development will range from seven to 22 stories with approximately 819,000 total gross square feet with approximately 552 residential units and approximately 1,340 parking spaces.

- **Longwood Research Institute –** involves the construction of 440,000 square feet of research space for Boston Children's Hospital at 333 Brookline Avenue.

- **Landmark Center –** involves the expansion of the existing Landmark Center with the construction of a 506,000-square foot, 14-story office/laboratory building on the southwest corner of Brookline Avenue and Fullerton Street.

- **Boston Children's Hospital - 819 Beacon Street –** involves the construction of an office building supporting Boston Children's Hospital uses with ground-floor retail and 432 parking spaces.

- **Pierce Boston –** involves the construction of a 30-story 390,460-square foot building with 20,500 square feet of commercial space and 349 residential units. The building

construction is now complete, but the building was not fully occupied when the traffic counts were conducted.

- **Kenmore Hotels** – involves the construction a 24-story hotel building containing approximately 382 rooms at 560-574 Commonwealth Avenue and a 19-story hotel building containing approximately 295 rooms at 655-665 Beacon Street with underground parking.

The background growth and area development projects are combined to produce the 2022 No-Build Condition vehicle volumes. These volumes are shown in Figures 2-9a and 2-9b for morning and evening peak hours, respectively.

2.4 2022 Build Conditions

The 2022 Build Condition traffic volumes were developed by estimating Project-generated traffic volumes, distributing these volumes, and assigning them to the study area roadways. The traffic volumes expected to be generated by the Project were added to the 2022 No-Build Conditions traffic volumes to create the 2022 Build Condition traffic volume networks. The following sections describe the procedures used to develop the Build Condition traffic volume networks.

2.4.1 Project-Generated Traffic

To estimate traffic impacts of the Project, it is necessary to determine the traffic volumes expected to be generated by the Project. The process on how this volume estimate is calculated is described below.

2.4.1.1 Unadjusted ITE Vehicle Trips

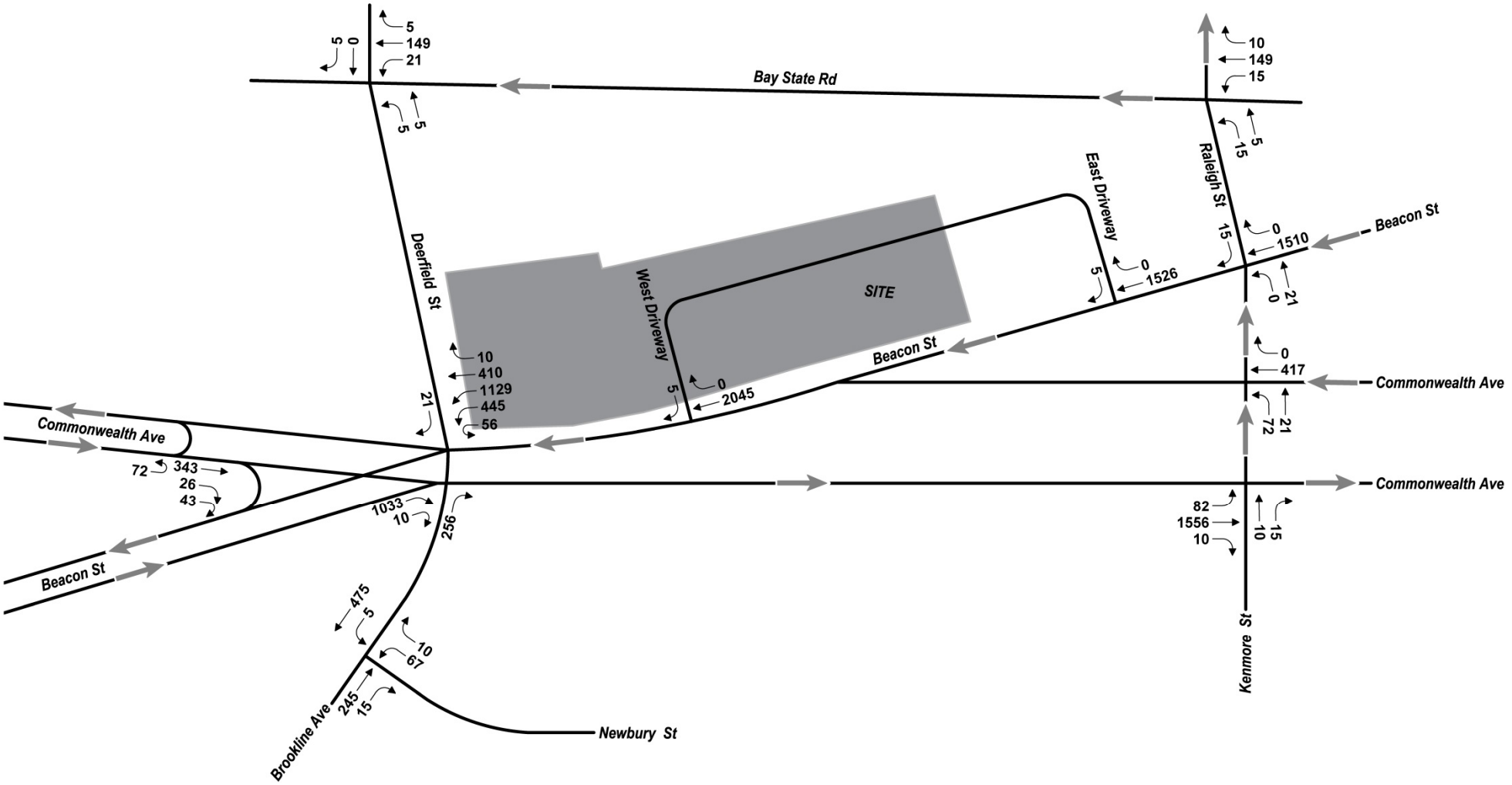
The Project is comprised of office and retail land uses. The ITE Trip Generation Manual categorizes these land uses and provides daily, morning, and evening peak hour unadjusted vehicle trip generation rates. The regression formula was used for office and the average rate was used for retail to estimate the unadjusted ITE vehicle trips. The land use codes and independent variables are shown in Table 2-4.

Table 2-4 ITE Land Use Code and Trip Rates

Land Use	ITE LUC	Independent Variable
Office	LUC 710 General Office	1,000 square feet (ksf)
Retail	LUC 820 Shopping Center	1,000 square feet (ksf)

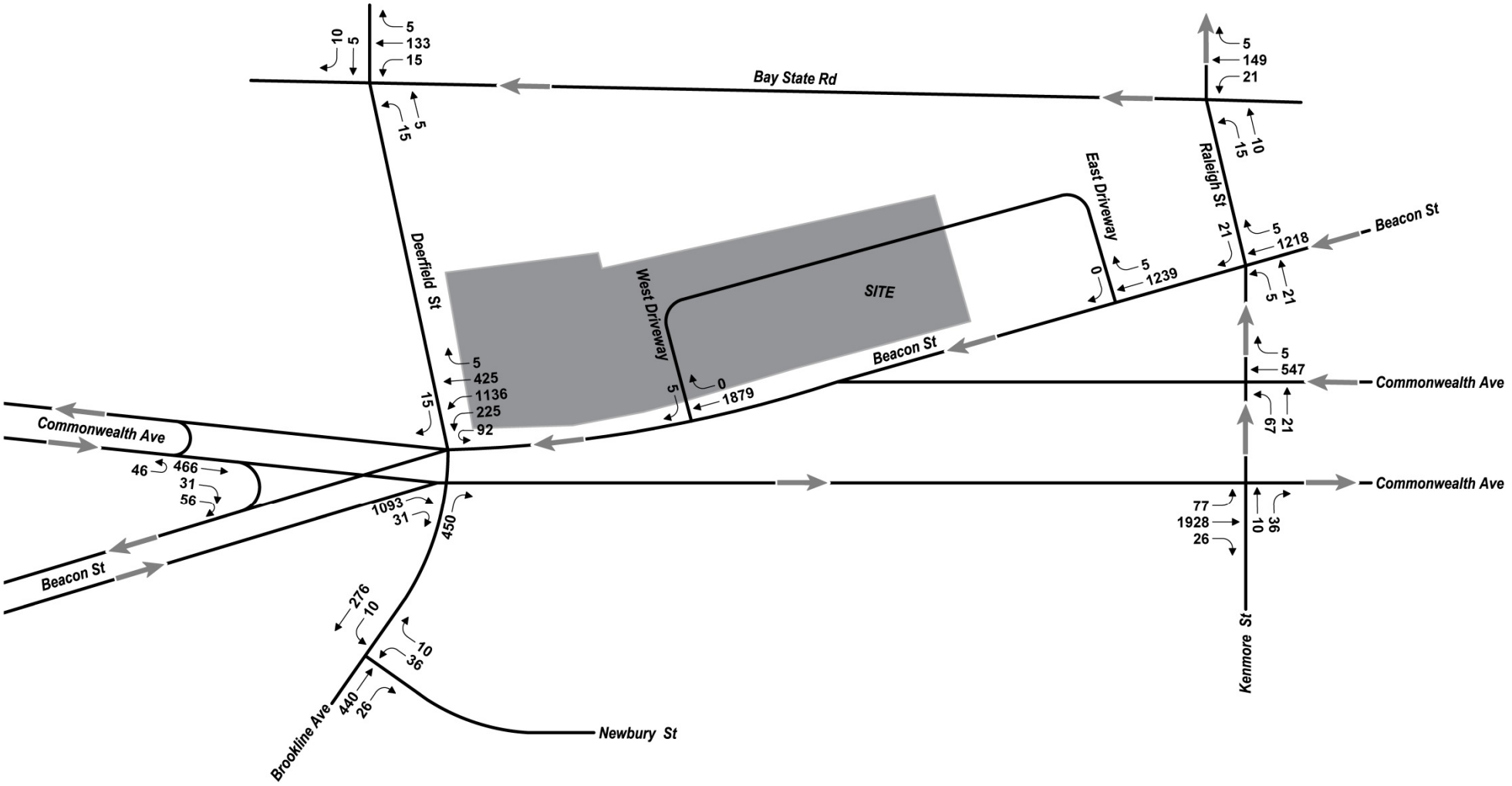
Source: ITE 9th Edition

These rates were used to calculate the unadjusted vehicle trips for the Project and are presented in Table 2-5. As shown in the table, the program shift of retail square footage to office causes a reduction in retail trips to the Project Site.



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-9a
2022 No-Build Condition Vehicle Volumes AM Peak Hour (7:30-8:30 a.m.)



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-9b
2022 No-Build Condition Vehicle Volumes PM Peak Hour (5:00-6:00 p.m.)

Table 2-5 Unadjusted ITE Vehicle Trips

	Daily	AM Peak Hour	PM Peak Hour
Office			
In	766	198	37
Out	766	27	179
Total	1,532	225	216
Retail			
In	(-401)	(-11)	(-33)
Out	(-401)	(-7)	(-36)
Total	(-802)	(-18)	(-70)
Total			
In	**365**	**187**	**3**
Out	**365**	**20**	**143**
Total	**730**	**207**	**146**

2.4.1.2 Person Trips

The unadjusted vehicle trips are converted into person trips by applying the national average vehicle occupancy (AVO) of 1.13 for office and 1.78 for retail as presented in the 2009 National Household Travel Survey.

2.4.1.3 Mode Share

To account for alternative modes of transportation, mode shares for the area, based on BTD guidelines for Area 4, were applied to the unadjusted ITE trip results. Mode shares are presented in Table 2-6.

Table 2-6 Mode Share

		AM Peak		PM Peak	
Mode	Daily	In	Out	In	Out
Office					
Vehicle	44%	37%	43%	43%	37%
Transit	32%	38%	28%	28%	38%
Walk/Bike/Other	24%	25%	29%	29%	25%
Retail					
Vehicle	33%	33%	22%	22%	33%
Transit	21%	31%	15%	15%	31%
Walk/Bike/Other	46%	36%	63%	63%	36%

Source: BTD Area 4 Rates

2.4.1.4 Project-Generated Trips

After AVO is applied to the ITE unadjusted vehicle trips to produce person trips, these trips are split into modes based on the mode splits shown previously in Table 2-6. The AVO is again applied to the person trips to produce adjusted vehicle trips. The Project trips for all modes are shown in Table 2-7. Due to the loss in retail square footage, the total net-new trips for some modes will be reduced with the Project. Overall, the Project will generate less net-new walk/bike/other trips over the course of the day (entering and exiting) and during the evening peak hour (exiting) than the existing conditions. Public transportation and vehicle trips will experience a slight net-increase due to the Project.

Table 2-7 Project-Generated Trips

	Public Transportation	Walk/Bike/Other	Vehicle
Daily			
Enter	127	(-120)	205
Exit	127	(-120)	205
Total	**254**	**(-240)**	**410**
AM Peak			
Enter	**79**	**49**	**69**
Exit	**7**	**1**	**10**
Total	**86**	**50**	**79**
PM Peak			
Enter	**3**	**(-26)**	**9**
Exit	**57**	**28**	**54**
Total	**60**	**2**	**63**

Source: ITE 9th Edition, BTD Area 4 Rates

2.4.1.5 Trip Distribution and Assignment

Trip distribution was based on BTD's guidelines for Area 4 (where the Project is located). The Area 4 trip distribution rates are based on the 2000 Census data about where residents work and where employees live. The Project-generated vehicle trips were assigned to the roadway network accordingly. A summary of the regional trip distribution results is presented in Table 2-8 and shown graphically in Figures 2-10a and 2-10b for the morning and evening peak hours, respectively.

Kenmore Square Redevelopment Boston, Massachusetts

Figure 2-10a
Trip Distribution AM Peak Hour

Kenmore Square Redevelopment Boston, Massachusetts

Figure 2-10b
Trip Distribution PM Peak Hour

Table 2-8 Project Trip Distribution

	AM Peak		PM Peak	
	In	Out	In	Out
Commonwealth Avenue EB	0%	68%	0%	65%
Commonwealth Avenue WB	20%	2%	32%	2%
Beacon Street EB	22%	0%	18%	0%
Beacon Street WB	55%	25%	45%	30%
Brookline Avenue NB	3%	0%	5%	0%
Brookline Avenue SB	0%	5%	0%	3%
Total	**100%**	**100%**	**100%**	**100%**

Source: BTD Area 4 Distribution

2.4.1.6 2022 Build Traffic Volumes

The Project-generated vehicle trips are shown in Figures 2-11a and 2-11b for the weekday morning and evening peak hours, respectively. These trips were added to the 2022 No-Build Condition traffic networks using the local trip distribution patterns described above to create the 2022 Build Condition traffic volumes, as shown in Figures 2-12a and 2-12b for the morning and evening peak hours, respectively.

2.4.3 Bicycle Access

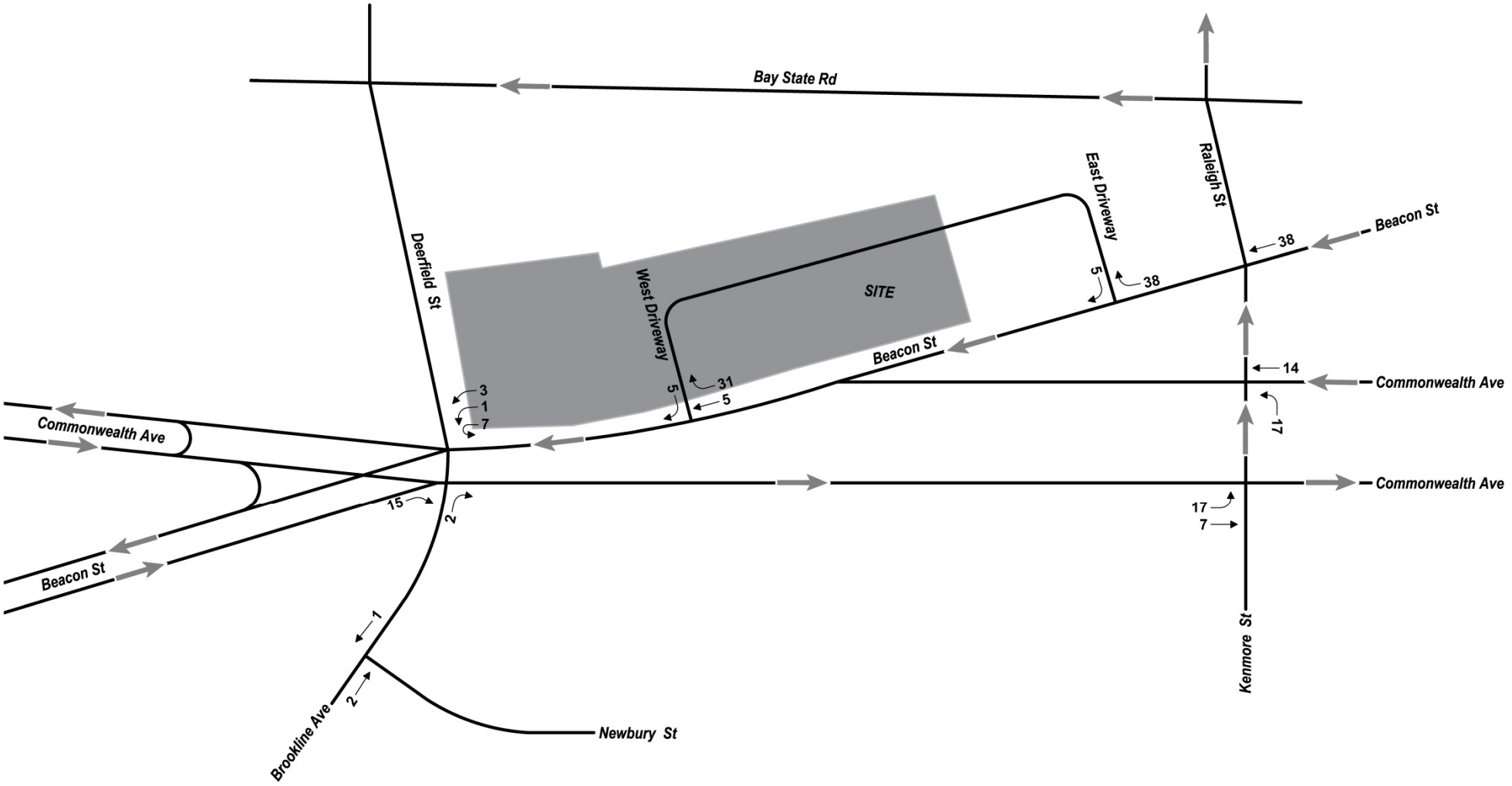
The Project will provide an indoor bicycle storage and maintenance room, and the Project will also provide outdoor bike racks for the use of guests visiting the building. All bicycle parking will conform to the City of Boston's Bicycle Parking Guidelines. Additionally, a buffered bicycle lane will be constructed as part of the Project along Commonwealth Avenue westbound for the length of the Project. This will replace the existing shared bicycle lanes.

2.4.4 Pedestrian Environment and Accessibility

The main pedestrian access is along Commonwealth Avenue, with some access points along Deerfield Street. The Project will bring new life to this stretch of Kenmore Square with enhanced landscaping along the street frontage. The streetscape activation will greatly improve the existing conditions.

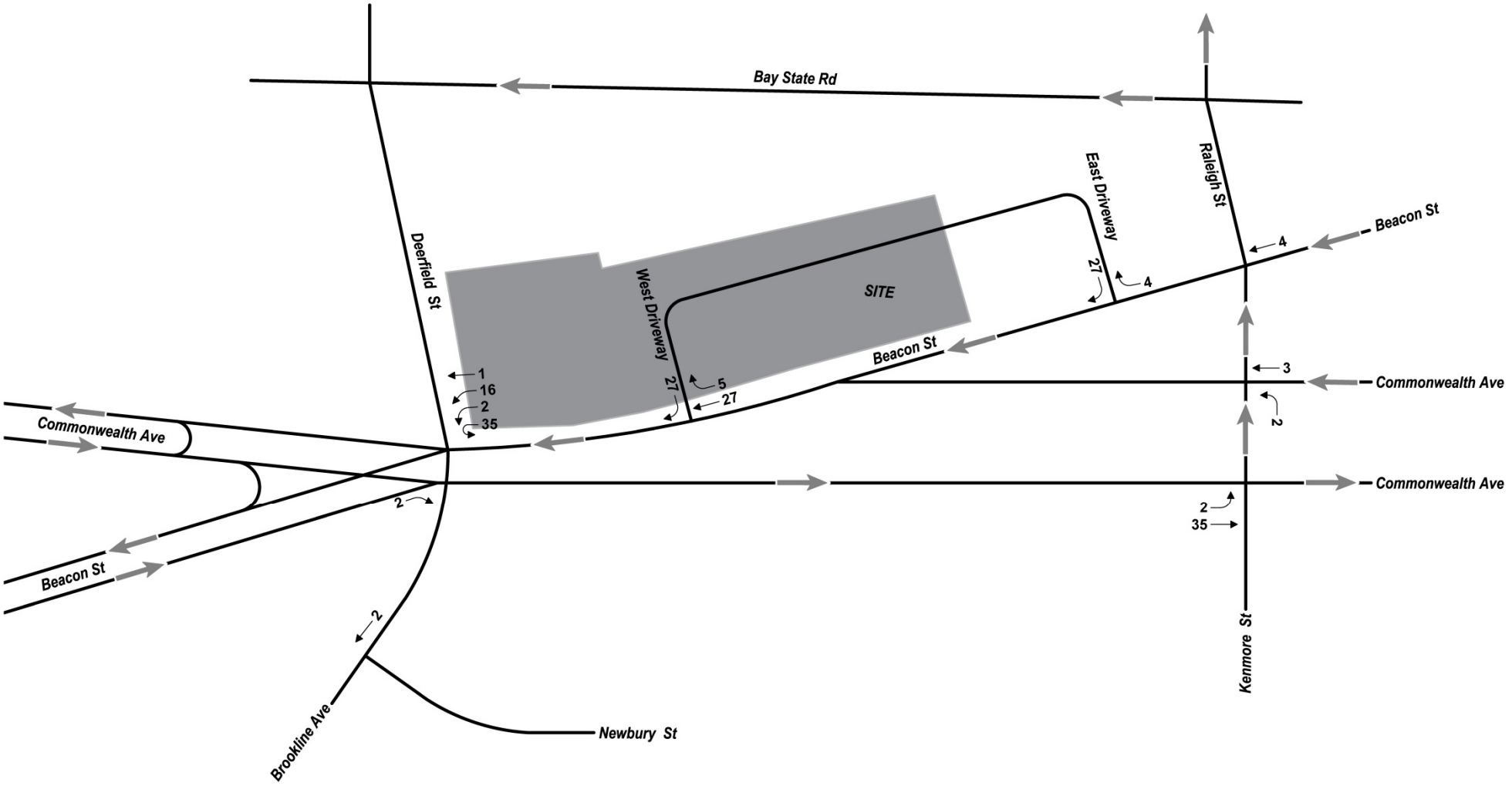
2.4.5 Site Access and Circulation

The Project will maintain the two existing driveways along Commonwealth Avenue, and vehicles will enter these driveways to access the parking garage.



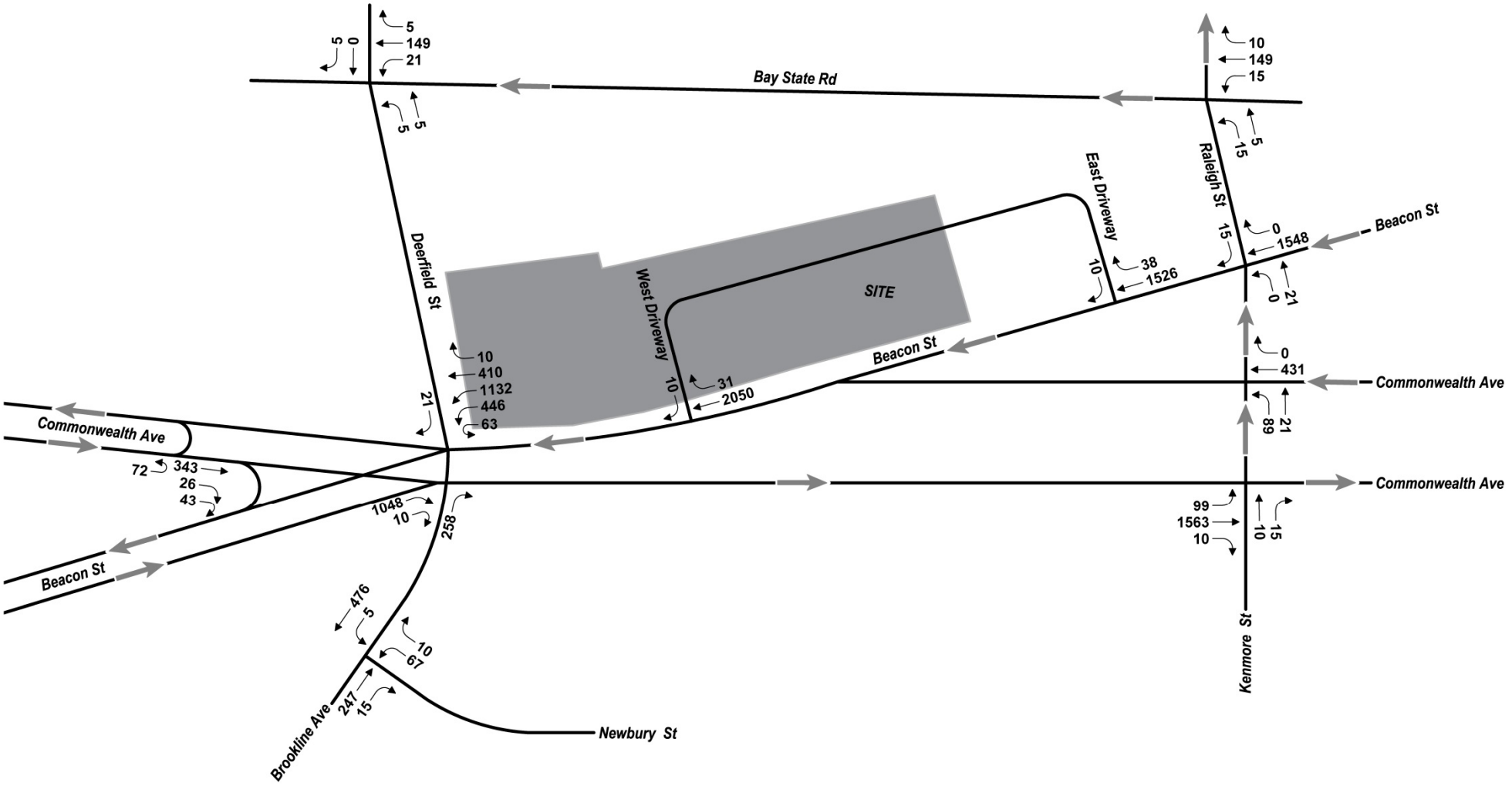
Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-11a
Project-Generated Trips AM Peak Hour (7:30-8:30 a.m.)



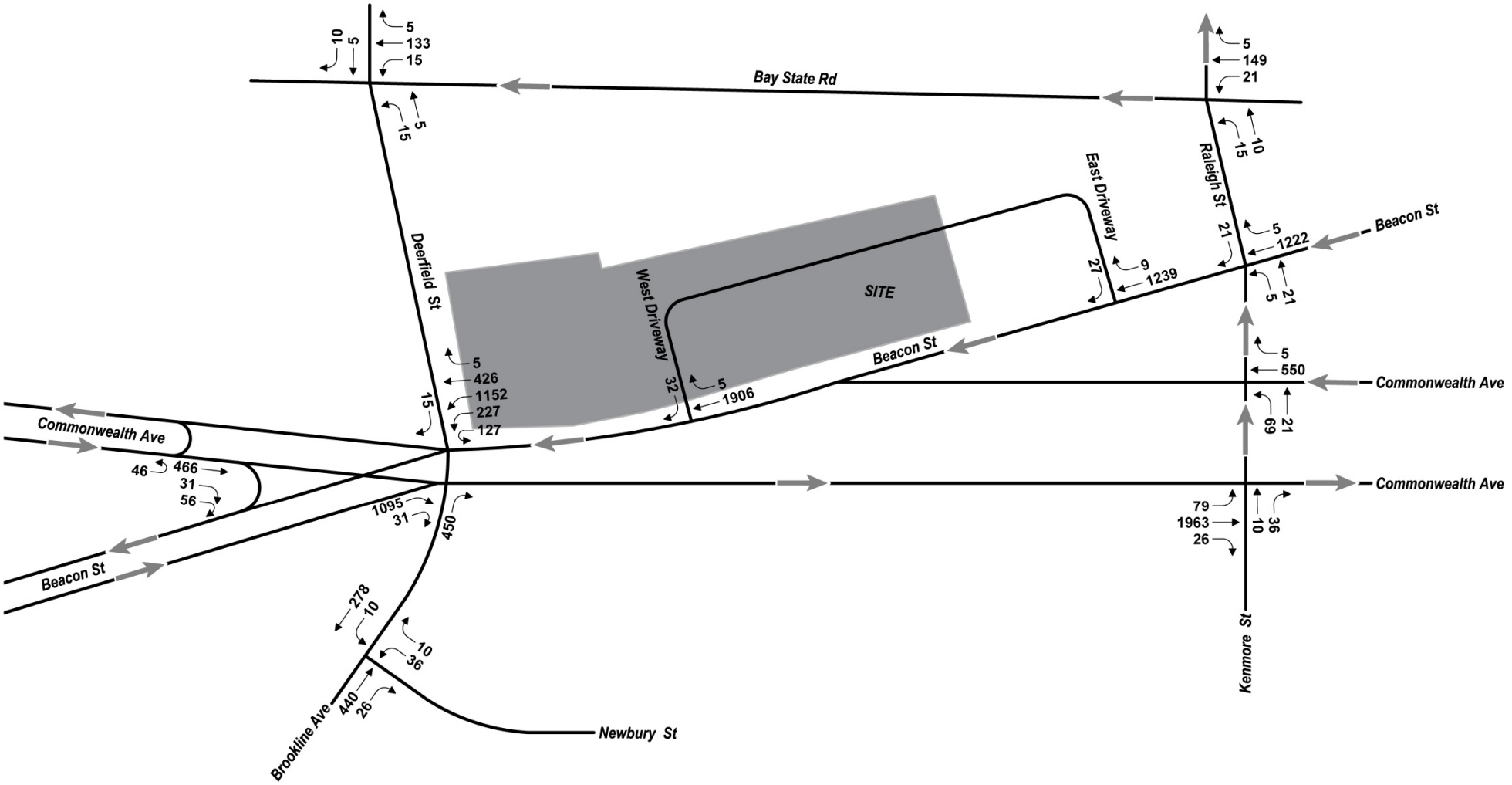
Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-11b
Project-Generated Trips AM Peak Hour (7:30-8:30 a.m.)



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-12a
2022 Build Condition Vehicle Volumes AM Peak Hour (7:30-8:30 a.m.)



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 2-12b
2022 Build Condition Vehicle Volumes PM Peak Hour (5:00-6:00 p.m.)

2.4.6 Parking

The parking needs for the Project will be accommodated by approximately 60 total spaces. Due to the nearby availability of public bus and train service, and amenities around the Project Site that will promote bicycle and pedestrian travel, the need for parking will be reduced. Additionally, alternate means of travel such as taxi, private ride services (Uber, Lyft, and others) should continue to reduce the parking needs for this area.

2.4.7 Loading and Service

Loading and service will occur behind the buildings. Loading docks are provided behind the Commonwealth Building and Beacon Building. By providing loading and service areas behind the building frontage, this will help eliminate disruptions to the traffic flow along Commonwealth Avenue. The service vehicles will access the loading areas via the two site driveways.

2.5 Transportation Mitigation

Consistent with the City's goals to reduce auto-dependency, the Project Proponent will support a program of transportation demand management (TDM) actions to reduce automobile trips generate by the Project. The goal of the Project's TDM plan is to reduce the use of single occupancy vehicles (SOVs) by encouraging carpooling/vanpooling, bicycle commuting and walking, and increased use of the area's public transportation system by residents and retail employees and customers.

The following TDM programs will be implemented as part of the Project to encourage the use of sustainable modes of transportation:

- The Proponent will contact a car sharing provider (such as Zipcar) to determine the feasibility of establishing a car sharing program for tenants and will provide parking space on-site for a least on car sharing vehicle, subject to demand.
- The Proponent will join a local Transportation Management Association (TMA) if one is established in the area.
- The Proponent will designate a transportation coordinator to oversee all transportation matters for the Project, including vehicular operations, servicing and loading, parking and the TDM programs. The transportation coordinator will act as the contact and liaison between the tenants of the Project and the City of Boston and the TMA.
- The Proponent will provide preferred parking for low-emitting fuel-efficient vehicles and electric vehicle charging stations within the proposed garage.

- The Project will provide ample bicycle parking within the Project Site in accordance with the City of Boston's Bicycle Parking Guidelines.

2.6 Operations Analysis

An intersection capacity analysis was conducted for the 2017 Existing, 2022 No-Build and 2022 Build Conditions morning and evening peak hours to determine how well the roadway facilities serve the existing traffic demand. Intersection operating conditions are classified by a quantified level-of-service (LOS).

LOS is a qualitative measure of control delay at an intersection providing an index to the operational qualities of a roadway or intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. LOS D is typically considered acceptable in a downtown, urban environment, while LOS E indicates that vehicles experience significant delay and queuing, while LOS F suggests unacceptable delays for the average vehicle. LOS designation is reported differently for signalized and unsignalized intersections. Longer delays at signalized intersections than at unsignalized intersections are perceived as acceptable.

For signalized intersections, the analysis considers the operations of each lane or lane group entering the intersection and the LOS designation is for the overall conditions at the intersection. For unsignalized intersections, however, this analysis assumes the traffic on the mainline is not affected by traffic on the side streets. The LOS is only determined for left turns from the main street and all movements from the minor street. The LOS designation is for the most critical movement, which is most often the left-turn out of the side street.

Synchro 9.0 software was used to evaluate the LOS operations at the study area intersection. This analysis is based on the 2000 Highway Capacity Manual (HCM). Table 2-9 below presents the LOS delay threshold criteria as defined in the HCM.

Table 2-9 Level of Service Criteria

Level of Service	Unsignalized Intersection Control Delay (sec/veh)	Signalized Intersection Control Delay (sec/veh)
LOS A	0 – 10	0 – 10
LOS B	> 10 – 15	> 10 – 20
LOS C	> 15 – 25	>20 – 35
LOS D	> 25 – 35	>35 – 55
LOS E	> 35 – 50	> 55 – 80
LOS F	> 50	>80

Source: 2010 HCM

Adjustments were made to the Synchro model to include the characteristics of each intersection, such as geometry, signal timings, heavy vehicles, bus operations, parking activity, bicycle conflicts, and pedestrian crossings. The capacity analysis results are summarized in the following sections.

2.6.1 Signalized Capacity Analysis

The LOS results of the analysis are summarized for each intersection in Table 2-10 and Table 2-11 for the 2017 Existing, 2022 No-Build, and 2022 Build Condition peak hours.

Table 2-10 Signalized Intersection Operations Analysis - Morning Peak Hour

	2017 Existing Condition					2022 No-Build Condition					2022 Build Condition				
Intersection/Movement	V/C[1]	Delay[2]	LOS[3]	50th %tile Queue	95th %tile Queue	V/C	Delay	LOS	50th %tile Queue	95th %tile Queue	V/C	Delay	LOS	50th %tile Queue	95th %tile Queue
Commonwealth Ave at Beacon St/ Deerfield St/ Brookline Ave	**0.89**	**33.9**	**C**	**-**	**-**	**1.09**	**55.7**	**E**	**-**	**-**	**1.10**	**58.7**	**E**	**-**	**-**
Commonwealth Ave EB Thru	0.86	57.2	E	156	196	0.88	59.2	E	161	#205	0.88	59.2	E	161	#205
Commonwealth Ave EB Hard Right	0.02	38.4	D	0	0	0.04	38.4	D	0	0	0.04	38.4	D	0	0
Brookline Ave NB Slight Right	0.72	49.8	D	102	#171	0.63	41.7	D	118	#204	0.64	41.8	D	120	#206
Deerfield St SB Slight Right	0.16	39.4	D	22	32	0.17	39.4	D	23	33	0.17	39.4	D	23	33
Beacon St NEB Right/Hard Right	0.90	44.3	D	343	#507	1.14	115.4	F	~457	#604	1.16	122.8	F	~471	#618
Beacon St SWB Hard Left/Left	0.78	54.2	D	160	m269	1.02	79.9	E	~351	m#300	1.04	85.7	F	~267	m#296
Beacon St SWB Thru/Right	0.60	9.4	A	188	194	0.80	11.4	B	256	m230	0.80	11.3	B	252	m225
Beacon St SWB Right/Hard Right	0.67	9.8	A	98	m95	0.69	8.2	A	63	m68	0.69	8.1	A	62	m68
Beacon St WB at Raleigh St/ Kenmore Street	**0.54**	**22.0**	**C**	**-**	**-**	**0.70**	**61.4**	**E**	**-**	**-**	**0.72**	**74.2**	**E**	**-**	**-**
Beacon St WB Thru/Right	0.77	21.5	C	355	479	1.05	62.3	E	~702	#838	1.09	75.4	E	~743	#872
Kenmore St NB Left	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kenmore St NB Thru	0.14	26.3	C	13	19	0.15	26.7	C	14	19	0.15	27.1	C	14	20
Raleigh St SB Right	0.14	43.6	D	16	28	0.14	43.6	D	16	28	0.14	43.6	D	16	28
Commonwealth Ave WB at Kenmore St	**0.15**	**46.8**	**D**	**-**	**-**	**0.19**	**47.1**	**D**	**-**	**-**	**0.20**	**46.5**	**D**	**-**	**-**
Commonwealth Ave WB Thru/Right	0.74	50.6	D	116	158	0.80	51.1	D	148	200	0.81	51.2	D	153	206
Kenmore St NB Left/Thru	0.11	36.6	D	10	17	0.12	33.7	C	10	24	0.14	32.8	C	11	26
Commonwealth Ave EB at Kenmore St	**0.49**	**9.8**	**A**	**-**	**-**	**0.53**	**9.2**	**A**	**-**	**-**	**0.54**	**9.1**	**A**	**-**	**-**
Commonwealth Ave EB Left/Thru/Right	0.58	8.8	A	139	175	0.63	8.3	A	143	m151	0.64	8.2	A	144	m152
Kenmore St NB Thru/Right	0.38	48.2	D	27	41	0.38	48.2	D	27	41	0.38	48.2	D	27	41

1 volume to capacity ratio
2 delay in seconds
3 level of service
Note: Queues are reported in feet

Table 2-11 Signalized Intersection Operations Analysis - Evening Peak Hour

	2017 Existing Conditions					2022 No-Build Conditions					2022 Build Conditions				
Intersection/Movement	V/C[1]	Delay[2]	LOS[3]	50th %tile Queue	95th %tile Queue	V/C	Delay	LOS	50th %tile Queue	95th %tile Queue	V/C	Delay	LOS	50th %tile Queue	95th %tile Queue
Commonwealth Ave at Beacon St/ Deerfield St/ Brookline Ave	**0.90**	**44.7**	**D**	**-**	**-**	**1.12**	**93.0**	**F**	**-**	**-**	**1.14**	**93.2**	**F**	**-**	**-**
Commonwealth Ave EB Thru	0.99	80.8	F	204	#314	1.02	82.5	F	~214	#325	1.02	87.5	F	~214	#325
Commonwealth Ave EB Hard Right	0.03	37.9	D	0	0	0.05	38.0	D	0	0	0.05	38.0	D	0	0
Brookline Ave NB Slight Right	0.99	86.8	F	157	#268	1.25	178.7	F	~248	#365	1.25	178.7	F	~248	#365
Deerfield St SB Slight Right	0.09	38.3	D	13	28	0.09	38.3	D	13	28	0.09	38.3	D	13	28
Beacon St NEB Right/Hard Right	0.94	56.8	E	286	#432	1.30	184.1	F	~546	#693	1.31	185.2	F	~547	#694
Beacon St SWB Hard Left/Left	0.44	40.1	D	93	m184	0.54	41.9	D	142	m185	0.61	42.4	D	179	m228
Beacon St SWB Thru/Right	0.77	15.6	B	186	256	0.88	19.8	B	224	m335	0.89	21.4	C	236	m3359
Beacon St SWB Right/Hard Right	0.69	13.2	B	94	m169	0.71	14.5	B	105	m150	0.71	15.3	B	110	m153
Beacon St WB at Raleigh St/ Kenmore Street	**0.49**	**27.2**	**C**	**-**	**-**	**0.54**	**35.6**	**D**	**-**	**-**	**0.54**	**36.4**	**D**	**-**	**-**
Beacon St WB Thru/Right	0.78	26.6	C	357	484	0.90	35.4	D	457	#629	0.91	36.3	D	462	#634
Kenmore St NB Left	0.04	32.2	C	3	m8	0.04	32.2	C	3	m8	0.04	31.5	C	3	m8
Kenmore St NB Thru	0.12	32.2	C	14	m21	0.12	32.5	C	14	m23	0.12	31.5	C	14	m23
Raleigh St SB Right	0.18	43.9	D	21	35	0.19	43.9	D	22	35	0.19	43.9	D	22	35
Commonwealth Ave WB at Kenmore St	**0.23**	**49.0**	**D**	**-**	**-**	**0.26**	**48.0**	**D**	**-**	**-**	**0.26**	**47.6**	**D**	**-**	**-**
Commonwealth Ave WB Thru/Right	0.83	48.8	D	189	242	0.85	49.5	D	209	274	0.85	49.2	D	210	276
Kenmore St NB Left/Thru	0.05	50.3	D	8	m27	0.07	39.4	D	7	m17	0.08	38.8	D	7	m17
Commonwealth Ave EB at Kenmore St	**0.54**	**12.8**	**B**	**-**	**-**	**0.65**	**12.1**	**B**	**-**	**-**	**0.66**	**12.3**	**B**	**-**	**-**
Commonwealth Ave EB Left/Thru/Right	0.65	11.5	B	178	m244	0.80	11.0	B	201	m194	0.81	11.2	B	223	m208
Kenmore St NB Thru/Right	0.54	49.5	D	43	66	0.54	49.7	D	43	66	0.54	49.7	D	43	66

The study area intersections show no change in performance from the 2022 No-Build Condition to the 2022 Build Condition, and all the LOS outcomes remain constant for both the morning and evening peak hours. For all intersections, the traffic volumes generated from the Project will not noticeably affect the surrounding area intersections.

2.6.2 Unsignalized Capacity Analysis

The LOS results of the unsignalized capacity analyses are summarized in Table 2-12 and Table 2-13 for the 2017 Existing, 2022 No-Build, and 2022 Build Condition peak hours.

The unsignalized intersection of Commonwealth Avenue at the Western Site Driveway will experience a slight decrease in performance from LOS D in the 2022 No-Build Condition to LOS E in the 2022 Build Condition during the evening peak hour. This change is due to the Project-generated vehicles that will be exiting the Project Site. Though the vehicle trips exiting the Project Site are modest, the vehicles will need to turn right onto Commonwealth Avenue, which is a heavily travelled roadway during the evening peak hour, and fewer opportunities to merge with the through traffic are available. All other study area intersections show no change in performance from the 2017 Existing Condition to the 2022 No-Build Condition, and all of the LOS outcomes remain constant for both the morning and evening peak hours. The intersections are minimally affected by the Project-generated trips added to the study area intersections in the 2022 Build Condition. The traffic volumes generated from the Project will not noticeably affect the surrounding area intersections.

Table 2-12 Unsignalized Intersection Operations Analysis - Morning Peak Hour

	2017 Existing Condition				2022 No-Build Condition				2022 Build Condition			
Intersection/Movement	V/C[1]	Delay[2]	LOS[3]	95th %tile Queue	V/C	Delay	LOS	95th %tile Queue	V/C	Delay	LOS	95th %tile Queue
Bay State Rd at Deerfield St												
Bay State Rd WB Thru/Right	-	8.3	A	-	-	8.3	A	-	-	8.3	A	-
Deerfield St NB Left/Thru	-	8.3	A	-	-	8.3	A	-	-	8.3	A	-
Deerfield St SB Thru/Right	-	6.8	A	-	-	6.8	A	-	-	6.8	A	-
Bay State Rd at Raleigh Street												
Bay State Rd WB Left/Thru/Right	0.01	0.8	A	1	0.01	0.7	A	1	0.01	0.7	A	1
Raleigh St NB Left/Thru	0.04	11.1	B	3	0.04	11.1	B	3	0.04	11.1	B	3
Brookline Ave at Newbury St												
Newbury St WB Left/Right	0.33	26.0	D	34	0.42	34.5	D	47	0.42	34.7	D	48
Commonwealth Ave WB at Western Site Driveway												
Western Site Driveway SB Right	0.02	14.6	B	1	0.02	16.6	C	2	0.04	17.1	C	3
Beacon St at Eastern Site Driveway												
Eastern Site Driveway SB Right	0.04	14.6	B	3	0.03	12.8	B	2	0.06	12.9	B	5

Table 2-13 Unsignalized Intersection Operations Analysis - Evening Peak Hour

	2017 Existing Condition				2022 No-Build Condition				2022 Build Condition			
Intersection/Movement	V/C[1]	Delay[2]	LOS[3]	95th %tile Queue	V/C	Delay	LOS	95th %tile Queue	V/C	Delay	LOS	95th %tile Queue
Bay State Rd at Deerfield St												
Bay State Rd WB Thru/Right	-	8.0	A	-	-	8.0	A	-	-	8.0	A	-
Deerfield St NB Left/Thru	-	7.9	A	-	-	8.0	A	-	-	8.0	A	-
Deerfield St SB Thru/Right	-	7.0	A	-	-	7.0	A	-	-	7.0	A	-
Bay State Rd at Raleigh Street												
Bay State Rd WB Left/Thru/Right	0.01	1.0	A	1	0.02	1.0	A	1	0.02	1.0	A	1
Raleigh St NB Left/Thru	0.07	11.0	B	5	0.07	11.0	B	5	0.07	11.0	B	5
Brookline Ave at Newbury St												
Newbury St WB Left/Right	0.89	158.6	F	117	1.13	258.5	F	147	1.01	204.1	F	134
Commonwealth Ave WB at Western Site Driveway												
Western Site Driveway SB Right	0.06	29.1	D	5	0.07	31.3	D	5	0.44	48.5	E	50
Beacon St at Eastern Site Driveway												
Eastern Site Driveway SB Right	0.01	11.1	B	1	0.01	11.9	B	1	0.10	12.6	B	9

2.7 Construction Management

The Proponent will develop a detailed evaluation of potential short-term construction-related transportation impacts including construction vehicle traffic, parking supply and demand, and pedestrian access. Detailed Construction Management Plans (CMP) will be developed and submitted to the BTD for their approval. These plans will detail construction vehicle routing and staging.

Construction vehicles will be necessary to move construction materials to and from the Project Site. Every effort will be made to reduce noise, control fugitive dust, and minimize other disturbances associated with construction traffic. Truck staging and laydown areas for the Project will be carefully planned. The need for street occupancy (lane closures) along roadways adjacent to the Project Site is not known at this time.

Contractors will be encouraged to devise access plans for their personnel that de-emphasize auto use (such as seeking off-site parking, provide transit subsidies, on-site lockers, etc.) Construction workers will also be encouraged to use public transportation to access the Project Site because no new parking will be provided for them. Because of the construction workers early arrival/departure schedule (typically 7:00 a.m. – 3:00 p.m.), conflict for on-street parking is not anticipated.

During the construction period, pedestrian activity adjacent to the site may be impacted by sidewalk closures. A variety of measures will be considered and implemented to protect the safety of pedestrians. Temporary walkways, appropriate lighting, and new directional and informational signage to direct pedestrians around the construction sites will be provided. After construction is complete, finished pedestrian sidewalks will be permanently reconstructed to meet ADA standards around the new facilities. Any damage as a result of construction vehicles or otherwise will be repaired per City standards.

Chapter 3

Environmental Review Component

3.0 ENVIRONMENTAL REVIEW COMPONENT

3.1 Wind

3.1.1 Introduction

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by the Proponent to assess the microclimate conditions around the proposed Project. This qualitative assessment focuses on pedestrian wind comfort and is based on the following:

- a review of the regional long-term meteorological data from Boston Logan International Airport;
- design drawings and documents received by RWDI on April 21 and 30, 2018;
- wind-tunnel studies undertaken by RWDI for similar projects in Boston and over the world;
- RWDI's engineering judgment, experience and expert knowledge of wind flows around buildings[1,2,3]; and,
- use of software developed by RWDI (Windestimator[2]) for estimating the potential wind conditions around generalized building forms.

This qualitative approach provides a screening-level estimation of potential wind conditions. The analysis shows that suitable wind comfort conditions are predicted for all public sidewalks, buildings entrances, the driveways, the above-ground terraces and surrounding pedestrian areas.

3.1.2 Site and Building Information

As described in detail in Chapter 1, the Project Site is located at the northeast corner of the intersection of Deerfield Street and Commonwealth Avenue. There are seven existing buildings on site, ranging from two to six stories. The immediate surroundings are of a similar height in all directions, with taller buildings on the Boston University campus to the

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1 C.J. Williams, H. Wu, W.F. Waechter and H.A. Baker (1999), "Experience with Remedial Solutions to Control Pedestrian Wind Problems", 10th International Conference on Wind Engineering, Copenhagen, Denmark.

2 H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", ASCE Structure Congress 2004, Nashville, Tennessee.

3 H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", Journal of Wind Engineering and Industrial Aerodynamics, vol.104-106, pp.397-407.

west and around the Fenway area to the south. Charles River is located to the north and downtown Boston to the distant east.

Key pedestrian areas include building entrances, sidewalks, outdoor seating areas at and above grade, subway station entrances, a sheltered bus station, Kenmore Square, a driveway between the Commonwealth Building and Beacon Building, and a parking lot behind the site.

3.1.3 Meteorological Data

Wind statistics at Boston Logan International Airport between 1990 and 2015 were analyzed and Figure 3-1 graphically depicts the distributions of wind frequency and directionality for the four seasons and for the annual period. When all winds are considered (regardless of speed), winds from the northwest and southwest quadrants are predominant. Northeasterly winds are also frequent, especially in the spring.

Strong winds with mean speeds greater than 20 miles per hour (mph) (red bands in the images) are predominantly from the west-northwest direction throughout the year, while the southwest and northeast winds are also frequent. These are critical wind directions to be focused on in the following discussions.

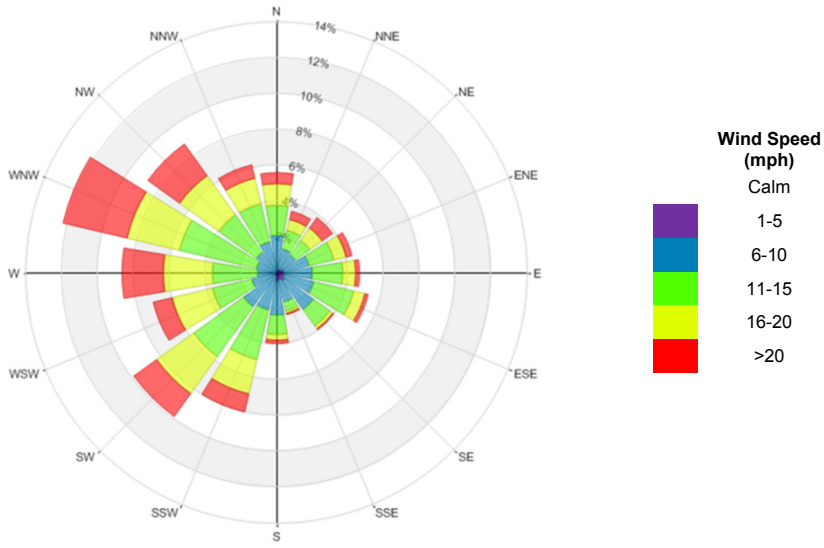
3.1.4 Wind Comfort Criteria

The BPDA has adopted two standards for assessing the relative wind comfort of pedestrians.

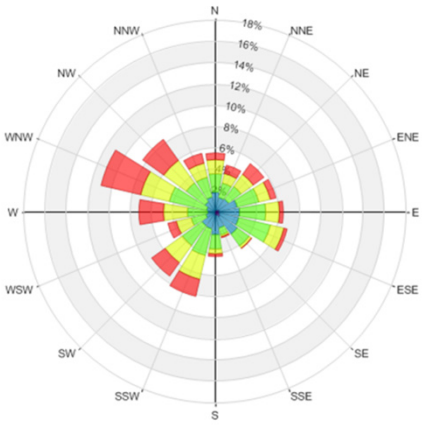
First, the BPDA wind design guidance criterion states that an effective gust velocity (hourly-mean wind speed + 1.5 times the root mean square wind speed) of 31 mph should not be exceeded more than one percent of the time. This criterion is hereby referred to as the gust criterion.

The second set of criteria used by the BPDA to determine the acceptability of specific locations is based on the work of Melbourne[4]. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing or walking. The criteria are expressed in terms of benchmarks for the one-hour mean wind speed exceeded one percent of the time (i.e., the 99-percentile mean wind speed). They provided in Table 3-1.

[4] Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions", Journal of Industrial Aerodynamics, 3 (1978) 241 - 249.



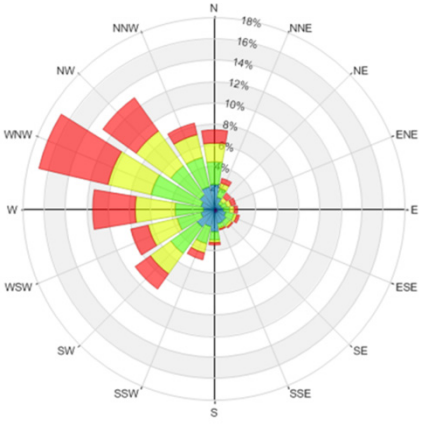
Annual Winds



Spring (March to May)

Summer (June to August)

Fall (September to November)



Winter (December to February)

Kenmore Square Redevelopment Boston, Massachusetts

RWDI

Figure 3-1
Wind Roses

Table 3-1 BPDA Mean Wind Speed Criteria*

Level of Comfort	Wind Speed
Dangerous	> 27 mph
Uncomfortable for Walking	>19 and ≤27 mph
Comfortable for Walking	>15 and ≤19 mph
Comfortable for Standing	>12 and ≤15 mph
Comfortable for Sitting	<12 mph

* Applicable to the hourly mean wind speed exceeded one percent of the time.

Pedestrians on sidewalks will be active and wind speeds comfortable for walking are appropriate. Lower wind speeds comfortable for standing are desired for building entrances where people are apt to linger. For any outdoor seating areas, low wind speeds comfortable for sitting are desired in the summer when it is typically in use.

The wind climate found in a typical location in Boston is generally comfortable for the pedestrian use of sidewalks and thoroughfares and meets the BPDA gust criterion of 31 mph at most areas, while windier conditions may be expected near the corners of tall buildings exposed to the prevailing winds. However, without any mitigation measures, this wind climate is likely to be frequently unsuitable for more passive activities such as sitting.

The following discussions on pedestrian wind comfort and safety will be based on the annual wind climate. Typically the summer and fall winds tend to be more comfortable than the annual winds, while the winter and spring winds are less comfortable than the annual winds.

3.1.5 Microclimate Conditions

3.1.5.1 Background

Predicting wind speeds and frequencies of occurrence is complicated. It involves building geometry, orientation, position and height of surrounding buildings, upstream terrain and the local wind climate. Over the years, RWDI has conducted thousands of wind tunnel model studies on pedestrian wind conditions around buildings, yielding a broad knowledge base. This knowledge has been incorporated into RWDI's proprietary software that allows, in many situations, for a screening-level numerical estimation of pedestrian wind conditions without wind tunnel testing.

Buildings taller than their surroundings tend to intercept the stronger winds at higher elevations and redirect them to the ground level. Such a Downwashing Flow (Figure 3-2, Image a) is the main cause for increased wind activity around buildings at the pedestrian level. When two buildings are situated side by side, wind flows tend to accelerate through

the space between the buildings due to the Channeling Effect (Figure 3-2, Image b). Oblique winds also cause wind accelerations around the downwind building corners (Figure 3-2, Image c). If these building/wind combinations occur for prevailing winds, there is a greater potential for increased wind activity and uncomfortable conditions.

3.1.5.2 Flow Patterns

Due to the increase in dimensions of the Commonwealth Building, some small changes in wind conditions are expected from those that currently exist in the area. The additional height of the buildings will result in minor increases in wind speeds at the southwest corner when winds are from the northwest (see Figure 3-3, Image a), at the driveway between the Commonwealth Building and Beacon Building when winds are from the northeast (see Figure 3-3, Image b), and at the southeast corner when winds are from the southwest (see Figure 3-3, Image c); however, the wind conditions are still predicted to be suitable for walking or better, as discussed below.

3.1.5.3 Commonwealth Building

As discussed in the previous section, wind speeds around the Commonwealth Building are expected to be slightly higher than those that currently exist in the area, though are predicted to continue to be suitable for walking or better. The highest wind speeds may occur at the southern corners of the Commonwealth Building (A1 and A2 in Figure 3-4, Image a). The resultant wind conditions are predicted to meet the effective gust criterion and, as mentioned, be suitable for walking or better on all sidewalks and driveways around the building, including A1.

The outdoor seating area outside of the retail space at the southeast corner may experience winds more suitable for walking. The Project team will study potential mitigation measures, such as wind screens or landscaping, to lessen these winds, if necessary.

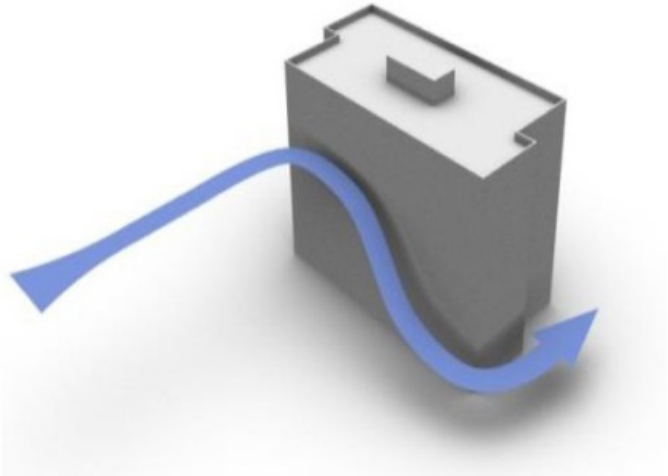
Wind conditions at all building entrances (B1 and B2 in Figure 3-4, Image a) are predicted to be appropriate in general due to the building's many positive design features, including recessed entrances and recessed south façade.

Within the driveway between the Commonwealth Building and Beacon Building, winds suitable for walking or better are predicted to be caused by southwesterly winds deflected by the Citgo sign and then by the Commonwealth Building down to the driveway.

No mitigation is anticipated due to the favorable wind conditions in pedestrian areas.

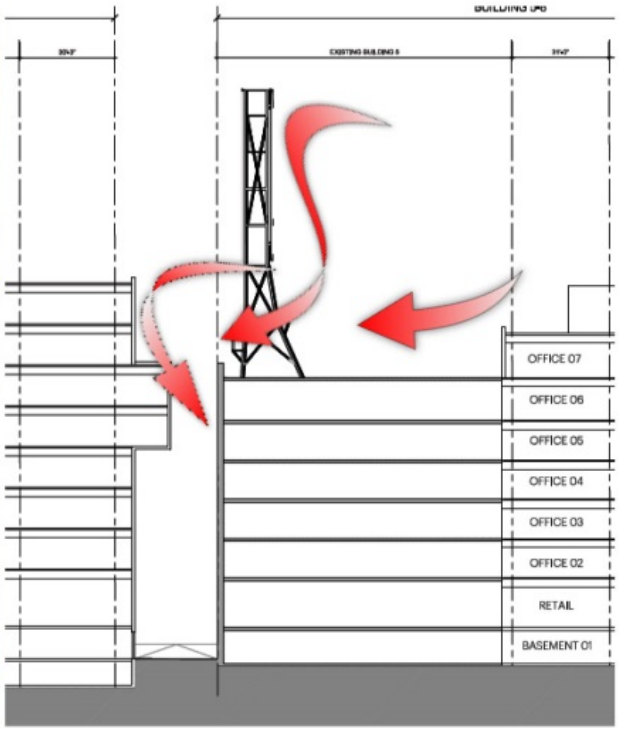
a) Downwashing Flow

b) Channeling Effect



c) Corner Acceleration

a: Northwesterly winds

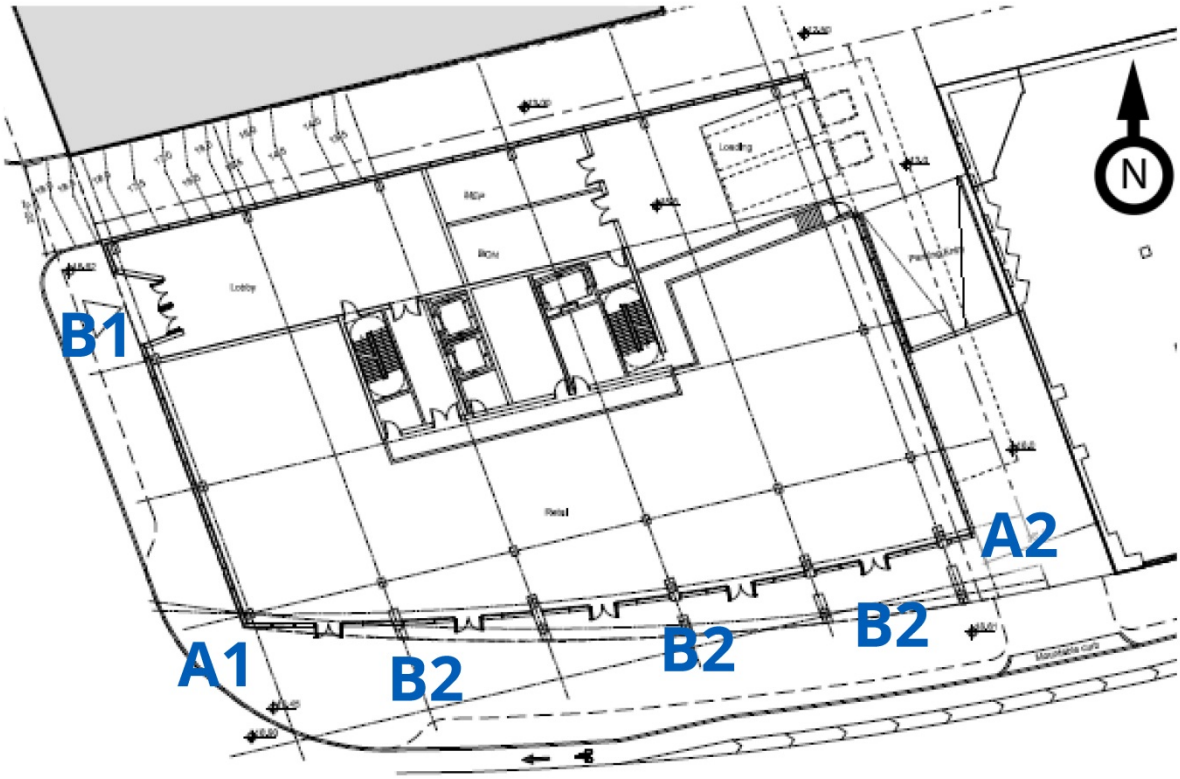


b: Northeasterly winds

c: Southwesterly winds

Kenmore Square Redevelopment Boston, Massachusetts

Figure 3-3
Project Wind Flow Patterns



a: Commonwealth Building

b: Pedestrian Areas in the Surrounding (photo courtesy of Google™ Earth

3.1.5.4 Beacon Building

The Beacon Building includes the interior renovation of 660 Beacon Street and construction of a seven-story building with new entrance canopies and changed entrance settings. Due to the minimal changes from the existing condition, wind comfort conditions are expected to be similar to those that currently exist at the entrances to the Beacon Building, as well as along the sidewalk and driveway.

3.1.5.5 Terraces

There are outdoor terraces at Levels 3, 5 and 7 of the Commonwealth Building and at Level 6 of the Beacon Building.

These areas are sheltered by the proposed and existing buildings from the prevailing west, northwest and northeast winds. Although winds from the southwest through southeast directions may reach these areas, the wind conditions are predicted to be suitable for the intended use of the terraces during the summer. The proposed landscaping and railings will further improve the wind conditions.

3.1.5.6 Other Pedestrian Areas

There are other pedestrian areas in the surrounding (Figure 3-4, Image b), including Kenmore Square (C1), a sheltered bus station (C2), subway entrances (C3) and a surface parking lot (C4).

Given the limited changes of the proposed Project in building massing, and the distances between the Project and these pedestrian areas, pedestrian wind comfort conditions in these areas are not anticipated to be affected by the proposed Project.

3.1.6 Summary

The proposed redevelopment consists of limited changes in building massing on the Project Site, and new canopies to the Beacon Building. Several positive design features are included in the current design for wind control, including canopies and recessed entrances to the Commonwealth Building and Beacon Building, the stepped south façade of the Commonwealth Building, and so on. Suitable wind comfort conditions are predicted for all public sidewalks, buildings entrances, the driveways, the above-ground terraces and surrounding pedestrian areas.

Wind speeds in the seating area around the southeast corner of the Commonwealth Building are predicted to be higher than desired and the Project team will evaluate potential mitigation measures to lessen wind conditions, if necessary.

3.2 Shadow

3.2.1 Introduction and Methodology

A shadow impact analysis was conducted to assess potential shadow impacts from the Project. The study evaluated the following four times of the year:

1. Spring Equinox (March 21) at 9:00 a.m., 12:00 noon, and 3:00 p.m.
2. Summer Solstice (June 21) at 9:00 a.m., 12:00 noon, 3:00 p.m. and 6:00 p.m.
3. Autumnal Equinox (September 21) at 9:00 a.m., 12:00 noon, 3:00 p.m. and 6:00 p.m.
4. Winter Solstice (December 21) at 9:00 a.m., 12:00 noon, and 3:00 p.m.

The shadow analysis identified existing and net new shadow that will be created by the Project, illustrating the likely shadow impact of the Project on existing conditions. The analysis focuses on nearby open spaces, sidewalks, and bus stops, adjacent to and in the vicinity of the Project Site. Shadows have been determined using the applicable Altitude and Azimuth data for Boston. Figures showing the net new shadow from the Project are provided in Figures 3-5 through 3-18 at the end of this section.

The new construction proposed as part of the Project will be similar in height to the existing buildings, and therefore will have limited new shadow on the surrounding area. The analysis shows new shadow from the Project will generally be limited to minor portions of surrounding streets and sidewalks, as well as the Project Site and nearby parking lots. No new shadow will be cast onto public open spaces during the time periods studied, or onto the Kenmore Station bus area.

3.2.2 Vernal Equinox (March 21)

On the vernal equinox at 9:00 a.m., shadow will be cast to the northwest, and will cast onto minor portions of Deerfield Street and its sidewalks, as well as nearby parking lots. At 12:00 p.m., shadow will be cast to the north, with new shadow limited to the parking lot on the north side of the Project Site. At 3:00 p.m., shadow will be cast to the northeast, with new shadow limited to the parking lot to the north of the Project Site and the site driveway between the Commonwealth Building and Beacon Building. No net new shadow will be cast onto public open spaces in the vicinity of the Project or the Kenmore Station bus area during the time periods studied.

3.2.3 Summer Solstice (June 21)

On the summer solstice at 9:00 a.m., shadow will be cast to the west, and will cast onto minor portions of Deerfield Street and its sidewalks, as well as nearby parking lots. At 12:00 p.m., shadow will be cast to the north, with minor areas of new shadow limited to the parking lot on the north side of the Project Site. At 3:00 p.m., shadow will be cast to the northeast, with minor areas of new shadow limited to the parking lot to the north of the Project Site and the site driveway between the Commonwealth Building and Beacon Building. At 6:00 p.m., new shadow will be cast onto portions of Commonwealth Avenue and Beacon Street, as well as their sidewalks. No net new shadow will be cast onto public open spaces in the vicinity of the Project or the Kenmore Station bus area during the time periods studied.

3.2.4 Autumnal Equinox (September 21)

On the autumnal equinox at 9:00 a.m., shadow will be cast to the northwest, and will cast onto minor portions of Deerfield Street and its sidewalks, as well as nearby parking lots. At 12:00 p.m., shadow will be cast to the north, with new shadow limited to the parking lot on the north side of the Project Site. At 3:00 p.m., shadow will be cast to the northeast, with new shadow limited to the parking lot to the north of the Project Site and a minor area of the site driveway between the Commonwealth Building and Beacon Building. At 6:00 p.m., a sliver of new shadow will be cast onto Beacon Street and its northern sidewalk. No net new shadow will be cast onto public open spaces in the vicinity of the Project or the Kenmore Station bus area during the time periods studied.

3.2.5 Winter Solstice (December 21)

The low angle sun during the winter solstice creates the longest shadows of the year. At 9:00 a.m., shadow will be cast to the northwest, and will cast onto a sliver of Deerfield Street and its sidewalks, and a portion of Bay State Road and its sidewalks. At 12:00 p.m., shadow will be cast to the north, with new shadow limited to the parking lot on the north side of the Project Site and a small area of the driveway between the Commonwealth Building and Beacon Building. At 3:00 p.m., shadow will be cast to the northeast, but no new shadow will be cast onto pedestrian areas in the surrounding area. No net new shadow will be cast onto public open spaces in the vicinity of the Project or the Kenmore Station bus area during the time periods studied.

3.2.6 Conclusion

Due to the proposed height and massing of the new buildings being constructed as part of the Project, which is similar to the existing buildings, new shadow will be limited to small portions of the surrounding streets and sidewalks during the time periods studied, as well as nearby parking lots. The Project will not cast any new shadow on surrounding open spaces or the Kenmore Station bus area.

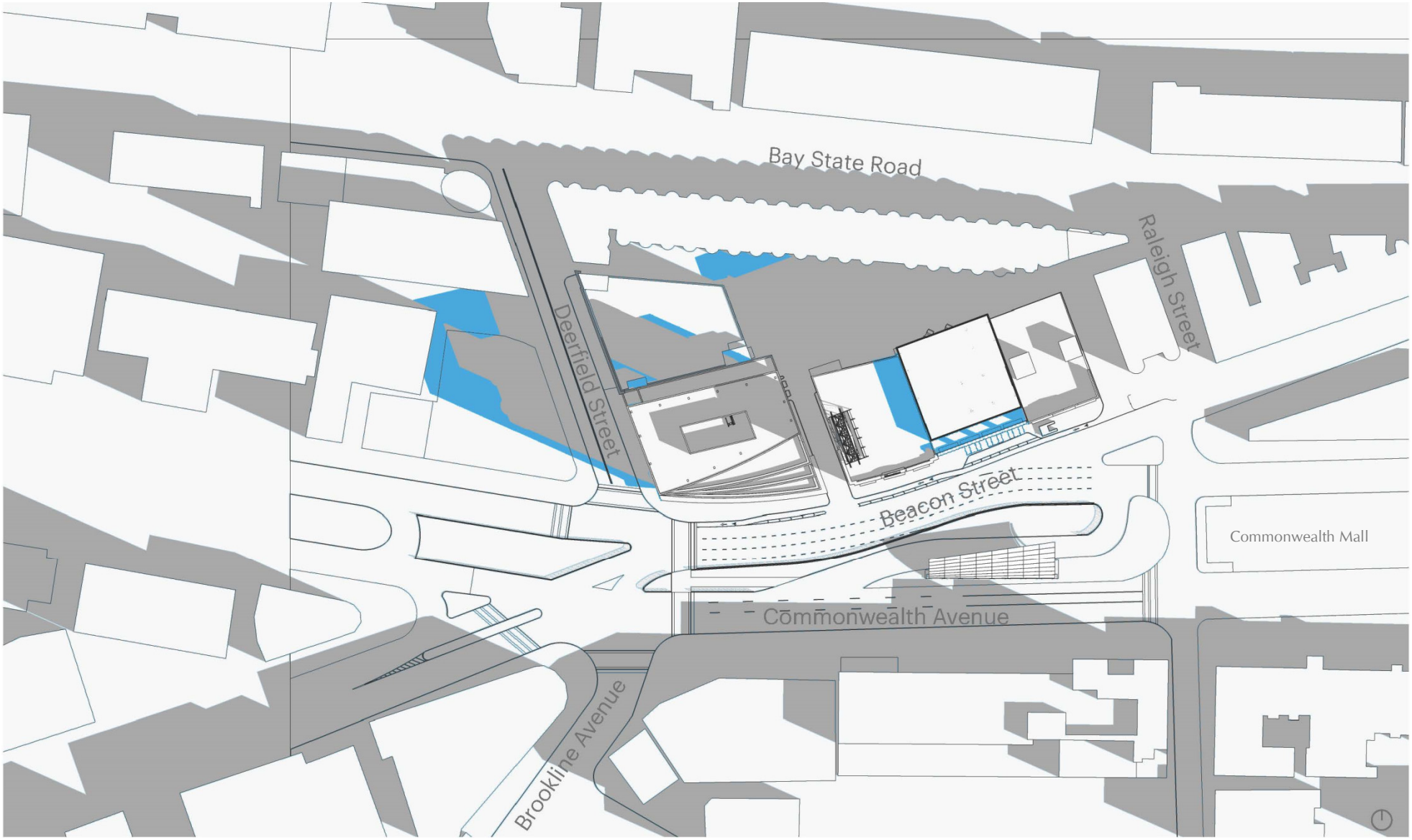


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Figure 3-5
Shadow Study, March 21, 9:00 a.m.

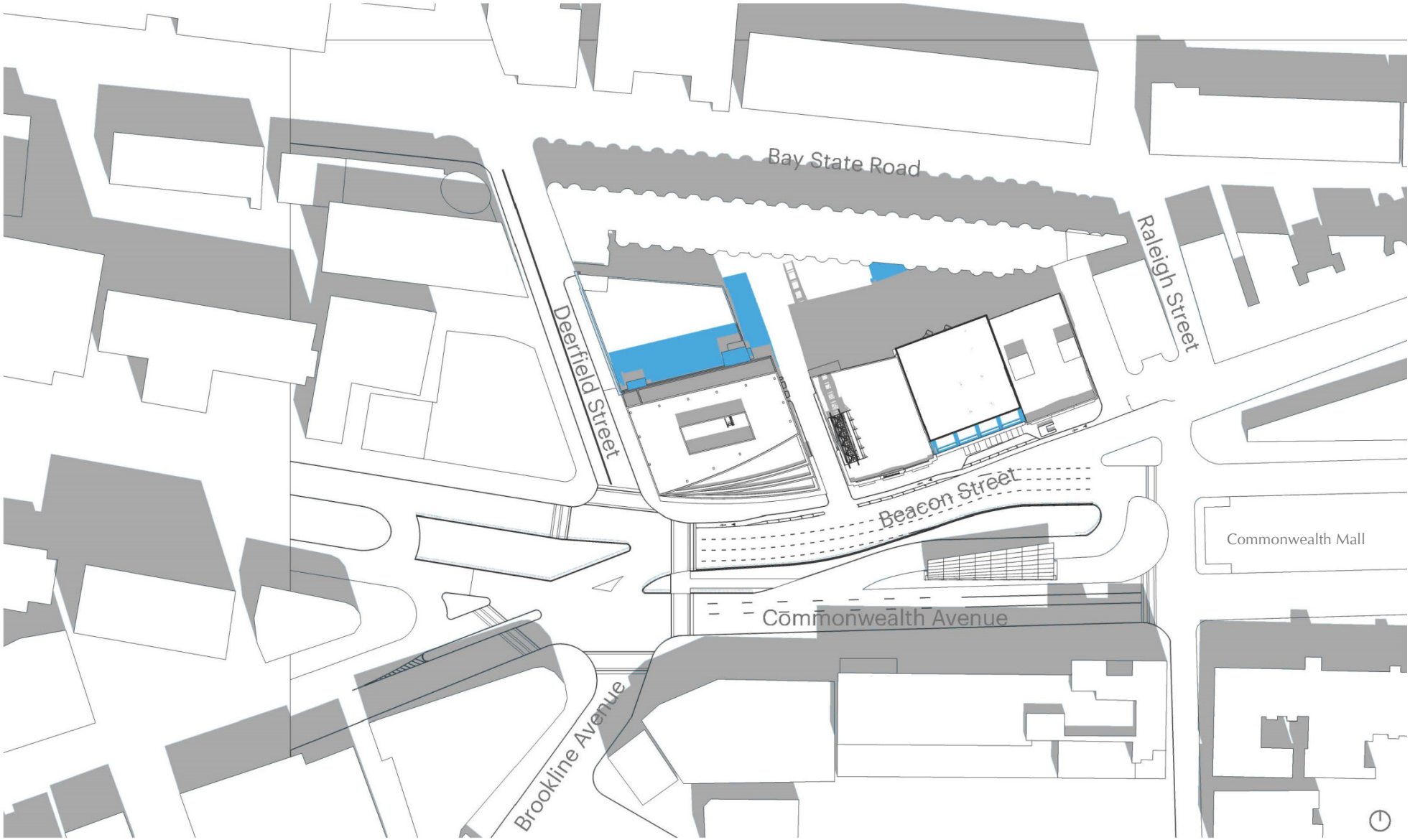

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Figure 3-6
Shadow Study, March 21, 12:00 p.m.

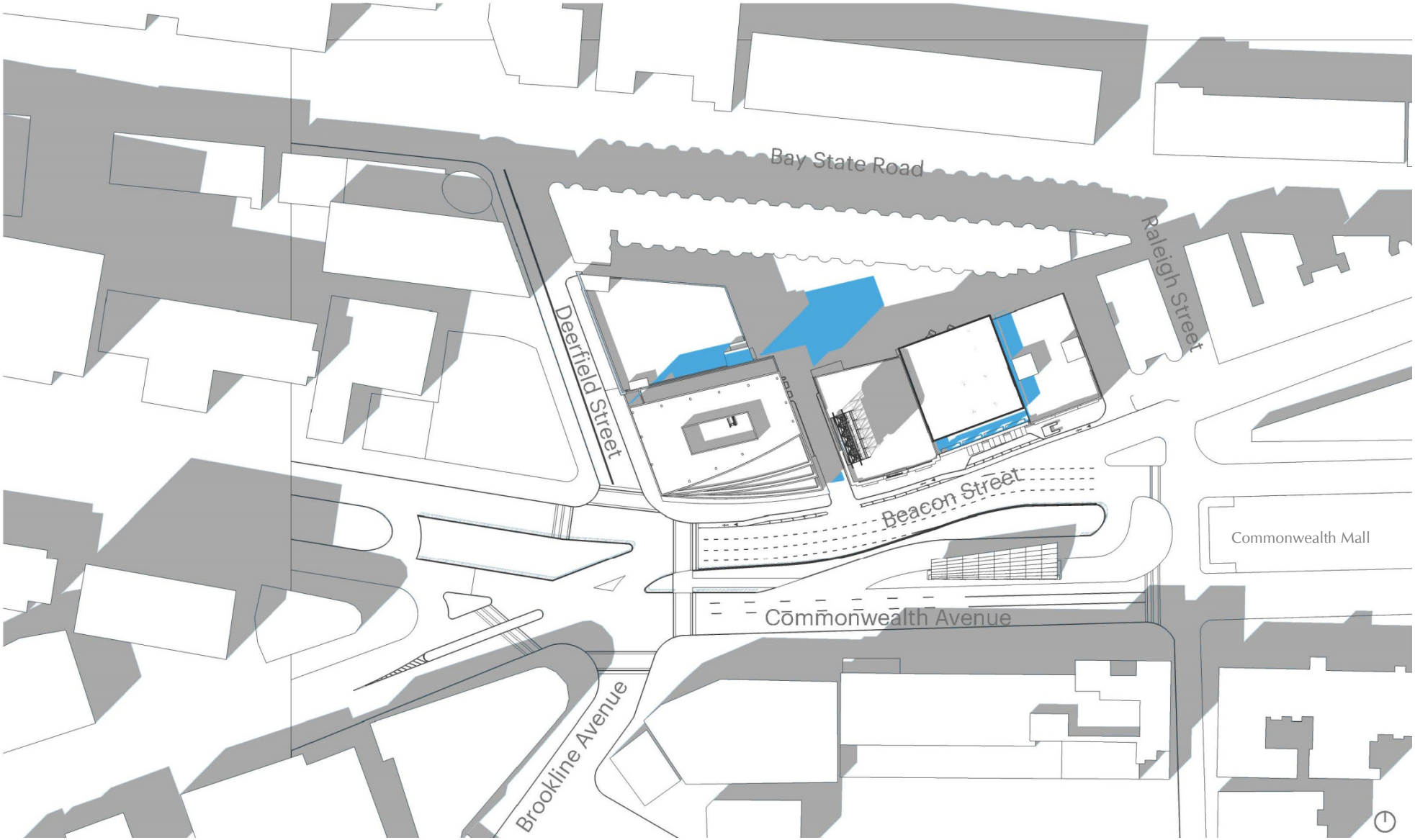

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Figure 3-7
Shadow Study, March 21, 3:00 p.m.

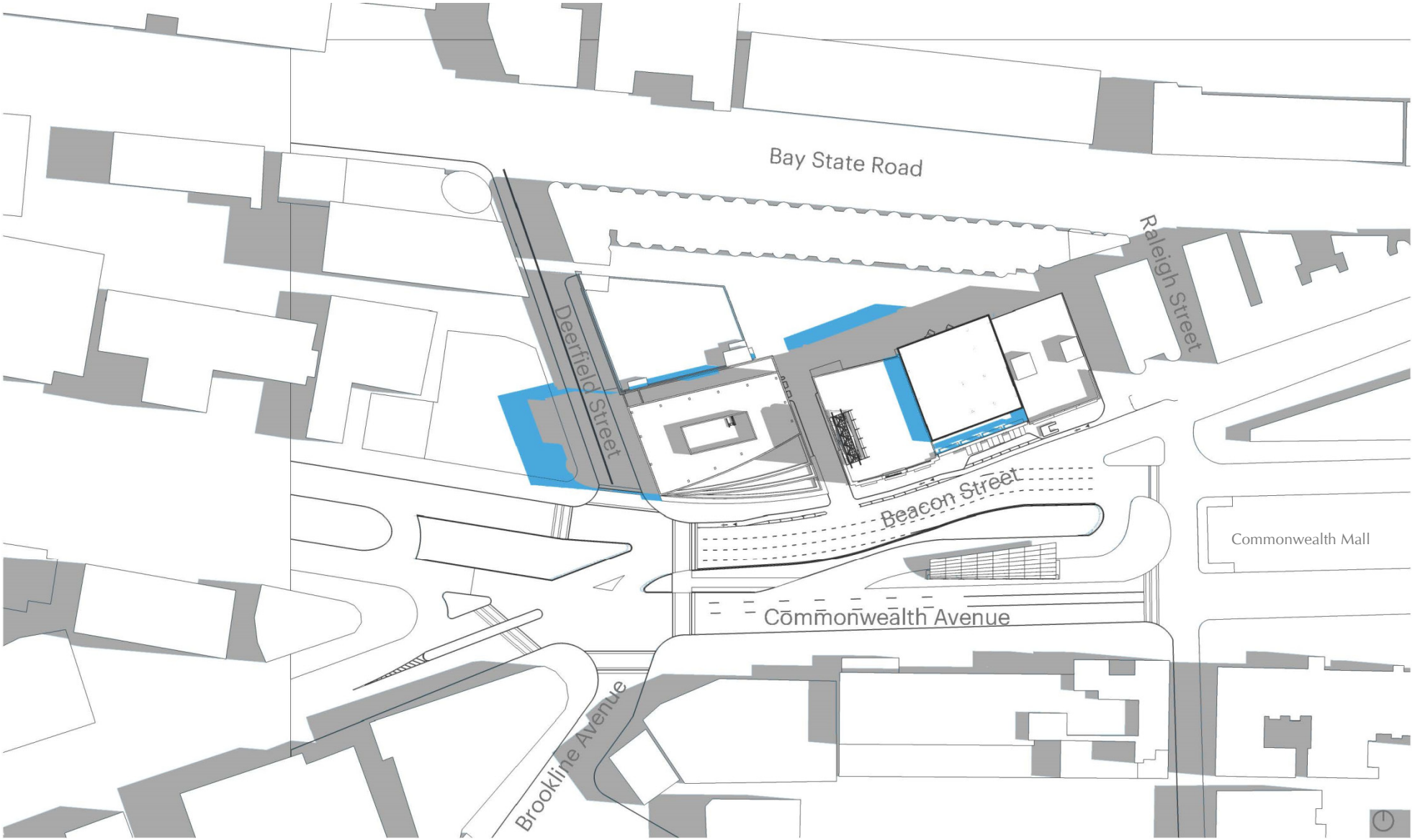

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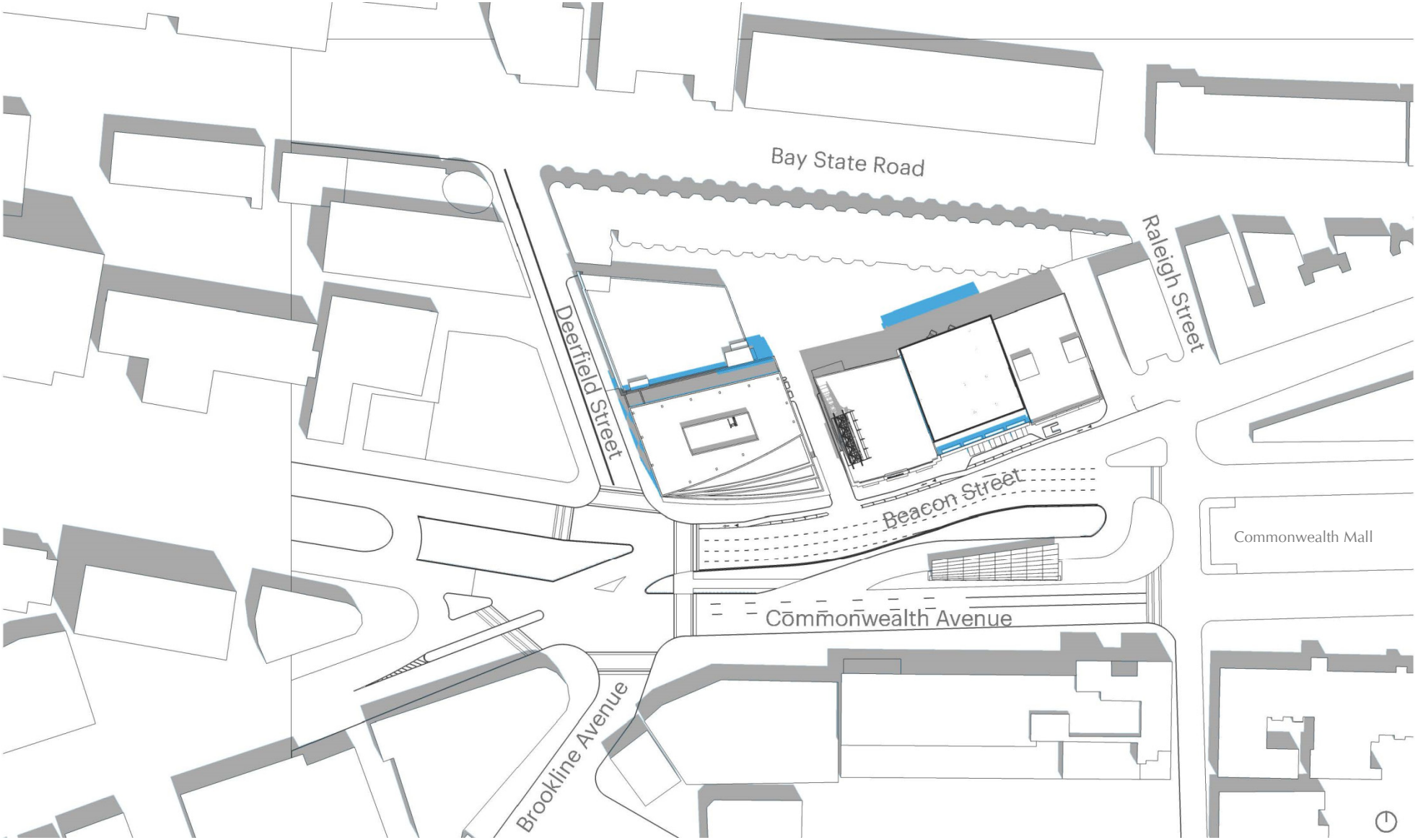
Figure 3-8
Shadow Study, June 21, 9:00 a.m.



Kenmore Square Redevelopment **Boston, Massachusetts**

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Figure 3-9
Shadow Study, June 21, 12:00 p.m.

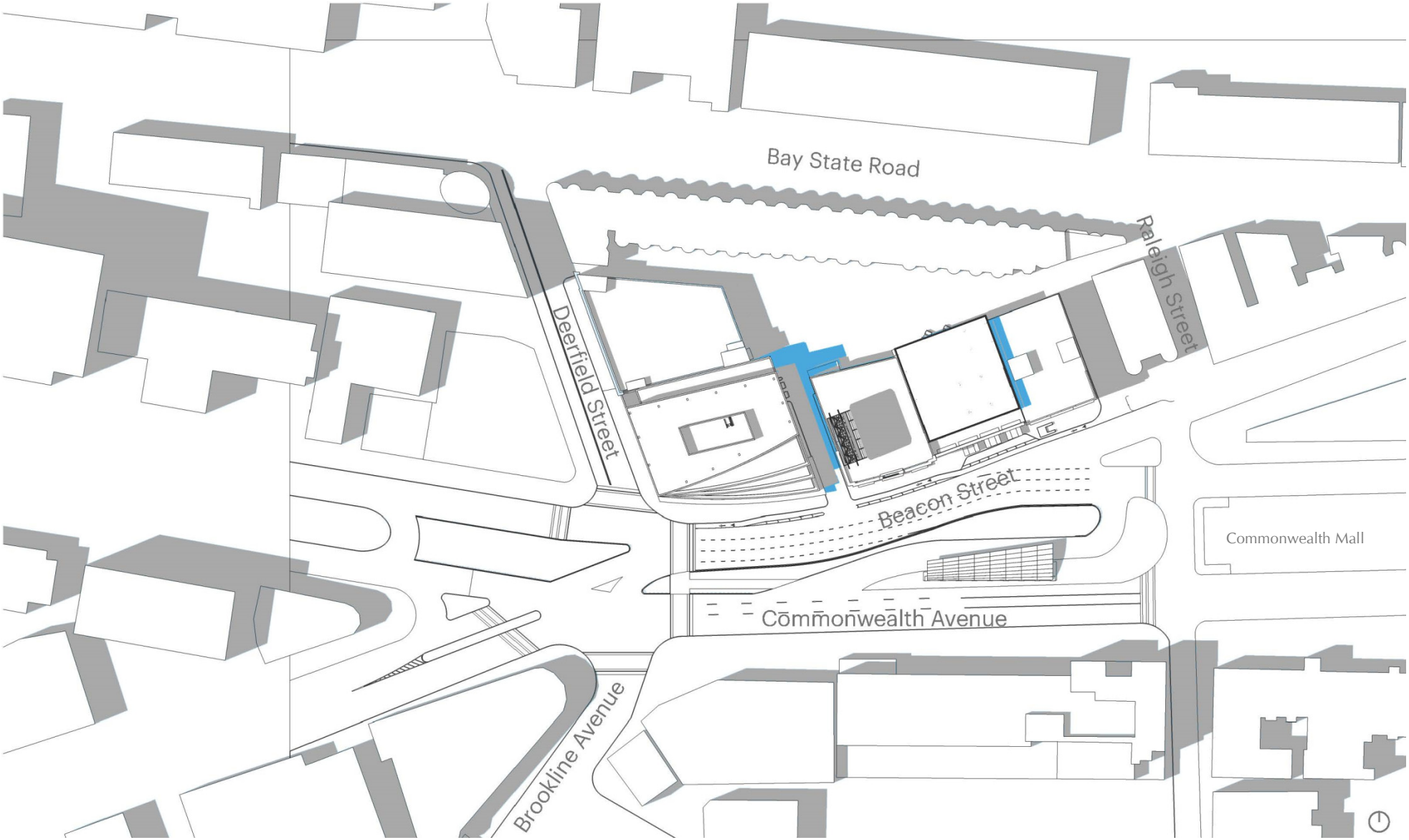

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Figure 3-10
Shadow Study, June 21, 3:00 p.m.

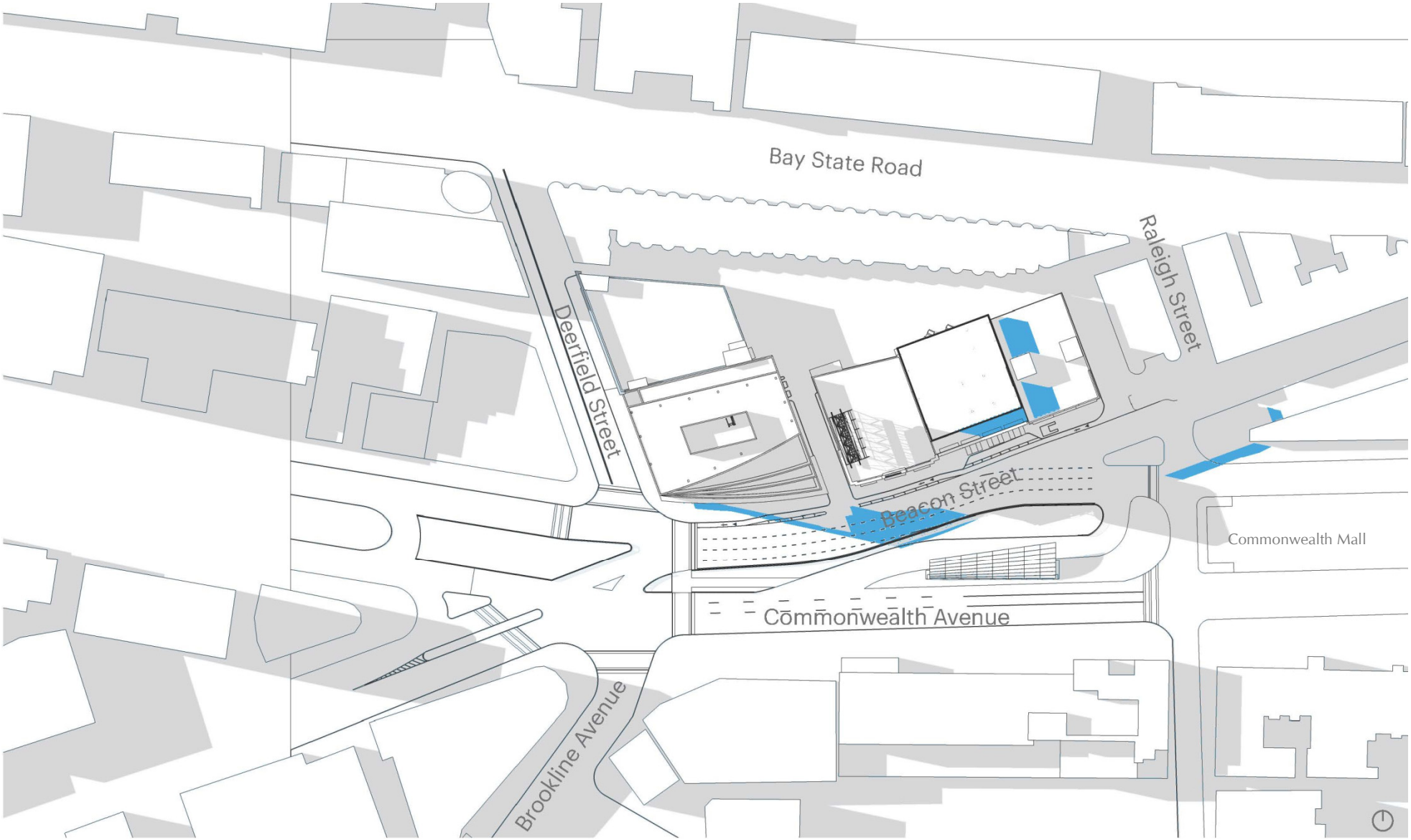

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Figure 3-11
Shadow Study, June 21, 6:00 p.m.

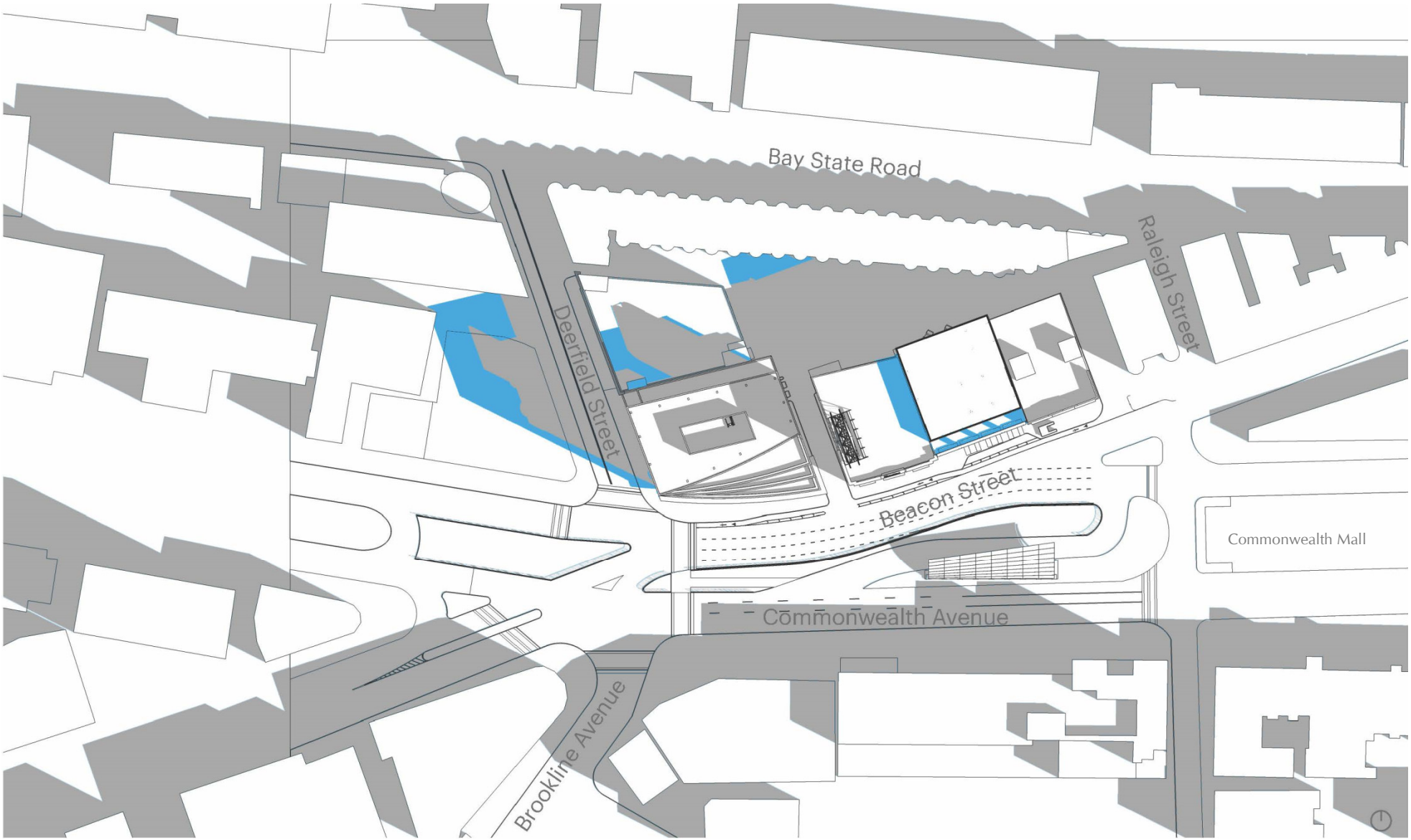

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Figure 3-12
Shadow Study, September 21, 9:00 a.m.

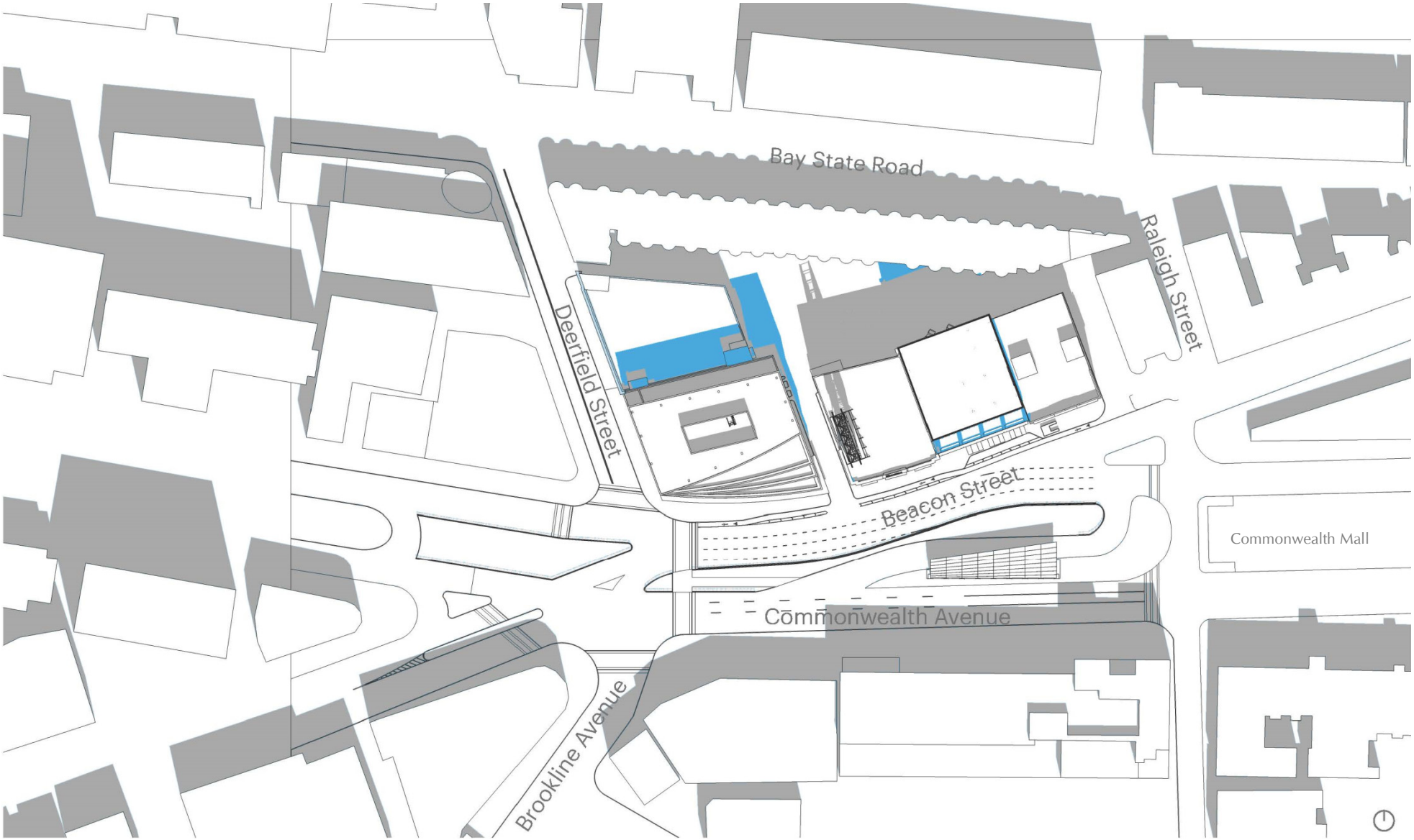

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Figure 3-13
Shadow Study, September 21, 12:00 p.m.

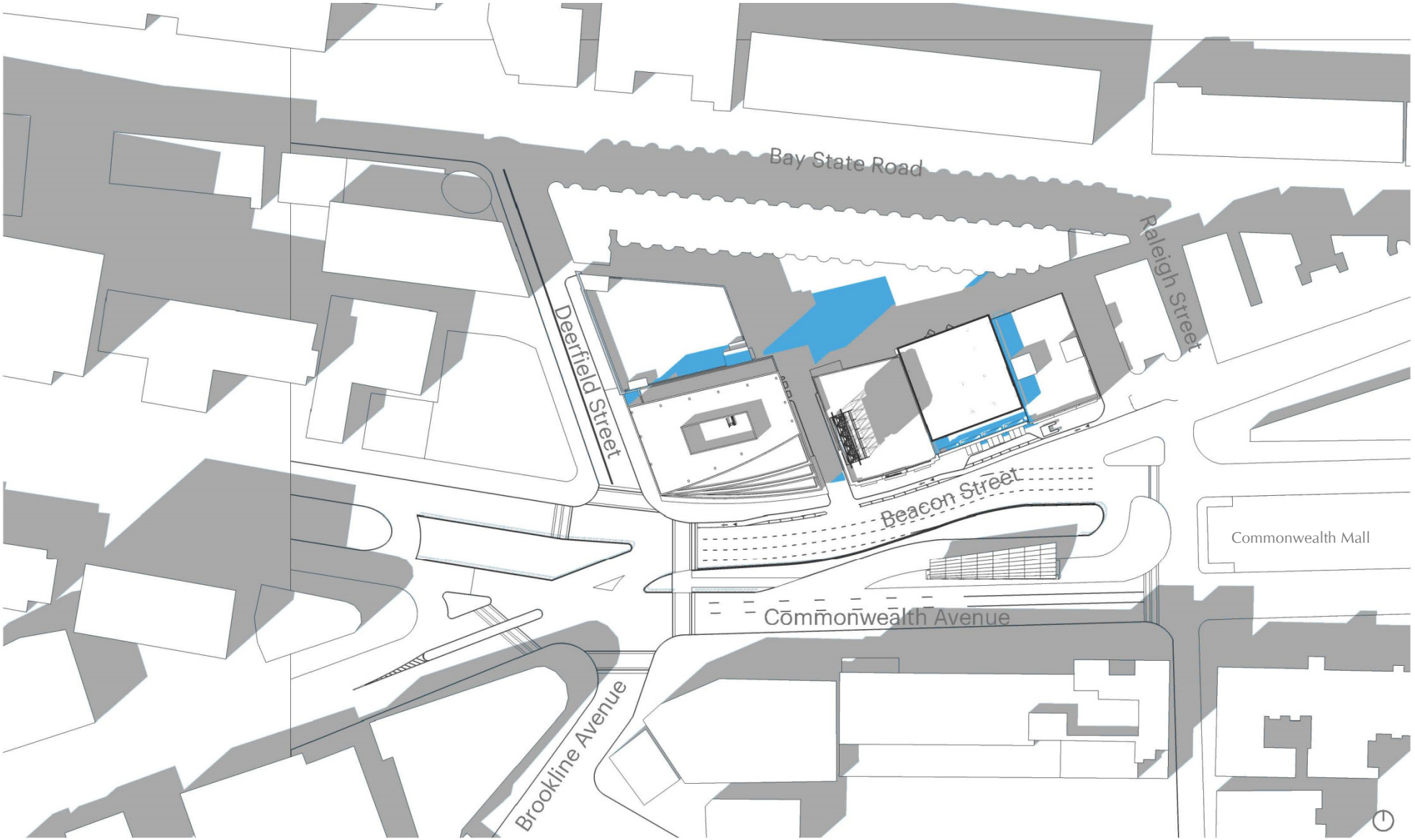

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Figure 3-14
Shadow Study, September 21, 3:00 p.m.

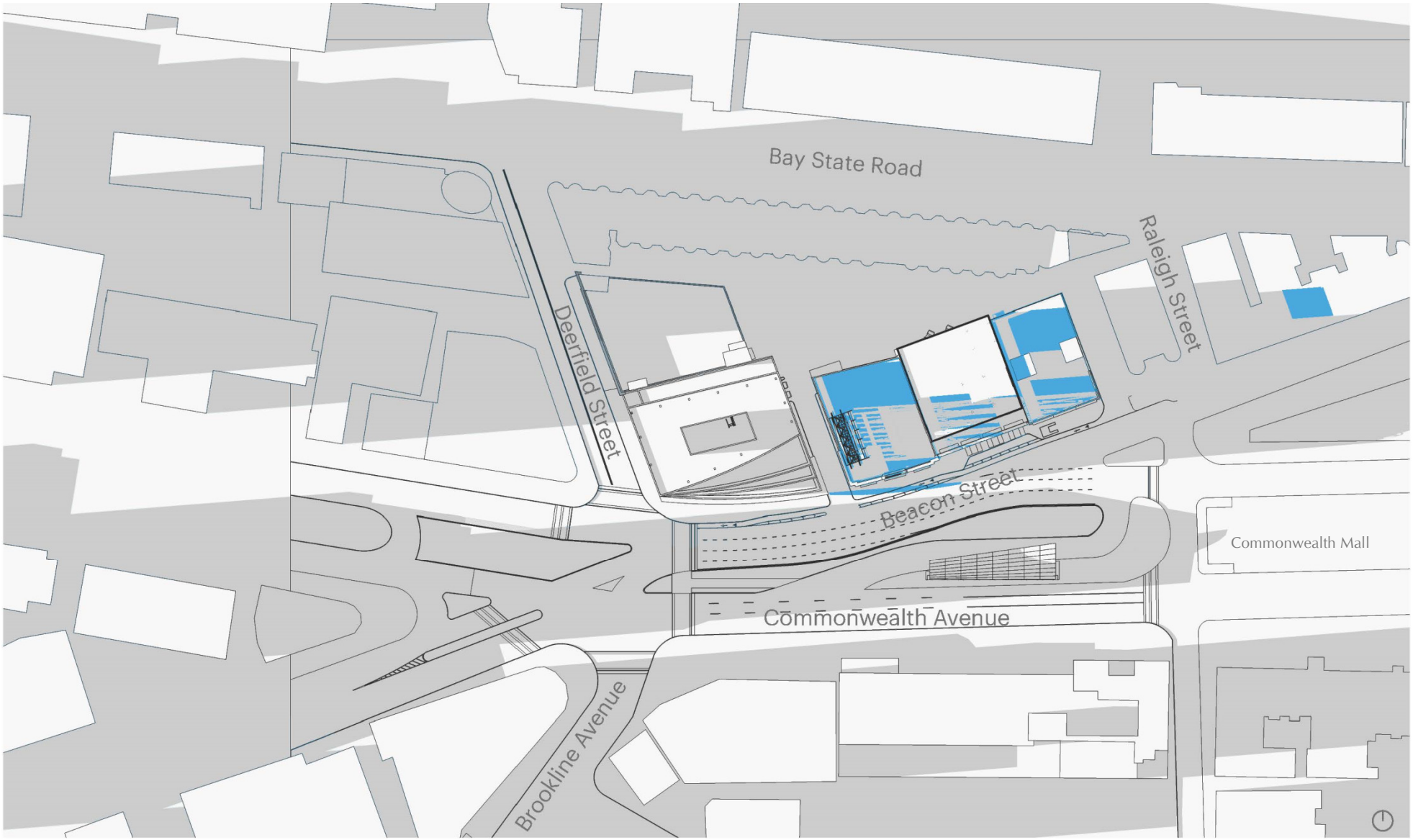

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Figure 3-15
Shadow Study, September 21, 6:00 p.m.

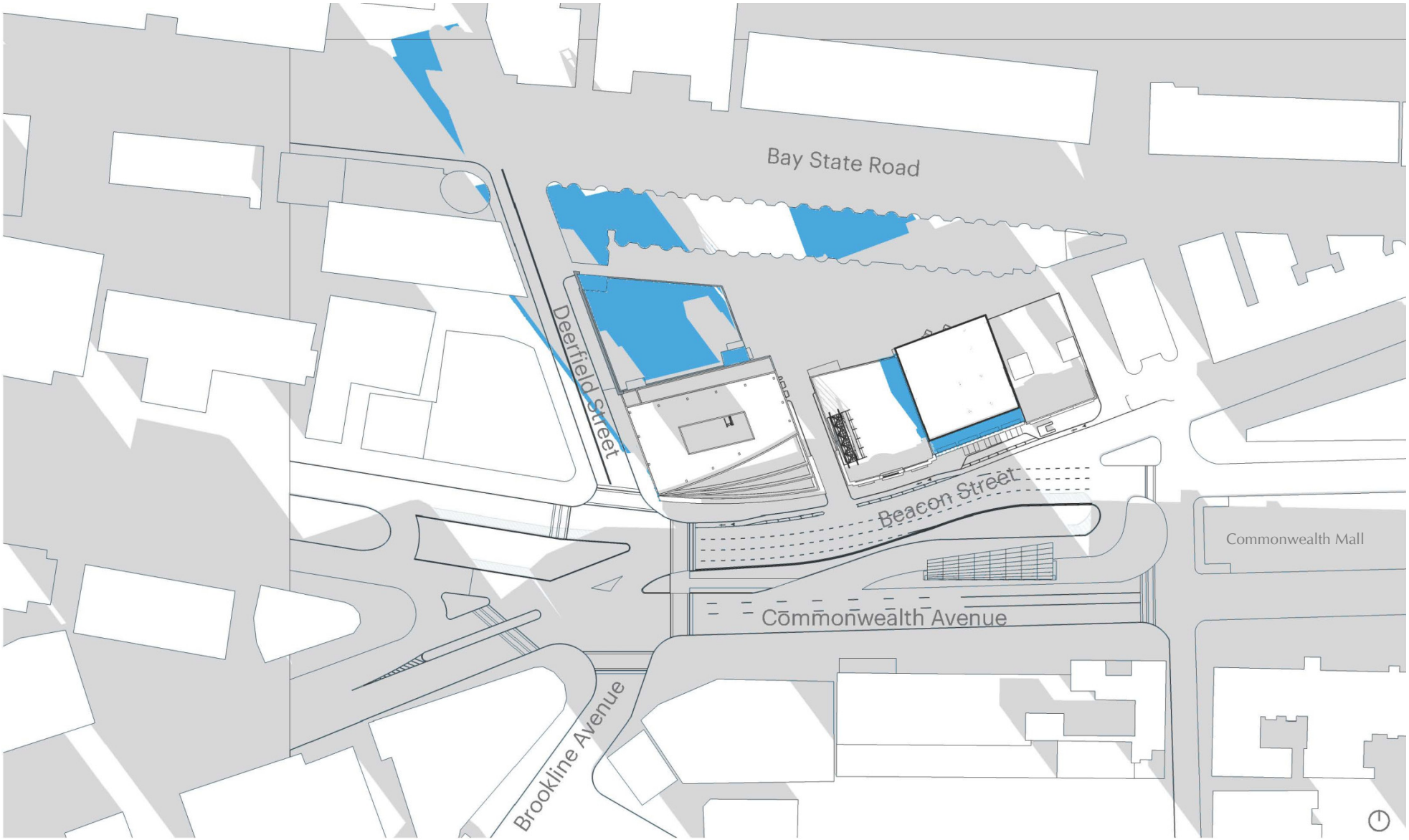

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Figure 3-16
Shadow Study, December 21, 9:00 a.m.

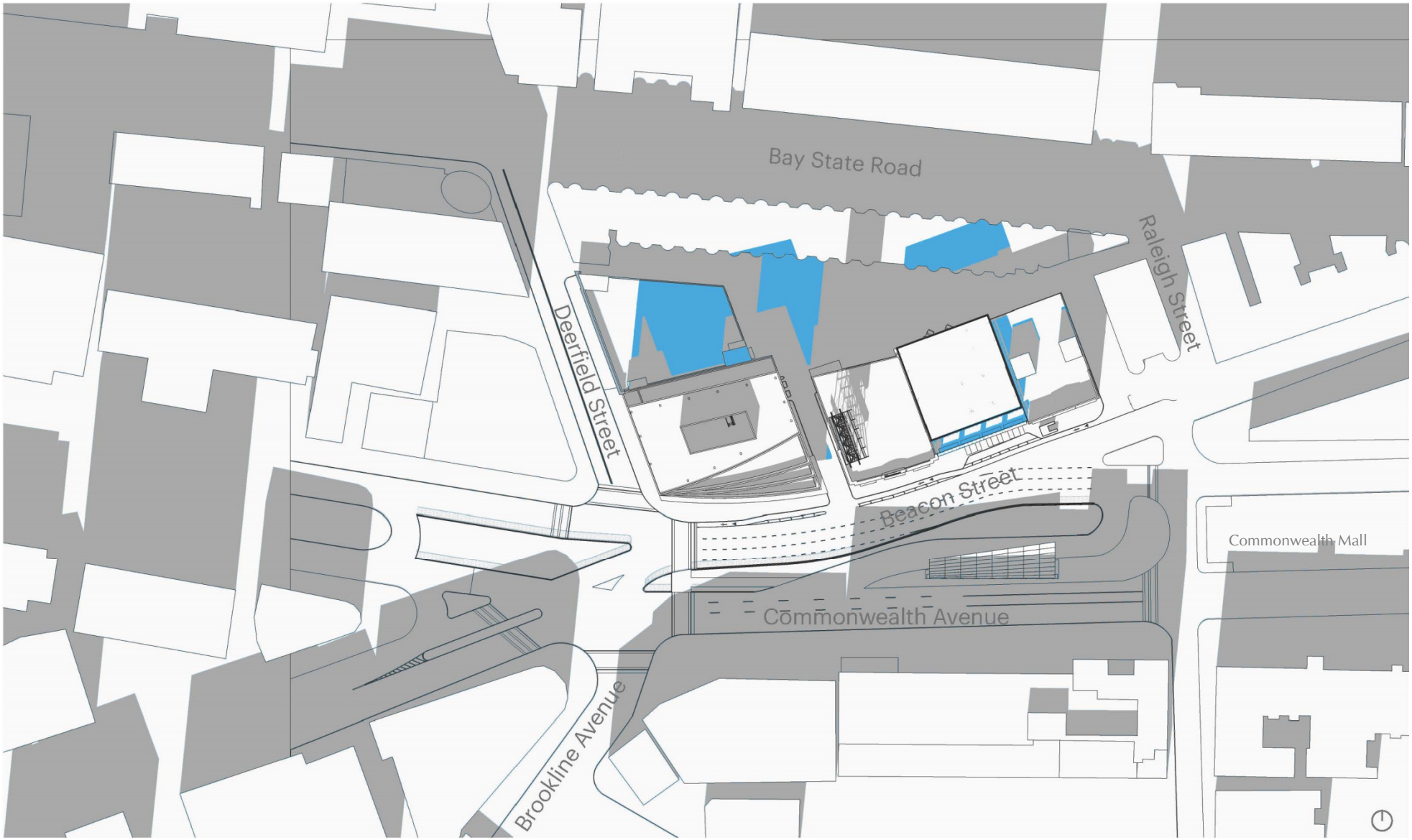

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Figure 3-17
Shadow Study, December 21, 12:00 p.m.

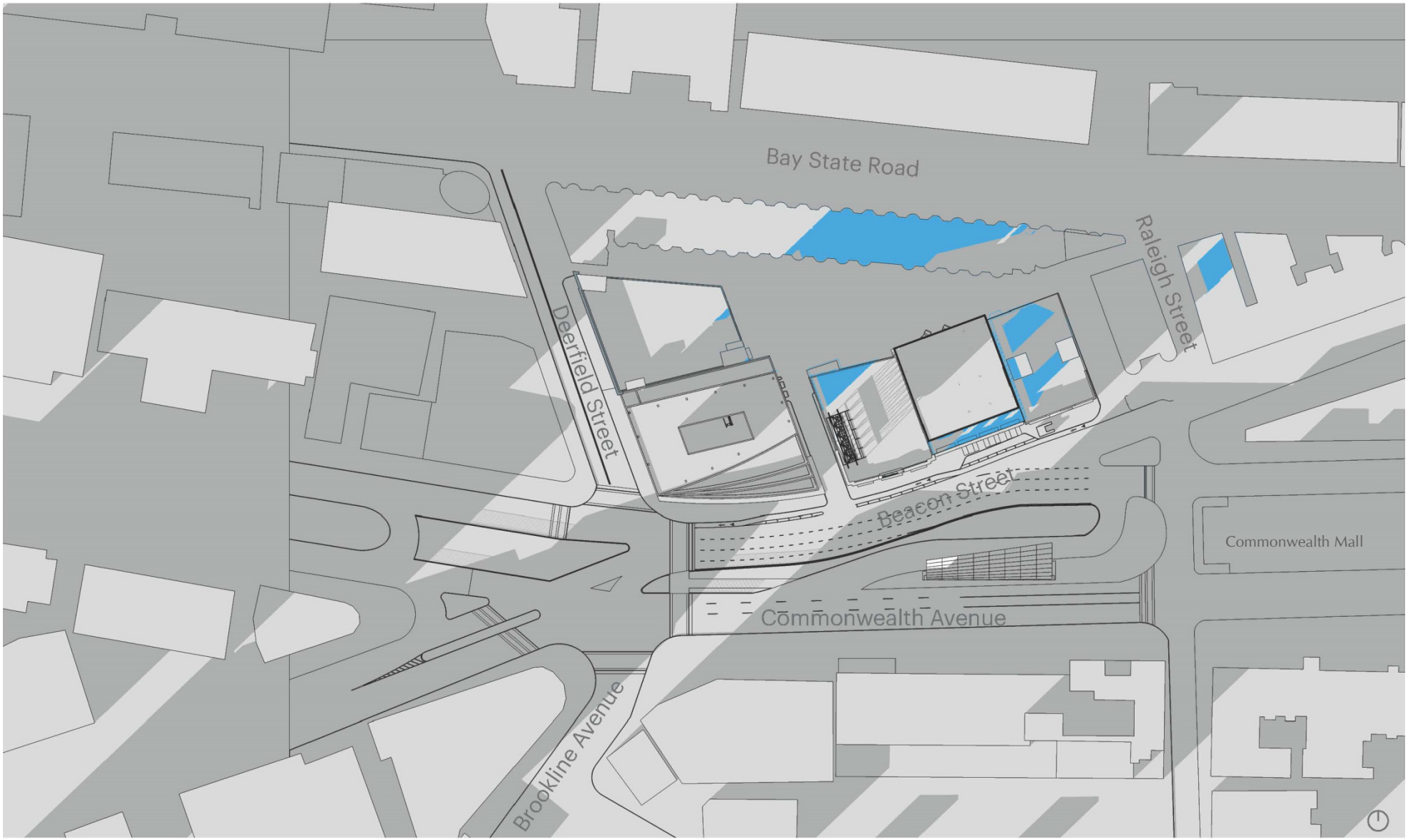

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Figure 3-18
Shadow Study, December 21, 3:00 p.m.

3.3 Daylight Analysis

3.3.1 Introduction

The purpose of the daylight analysis is to estimate the extent to which the Project will affect the amount of daylight reaching the streets and the sidewalks in the immediate vicinity of a project site. Massing will be modestly increased within certain areas of the Project Site, and will therefore increase daylight obstruction.

3.3.2 Methodology

The daylight analysis was performed using the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program[5]. This program measures the percentage of "sky dome" that is obstructed by a project, and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

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

Three viewpoints were chosen to evaluate the daylight obstruction for the proposed conditions, one each from Deerfield Street, Commonwealth Avenue, and Beacon Street. Two area context points were considered in order to provide a basis of comparison to existing, or soon to be existing conditions in the surrounding area. The viewpoint and area context viewpoints were taken in the following locations and are shown on Figure 3-19.

- **Viewpoint 1:** View from Deerfield Street facing east toward 535 Commonwealth Avenue.
- **Viewpoint 2:** View from Commonwealth Avenue facing northwest toward 535 Commonwealth Avenue.
- **Viewpoint 3:** View from Beacon Street facing northwest toward 650-660 Beacon Street.

---

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

- **Area Context Viewpoint AC1:** View from Deerfield Street facing east toward 11 Deerfield Street.

- **Area Context Viewpoint AC2:** View from Beacon Street facing northwest toward 648-642 Beacon Street.

3.3.3 Results

The results for each viewpoint are described in Table 3-2. Figures 3-20 to 3-22 illustrate the BRADA results for each analysis.

Table 3-2 Daylight Analysis Results

Viewpoint Locations		Existing Conditions	Proposed Conditions
Viewpoint 1	View from Deerfield Street facing east toward 535 Commonwealth Avenue	67.7%	78.5%
Viewpoint 2	View from Commonwealth Avenue facing north toward 535 Commonwealth Avenue	12.6%	43.8%
Viewpoint 3	View from Beacon Street facing northwest toward 650-660 Beacon Street	65.4%	67.3%
Area Context Points			
AC1	View from Deerfield Street facing east toward 11 Deerfield Street.	57.1%	N/A
AC2	View from Beacon Street facing northwest toward 648-642 Beacon Street.	59.2%	N/A

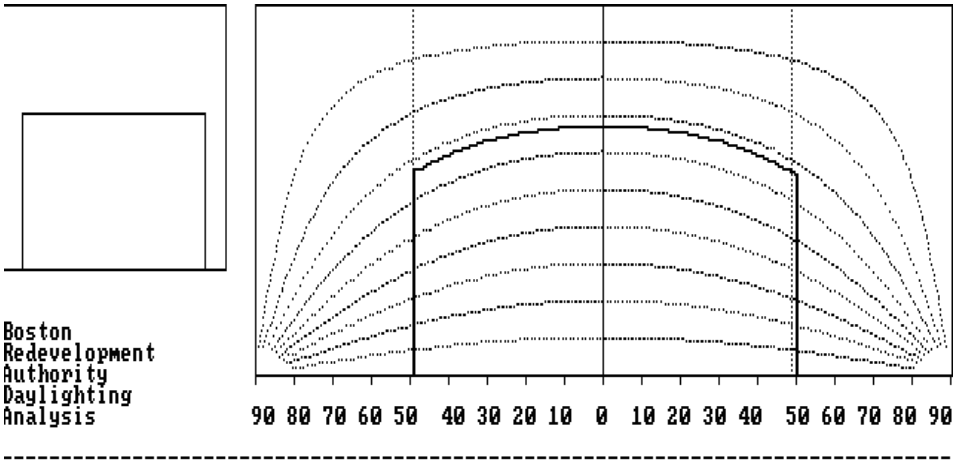
Kenmore Square Redevelopment Boston, Massachusetts

Epsilon Associates Inc.

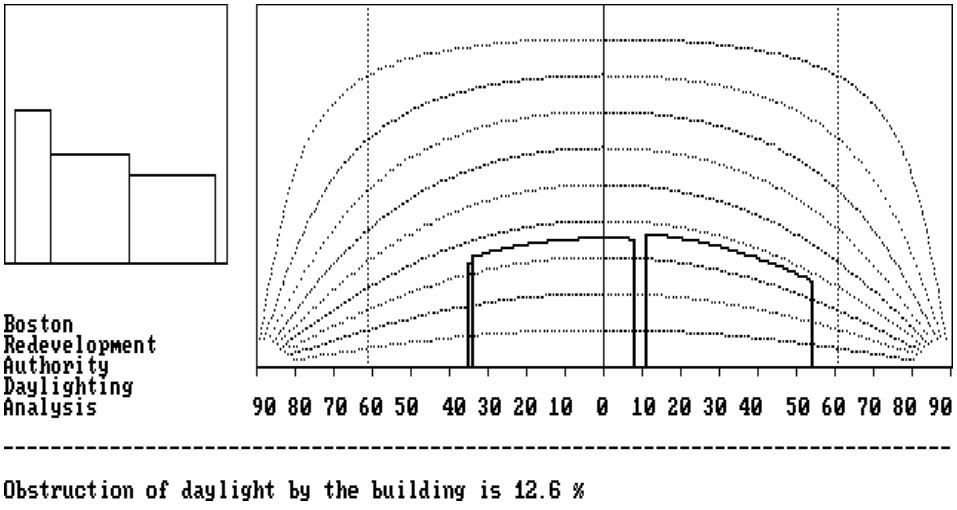
Figure 3-19

Viewpoint and Area Context Locations

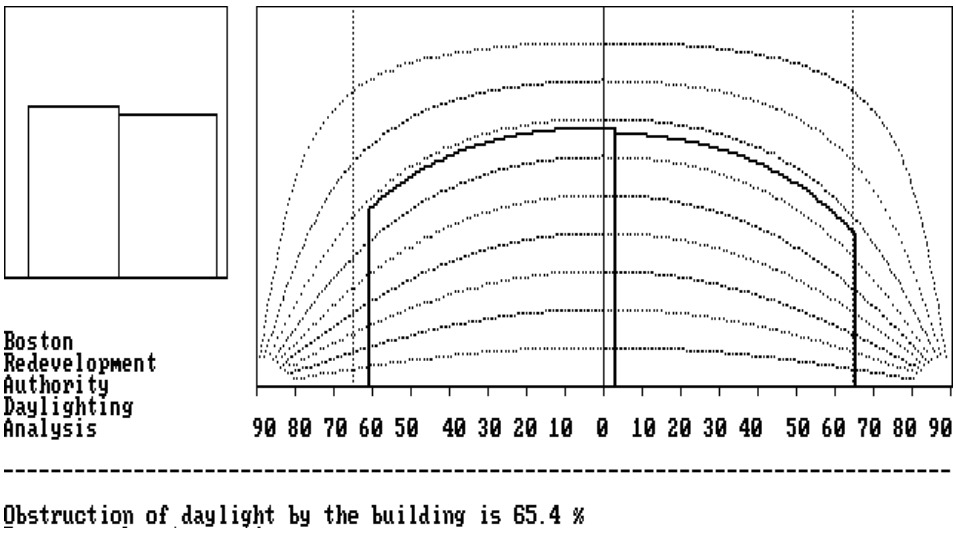
Viewpoint 1: View from Deerfield Street facing east toward 535 Commonwealth Avenue.



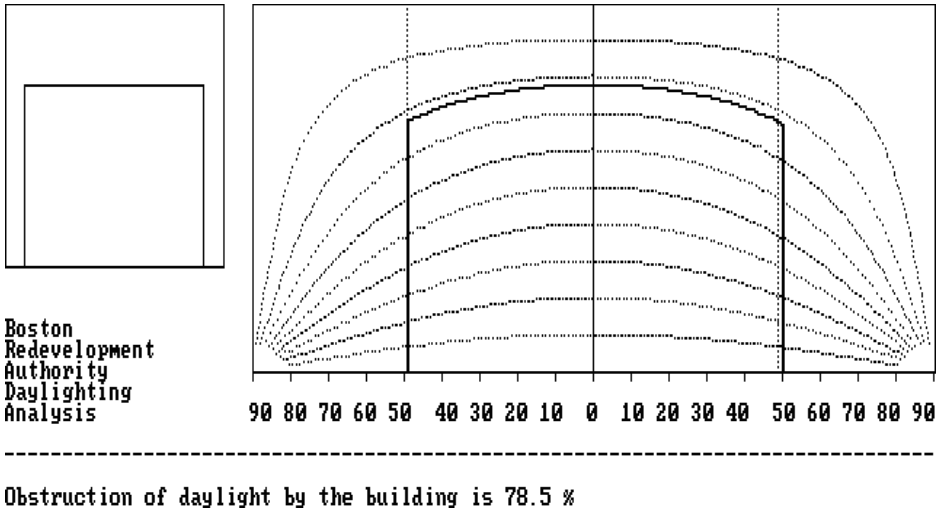
Viewpoint 2: View from Commonwealth Avenue facing northwest toward 535 Commonwealth Avenue.



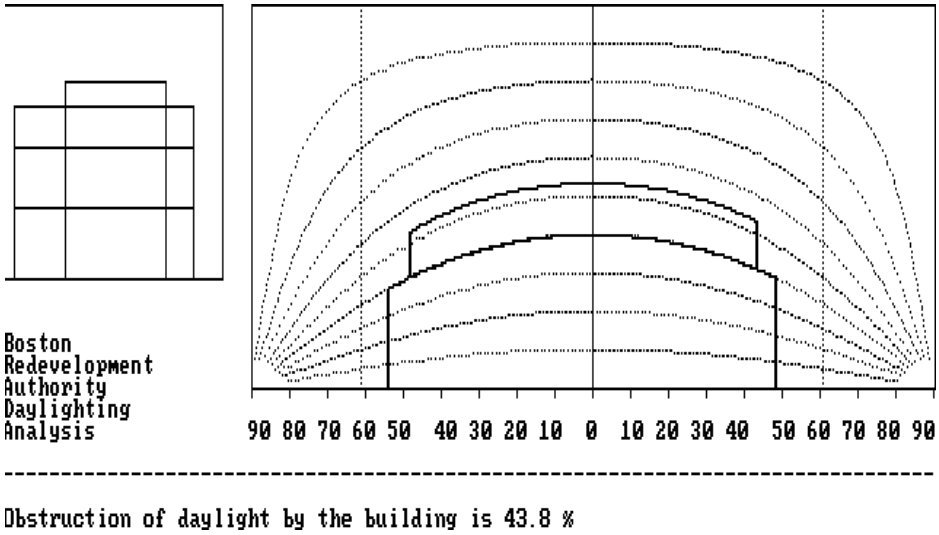
Viewpoint 3: View from Beacon Street facing northwest toward 660-648 Beacon Street.



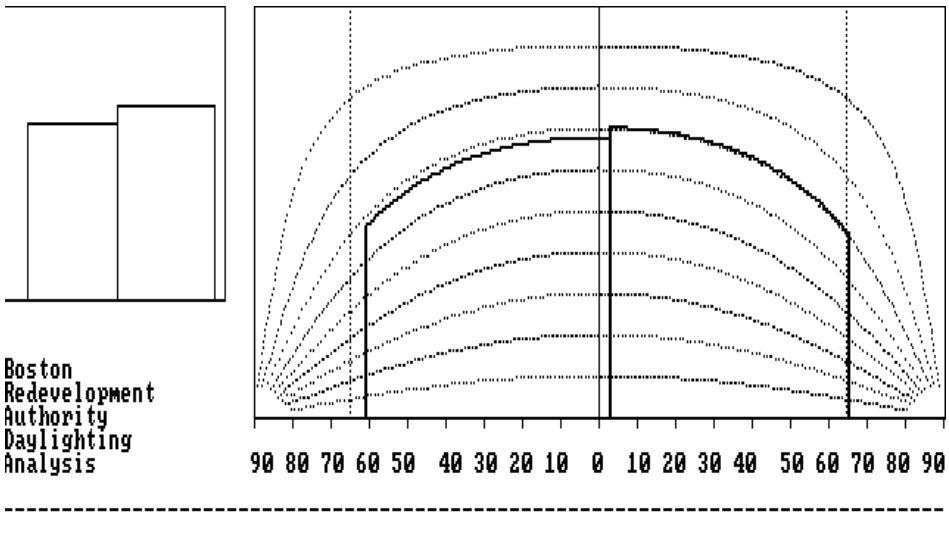
Viewpoint 1: View from Deerfield Street facing east toward 535 Commonwealth Avenue.



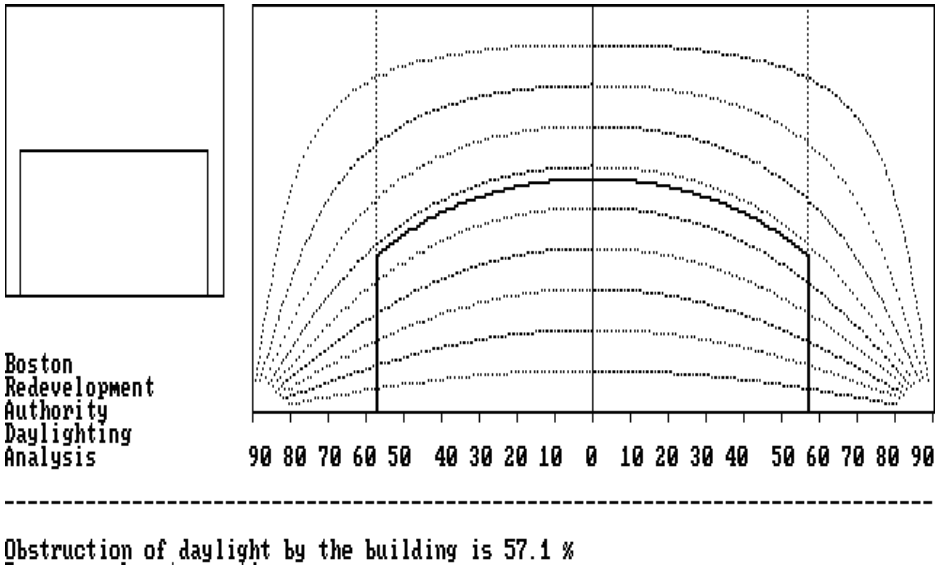
Viewpoint 2: View from Commonwealth Avenue facing northwest toward 535 Commonwealth Avenue.



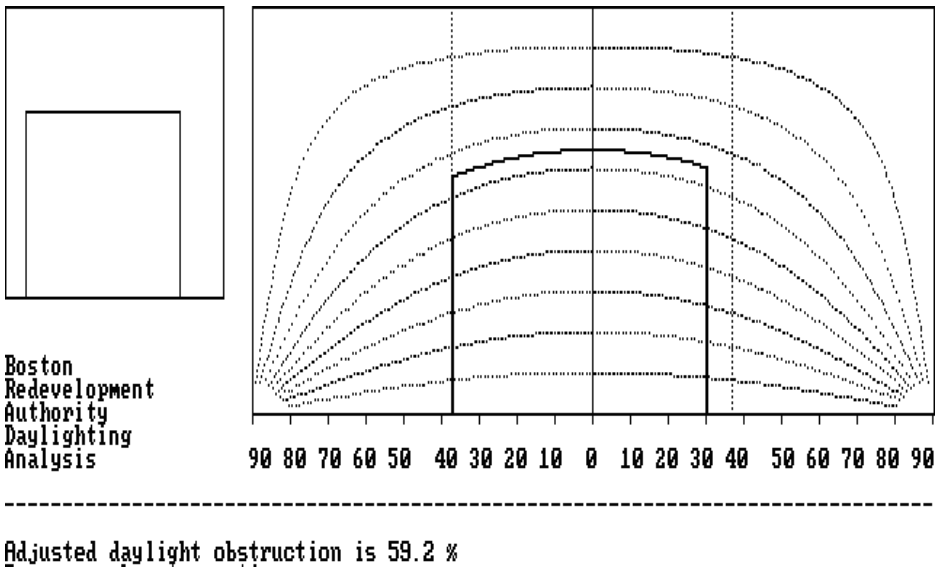
Viewpoint 3: View from Beacon Street facing northwest toward 660-648 Beacon Street.



Area Context 1: View from Deerfield Street facing east toward 11 Deerfield Street.



Area Context 2: View from Beacon Street facing northwest toward 648 Beacon Street.



Beacon Street – Viewpoint 1

Deerfield Street runs along the western edge of the Project Site. Viewpoint 1 was taken from the center of Deerfield Street facing east toward 535 Commonwealth Avenue. The Project will result in a daylight obstruction value of 78.5 percent, compared to 67.7 percent in the existing condition.

Commonwealth Avenue – Viewpoint 2

Commonwealth Avenue runs along the southern edge of the Project Site. Viewpoint 3 was taken from the center of Commonwealth Avenue facing north toward 535 Commonwealth Avenue. The existing conditions have a daylight obstruction value of 12.6 percent. The Project will result in a daylight obstruction value of 43.8 percent. This obstruction value is more than the existing condition, but less than that of the Area Context buildings.

Deerfield Street – Viewpoint 3

Viewpoint 3 was taken from the center of Beacon Street facing northwest toward 650-660 Beacon Street. The existing daylight obstruction is 65.4 percent. The Project will result in a daylight obstruction value of 67.3 percent. This obstruction value is a modest increase over existing conditions; however, it is consistent with existing buildings in the area, including the Area Context buildings.

Area Context Viewpoints

The Project area currently consists of low to mid-rise commercial buildings. To provide a larger context for comparison of daylight conditions, obstruction values were calculated for the two Area Context Viewpoints described above, with locations shown on Figure 3-19. Area Context Conditions are shown on Figure 3-22. The daylight obstruction values ranged from 57.1 percent for Area Context 1 to 59.2 percent for Area Context 2.

3.3.4 Conclusion

The daylight analysis conducted for the Project describes proposed daylight obstruction conditions at the Project Site and existing conditions in the surrounding area. The results of the BRADA analysis indicate that while the development of the Project will result in increased daylight obstruction over existing conditions, the resulting conditions at most viewpoints will be comparable to or lower than the daylight obstruction values within the surrounding area. The daylight obstruction when viewing the Project from adjacent streets is consistent with area buildings and is typical of densely developed urban areas.

3.4 Solar Glare

It is not anticipated that the Project will include the use of reflective glass or other reflective materials on the building facades that would result in adverse impacts from reflected solar glare from the Project.

3.5 Air Quality

3.5.1 Introduction

The BPDA requires that proposed projects evaluate the air quality in the local area, and assess any adverse air quality impacts attributable to a project.

The Project does not generate enough traffic to require a mesoscale vehicle emissions quantification analysis. However, the Project creates new trips through local intersections operating at LOS D or worse. Therefore, a microscale analysis of carbon monoxide has been completed to provide information on the Project's impact to air quality from mobile sources.

Any new stationary sources will be reviewed by the Massachusetts Department of Environmental Protection (MassDEP) during permitting under the Environmental Results Program, as required. It is expected that all stationary sources will be small, and any impacts from stationary sources would be minimal.

3.5.2 National Ambient Air Quality Standards and Background Concentrations

Background air quality concentrations and federal air quality standards were utilized to conduct the above air quality impact analyses. Federal National Ambient Air Quality Standards (NAAQS) were developed by the U.S. Environmental Protection Agency (EPA) to protect the human health against adverse health effects with a margin of safety. The modeling methodologies were developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[6] The following sections outline the NAAQS standards and detail the sources of background air quality data.

3.5.2.1 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, EPA promulgated NAAQS for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) (PM-10 and PM-2.5), carbon monoxide (CO), ozone (O_3), and lead (Pb). The NAAQS are listed in Table 3-3. Massachusetts Ambient Air

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

Quality Standards (MAAQS) are typically identical to NAAQS (differences are highlighted in **bold** in Table 3-3).

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 were applied when comparing to the modeling results for the Project.

The NAAQS also reflect various durations of exposure. The non-probabilistic 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.

Table 3-3 National (NAAQS) and Massachusetts (MAAQS) Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$) Primary	NAAQS ($\mu g/m^3$) Secondary	MAAQS ($\mu g/m^3$) Primary	MAAQS ($\mu g/m^3$) Secondary
NO_2	Annual [1]	100	Same	100	Same
	1-hour [2]	**188**	None	**None**	None
SO_2	Annual [1][9]	80	None	80	None
	24-hour [3][9]	365	None	365	None
	3-hour [3]	None	1300	None	1300
	1-hour [4]	**196**	None	**None**	None
PM-2.5	Annual [1]	**12**	**15**	**None**	**None**
	24-hour [5]	**35**	**Same**	**None**	**None**
PM-10	Annual [1][6]	**None**	None	**50**	Same
	24-hour [3][7]	150	Same	150	Same
CO	8-hour [3]	10,000	Same	10,000	Same
	1-hour [3]	40,000	Same	40,000	Same
Ozone	8-hour [8]	**147**	Same	**235**	Same
Pb	3-month [1]	1.5	Same	1.5	Same

[1] Not to be exceeded.
[2] 98th percentile of one-hour daily maximum concentrations, averaged over three years.
[3] Not to be exceeded more than once per year.
[4] 99th percentile of one-hour daily maximum concentrations, averaged over three years.
[5] 98th percentile, averaged over three years.
[6] EPA revoked the annual PM-10 NAAQS in 2006.
[7] Not to be exceeded more than once per year on average over three years.
[8] Annual fourth-highest daily maximum eight-hour concentration, averaged over three years.
[9] EPA revoked the annual and 24-hour SO_2 NAAQS in 2010. However, they remain in effect until one year after the area's initial attainment designation, unless designated as "nonattainment".

Source: http://www.epa.gov/ttn/naaqs/criteria.html and 310 CMR 6.04

3.5.2.2 Background Concentrations

To estimate background pollutant levels representative of the area, the most recent air quality monitor data reported by the MassDEP to EPA was obtained for 2014 to 2016. Data for the pollutant and averaging time combinations were obtained from the EPA's AirData website.

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

Background concentrations were determined from the closest available monitoring stations to the proposed development. All pollutants are not monitored at every station, so data from multiple locations are necessary. The closest monitor is at Kenmore Square in Boston, proximate to the Project's location. However this site does not sample for Ozone and Lead, and ceased sampling for CO in 2015. The next closest monitor is at Harrison Avenue, roughly 1.5 miles southeast of the Project. Values from this site are used for the remaining pollutants. A summary of the background air quality concentrations are presented in Table 3-4.

Table 3-4 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	Averaging Time	2014	2015	2016	Background Concentration ($\mu g/m^3$)	NAAQS	Percent of NAAQS
SO_2 [1][6]	1-Hour [5]	25.4	14.4	10.7	16.9	196.0	9%
	3-Hour [6]	24.6	11.5	10.0	24.6	1300.0	2%
	24-Hour	13.1	7.6	5.2	13.1	365.0	4%
	Annual	2.5	1.4	1.1	2.5	80.0	3%
PM-10	24-Hour	53.0	30.0	30.0	53.0	150.0	35%
	Annual	15.0	14.2	14.1	15.0	50.0	30%
PM-2.5	24-Hour [5]	14.6	14.5	13.0	14.0	35.0	40%
	Annual [5]	6.1	6.5	6.2	6.3	12.0	52%
NO_2 [3]	1-Hour [5]	92.1	105.3	88.4	95.3	188.0	51%
	Annual	32.3	32.5	28.3	32.5	100.0	33%

Table 3-4 Observed Ambient Air Quality Concentrations and Selected Background Levels (continued)

Pollutant	Averaging Time	2014	2015	2016	Background Concentration ($\mu g/m^3$)	NAAQS	Percent of NAAQS
CO [2][7]	1-Hour	1489.8	1560.9	2760.7	2760.7	40000.0	7%
	8-Hour	1260.6	1031.4	2062.8	2062.8	10000.0	21%
Ozone [4]	8-Hour	106.0	109.9	113.9	113.9	147.0	77%
Lead	Rolling 3-Month	0.014	0.016	0.017	0.017	0.15	12%

Notes:
From 2014-2016 EPA's AirData Website
[1] SO_2 reported ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2.62 $\mu g/m^3$.
[2] CO reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1146 $\mu g/m^3$.
[3] NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1.88 $\mu g/m^3$.
[4] O_3 reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1963 $\mu g/m^3$.
[5] Background level is the average concentration of the three years.
[6] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.
[7] CO monitor at Kenmore Square was deactivated in January 2015. Harrison Avenue monitor used for 2015 and 2016.

Air quality in the vicinity of the Project Site is generally good, with all local background concentrations found to be well below the NAAQS.

3.5.2 Mobile Sources

Mobile sources of air pollution include emissions from gasoline, diesel, and natural gas fueled vehicle traffic. Emissions from mobile sources have continually decreased as engine technology and efficiency have been improved.

3.5.2.1 Methodology

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

The microscale analysis typically examines ground-level CO impacts due to traffic queues in the immediate vicinity of a project. CO is used in microscale studies to indicate roadway

pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in so-called "hot spot" (high concentration) locations around congested intersections. The NAAQS standards do not allow ambient CO concentrations to exceed 35 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 microscale analysis has been conducted using the latest versions of EPA's MOVES and CAL3QHC programs to estimate CO concentrations at sidewalk receptor locations. Baseline (2017) and future year (2022) emission factor data calculated from the MOVES model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersections. The modeling methodology was developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[7]

Existing background values of CO at the nearest monitor location at Harrison Avenue were obtained from MassDEP. CAL3QHC results were then added to background CO values of 2.4 ppm (one-hour) and 1.8 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).

Modeling assumptions and backup data for results presented in this section are provided in Appendix B.

Intersection Selection

Two signalized intersections included in the traffic study meets the above conditions described at the beginning of this section (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 found to meet the criteria are the intersection of Commonwealth Avenue Westbound and Kenmore Street and the intersection of Commonwealth Avenue, Brookline Avenue, Beacon Street and Deerfield Street (also known as Kenmore Square).

Microscale modeling was performed for the intersections based on the aforementioned methodology. The 2017 Existing Condition and the 2022 No-Build and Build conditions were each evaluated for both morning (a.m.) and afternoon (p.m.) peak.

[7] 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

Emissions Calculations (MOVES)

The EPA MOVES computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOVES model are based on motor vehicle operations typical of daily periods. The Commonwealth's statewide annual Inspection and Maintenance (I&M) program was included, as well as the county specific vehicle age registration distribution, fleet mix, meteorology, and other inputs. The inputs for MOVES for the existing (2017) and future year (2022) are provided by MassDEP.

All link types for the modeled intersections were input into MOVES. Idle emission factors are obtained from factors for a link average speed of 0 miles per hour (mph). Moving emissions are calculated based on speeds at which free-flowing vehicles travel through the intersection as stated in traffic modeling (Synchro) reports. A speed of 25 mph is used for all free-flow traffic, consistent with the City of Boston speed limit. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary) and left turns, respectively. Roadway emissions factors were obtained from MOVES using EPA guidance.[8]

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

Receptors & Meteorology Inputs

Sets of up to 276 receptors were placed in the vicinity of the modeled intersections. Receptors extended approximately 300 feet on the sidewalks along the roadways approaching the intersections. The roadway links and receptor locations of the modeled intersection are presented in Figures 3-23 and 3-24.

For the CAL3QHC model, limited meteorological inputs are required. Following EPA guidance[9], 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 due to the urban structures located adjacent to the intersection.[10]

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

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

[10] 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.

Kenmore Square Redevelopment **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 3-23

Intersection of Commonwealth Avenue (WB) and Kenmore Street

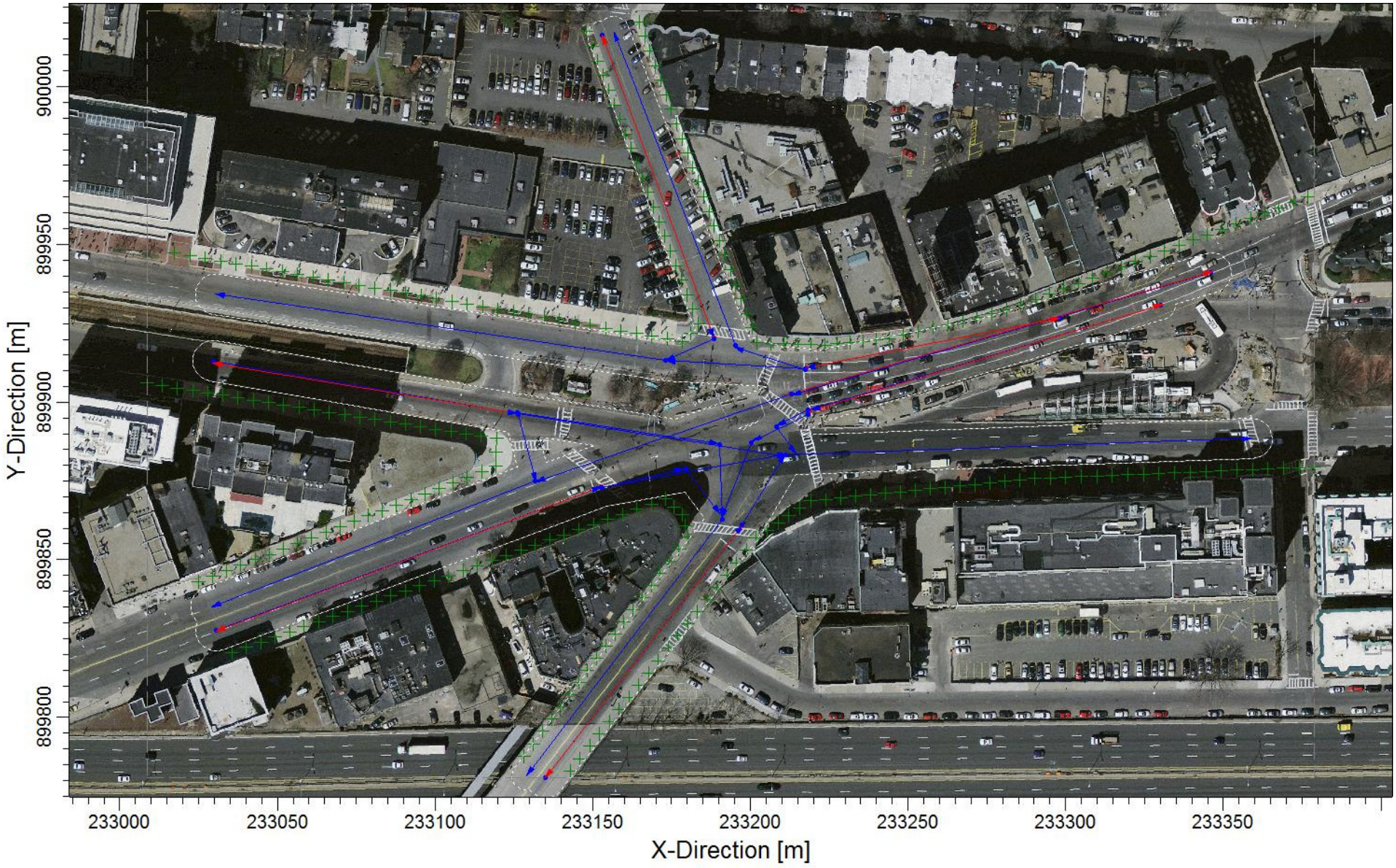

Figure 3-24

Intersection of Commonwealth Avenue, Beacon Street, Brookline Avenue and Deerfield Street

Impact Calculations (CAL3QHC)

The CAL3QHC model predicts one-hour concentrations using queue-links at signalized intersections, worst-case meteorological conditions, and traffic input data. The one-hour concentrations were scaled by a factor of 0.9 to estimate eight-hour concentrations.[11] The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling outputs.

For use in the microscale analysis, background concentrations of CO in ppm were required. The corresponding maximum background concentrations in ppm were 2.4 ppm (2,750 $\mu g/m^3$) for one-hour and 1.8 ppm (2,062 $\mu g/m^3$) for eight-hour CO.

3.5.2.2 Air Quality Results

The results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 3-5 through 3-7 for the 2017 and 2022 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.9.[12]

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 (0.4 ppm) plus background (2.4 ppm) is 2.8 ppm. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.4 ppm) plus background (1.8 ppm) is 2.2 ppm. All concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm.

3.5.2.3 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.

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

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

Table 3-5 Summary of Microscale Modeling Analysis (Existing 2017)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Commonwealth Avenue (Westbound) and Kenmore Street	AM	0.3	2.4	2.7	35
	PM	0.2	2.4	2.6	35
Commonwealth Avenue, Brookline Avenue, Beacon Street and Deerfield Street	AM	0.3	2.4	2.7	35
	PM	0.4	2.4	2.8	35
8-Hour					
Commonwealth Avenue (Westbound) and Kenmore Street	AM	0.3	1.8	2.1	9
	PM	0.2	1.8	2.0	9
Commonwealth Avenue, Brookline Avenue, Beacon Street and Deerfield Street	AM	0.3	1.8	2.1	9
	PM	0.4	1.8	2.2	9

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

Table 3-6 Summary of Microscale Modeling Analysis (No Build 2022)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Commonwealth Avenue (Westbound) and Kenmore Street	AM	0.1	2.4	2.5	35
	PM	0.2	2.4	2.6	35
Commonwealth Avenue, Brookline Avenue, Beacon Street and Deerfield Street	AM	0.2	2.4	2.6	35
	PM	0.3	2.4	2.7	35
8-Hour					
Commonwealth Avenue (Westbound) and Kenmore Street	AM	0.1	1.8	1.9	9
	PM	0.2	1.8	2.0	9
Commonwealth Avenue, Brookline Avenue, Beacon Street and Deerfield Street	AM	0.2	1.8	2.0	9
	PM	0.3	1.8	2.1	9

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

Table 3-7 Summary of Microscale Modeling Analysis (Building 2022)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Commonwealth Avenue (Westbound) and Kenmore Street	AM	0.1	2.4	2.5	35
	PM	0.2	2.4	2.6	35
Commonwealth Avenue, Brookline Avenue, Beacon Street and Deerfield Street	AM	0.2	2.4	2.6	35
	PM	0.2	2.4	2.6	35
8-Hour					
Commonwealth Avenue (Westbound) and Kenmore Street	AM	0.1	1.8	1.9	9
	PM	0.2	1.8	2.0	9
Commonwealth Avenue, Brookline Avenue, Beacon Street and Deerfield Street	AM	0.2	1.8	2.0	9
	PM	0.2	1.8	2.0	9

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

3.6 Stormwater/Water Quality

Stormwater and water quality are discussed in Chapter 7.

3.7 Flood Hazard Zones / Wetlands

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for the site – Community Panel Number 25025C0076G – effective September 25, 2009 indicates the FEMA Flood Zone Designations for this site area. The FIRMs show that the Project is outside of the 500-year flood zone.

There is a Chapter 91 Determination of Applicability, which is recorded with the Suffolk County Registry of Deeds in Book 43092, Page 192, in which MassDEP determined that the Project Site includes landlocked tidelands but does not include any trust lands subject to licensing and permitting by MassDEP under Chapter 91 and 310 CMR 9.00.

3.8 Geotechnical Impacts

Geotechnical subsurface exploration activities, consisting of soil borings advanced at several locations on the site, were conducted on behalf of the Proponent.

The soil borings encountered a two- to sixteen-foot layer of granular fill below the site's existing asphalt surface. Typical of urban locations, occasional cobbles, brick, ash and cinders were also observed within the fill layer. A layer of organic deposit, approximately one to nine feet in thickness was encountered below the fill material. Underlying the fill and organic deposit, a natural glacial outwash deposit was present at depths ranging from ten to eighteen feet below the ground surface. Where encountered, a clay deposit was present beneath the glacial outwash deposit at depths of 17 and 23.5 feet below ground surface. The top of the clay deposit, approximately the first five feet, was generally observed to consist of a very stiff to hard, yellow clay with traces of sand and silt. Beneath the yellow clay crust, the clay deposit transitioned to a blue clay with traces of silt which transitioned from a firm consistency to a very soft consistency with depth. Groundwater observation wells installed at the site indicate that groundwater level ranges from approximately 4.5 feet to 9.1 feet Boston City Base (BCB).

3.9 Solid and Hazardous Waste

3.9.1 Hazardous Waste

The current MassDEP database indicates that the site is not a MassDEP-listed Massachusetts Contingency Plan (MCP) site. Environmental site assessments performed at the site identified the historical usage of the site, which included automotive sales and repair, and the historical storage of fuel oil and gasoline in underground storage tanks. In order to further assess potential environmental impacts from the site's prior uses, a Phase II subsurface investigation was completed. Based upon the results of the Phase II subsurface investigation, with the exceptions described below, the potential environmental concerns are not considered to have impacted soil and/or groundwater at the site.

The Phase II subsurface investigation identified a localized area of petroleum impacted soil at shallow depths along the north side of 642-648 Beacon Street and a potential underground storage tank (UST) was identified adjacent to the north side of the proposed Beacon Building. As part of the subsurface exploration program that was completed at the site, soil and groundwater testing was performed within the area of the suspected UST. The testing did not identify concentrations of petroleum hydrocarbons or petroleum related constituents in excess of the applicable reporting thresholds.

Additional characterization of the site's soil and groundwater will be conducted and, if necessary, soil, groundwater, and other materials will be managed in accordance with applicable local, state, and federal laws and regulations. During excavation, all soils

exported from the site will be managed for off-site disposal in accordance with the current regulations and policies of MassDEP.

3.9.2 Operation Solid Waste and Recycling

The Project will generate solid waste typical of commercial/retail uses. Solid waste is expected to include wastepaper, cardboard, glass bottles and food. Recyclable materials will be recycled through a program implemented by building management. The new portions of the Project will generate approximately 336 tons per year of solid waste.

With the exception of household hazardous wastes typical of commercial/retail developments (e.g., cleaning fluids and paint), the Project will not involve the generation, use, transportation, storage, release, or disposal of potentially hazardous materials. Typical waste generated by the uses will be handled in compliance with all local, state and federal regulations.

The buildings will include single-stream recycling collection for standard recycling items such as beverage containers, bottles, jars, plastic, paper and cardboard.

3.10 Noise Impacts

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

Table 3-8 below presents the "Zoning District Noise Standards" contained in Regulation 2.5 of the APCC "Regulations for the Control of Noise in the City of Boston," adopted December 17, 1976. These maximum allowable sound pressure levels apply at the property line of the receiving property. Zoning District Noise Standards are presented below in Table 3-8.

Table 3-8 City of Boston Zoning District Noise Standards, Maximum Allowable Sound Pressure Levels

Octave-band Center Frequency (Hz)	Residential Zoning District Daytime (dB)	Residential Zoning District All Other Times (dB)	Residential-Industrial Zoning District Daytime (dB)	Residential-Industrial Zoning District All Other Times (dB)	Business Zoning District Anytime (dB)	Industrial Zoning District Anytime (dB)
32	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
A-Weighted (dBA)	**60**	**50**	**65**	**55**	**65**	**70**

Notes: Noise standards are extracted from Regulation 2.5, City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.

All standards apply at the property line of the receiving property.

dB and dBA based on a reference sound pressure of 20 micropascals.

'Daytime' refers to the period between 7:00 a.m. and 6:00 p.m. daily, excluding Sunday.

Additionally, the MassDEP has the authority to regulate noise under 310 CMR 7.10, which is part of the Commonwealth's air pollution control regulations. According to MassDEP, "unnecessary" noise is considered an air contaminant and thus prohibited by 310 CMR 7.10. The MassDEP administers this regulation through Noise Policy DAQC 90-001 which limits a source to a 10-dBA increase above the L_{90} ambient sound level measured at the Project property line and at the nearest residences. The MassDEP policy further prohibits "pure tone" conditions where the sound pressure level in one octave-band is 3 dB or more than the sound levels in each of two adjacent bands.

While the details of the mechanical equipment associated with the Project have not yet been precisely determined, steady operational noise from stationary sources will primarily involve heating, cooling, and ventilation equipment.

During the final design phase of the Project, mechanical equipment and noise-related mitigation will be specified to meet the applicable City of Boston and MassDEP noise limits.

Reasonable efforts will be made, if necessary, to minimize noise impacts from the Project using routinely employed methods of noise control, including:

- Selection of "low-noise" equipment models;
- Fitting of inlet and discharge vents with duct silencers;
- Installation of screening barriers to provide shielding where appropriate;
- Use of sound-attenuating enclosures, acoustical blankets, or both on continuously operating equipment with outdoor exposure; and
- Siting of noisy equipment at locations that protect sensitive receptors by shielding or with increased distance.

The Project, with appropriate noise control, is not expected to result in any adverse noise impacts at nearby sensitive receptors. Short-term, intermittent increases in noise levels will occur during Project construction. However, every reasonable effort will be made to minimize the noise impacts and ensure the Project complies with the requirements of the City of Boston noise ordinance.

3.11 Construction Impacts

3.11.1 Introduction

A Construction Management Plan (CMP) in compliance with the City's Construction Management Program will be submitted to the BTD once final plans are developed and the construction schedule is fixed. The construction contractor will be required to comply with the details and conditions of the approved CMP.

Proper pre-planning with the City and neighborhood will be essential to the successful construction of the Project. Construction methodologies, which ensure public safety and protect nearby residences and 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 responsible for responding to the questions/comments/complaints of the residents and businesses in the neighborhood.

The Proponent intends to follow the guidelines of the City of Boston and the MassDEP, which direct the evaluation and mitigation of construction impacts.

3.11.2 Construction Methodology/Public Safety

Construction methodologies that ensure public safety and protect the immediately surrounding area will be employed. Techniques such as barricades and signage will be used. Construction management and scheduling will minimize impacts on the surrounding environment and will include plans for construction worker commuting and parking, routing plans for trucking and deliveries, and the control of noise and dust.

As the design of the Project progresses, the Proponent will meet with BTD 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 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 to BTD for approval prior to the commencement of construction work.

3.11.3 Construction Schedule

Construction is anticipated to start in the first quarter of 2019, with completion by the first quarter of 2021.

Typical construction hours will be from 7:00 a.m. to 6:00 p.m., Monday through Friday, with most shifts ordinarily ending at 3:30 p.m. 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; certain components must be completed in a single pour, and placement of concrete cannot be interrupted.

3.11.4 Construction Staging/Access

Access to the site and construction staging areas will be provided in the CMP.

Although specific construction and staging details have not been finalized, the Proponent and its construction manager 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.

3.11.5 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.

A CMP will be submitted to BTD for review and approval prior to issuance of a Building Permit. 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 Charles River" plaques will be installed at storm drains that are replaced or installed as part of the Project.

3.11.6 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 500 construction jobs will be created over the length of construction. The Proponent will make reasonable good-faith efforts to have at least 51% of the total employee work hours be for Boston residents, at least 40% of total employee work hours be for minorities and at least 12% of the total employee work hours be for women. The Proponent will enter into jobs agreements with the City of Boston.

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 contractors will work aggressively to ensure that construction workers are well informed of the public transportation options serving the area. Space on-site will be made available for workers' supplies and tools so they do not have to be brought to the site each day.

3.11.7 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 during morning and afternoon peak hours in a manner that 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 development 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 development. 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.

3.11.8 Construction Air Quality

Short-term air quality impacts from fugitive dust may be expected during demolition, excavation and the early phases of construction. Plans for controlling fugitive dust during demolition, excavation and construction include mechanical street sweeping, wetting portions of the site during periods of high wind, 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, pursuant to this Article 80 approval. These measures are expected to include:

- Using wetting agents on areas of exposed soil on a scheduled basis;
- Using covered trucks;
- Minimizing spoils on the construction site;
- Monitoring 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.

3.11.9 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.

3.11.10 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.

3.11.11 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 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.

3.11.12 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. 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.

3.12 Rodent Control

A rodent extermination certificate will be filed with the building permit application for the Project. Rodent inspection monitoring and treatment will be carried out before, during, and at the completion of all construction work for each phase of the Project, in compliance with the City's requirements.

3.13 Wildlife Habitat

The Project Site is in an established urban neighborhood. There are no wildlife habitats in or adjacent to the Project Site.

Chapter 4

Sustainability and Climate Change Adaptation

4.0 SUSTAINABILITY AND CLIMATE CHANGE ADAPTATION

4.1 Green Building

4.1.1 Introduction

Sustainability is one of the Proponent and Design team's priorities for the Project. The goal for the development is to enhance the neighborhood, minimize negative environmental impact, and maximize occupant health and comfort. These goals will continue to be a major guide for decisions regarding design and operations for the Project.

Each Project Component will separately demonstrate Leadership in Energy and Environmental Design (LEED) compliance, as required by Article 37 of the Code. The Commonwealth Building will be evaluated using the LEED v4 New Construction rating system, while the Beacon Building will utilize the LEED v4 Core and Shell rating system. Both Project Components have a goal of meeting the Silver level, as shown in the LEED checklists included at the end of this section, and both are anticipated to be LEED certified.

4.1.2 Commonwealth Building

The Project is expected to achieve 54 LEED v4 points for the Commonwealth Building, and has identified 28 additional potential targets for the Commonwealth Building, and based on the current target credits, a LEED Silver rating is anticipated. The Project incorporates a holistic approach to sustainability, while mitigating the environmental impacts of energy, water and material use. The LEED Silver certification is contingent upon the final design, outcome of calculations, material procurement, and the related refinements to the Commonwealth Building. A summary on the preliminary approach to the credit categories are outlined below and shown in the LEED checklist provided at the end of this section.

Integrative Process

The Project team participated in team meetings and collaborated with each other to evaluate the potential of implementing high performance building design and water use reduction strategies early in the design process. Preliminary water use reduction calculations and a simple box energy model were developed before the completion of schematic design phase (see Appendix C for the energy model analysis).

Location and Transportation

The Project team has identified 14 likely achievable points within the Location and Transportation credit category, along with two points that may be feasible with additional investigation. The Project site has been previously developed, and is in the densely populated Kenmore Square neighborhood that offers a range of amenities and convenient public transportation options. The diversity in public transportation options encourages building occupants and visitors to utilize these modes, as opposed to taking single occupant

vehicles. A reduced parking footprint will incorporate preferred parking and electric vehicle charging stations which will provide the necessary infrastructure to encourage the use of green vehicles. The Commonwealth Building component will provide ample bicycle storage and shower facilities to support bicycle commuters and guests.

Sustainable Sites

The Project team has identified four likely achievable points within the Sustainable Sites category. The Commonwealth Building will be designed to minimize rainwater runoff and reduce the impact of highly absorptive surfaces that contribute to the urban heat island effect. The Project team has also identified two points that may be feasible and require further investigation to determine achievability. The Proponent and the Project team will track and continue to evaluate the potential to pursue these possible credits related to the Project's continued rainwater management strategy and ability to reduce external light pollution on site.

Water Efficiency

The Project team has identified six likely achievable points, along with an additional five points that may be feasible and require additional investigation. The Commonwealth Building will be designed to incorporate high-efficiency water fixtures that reduce indoor water consumption, and will incorporate advanced water meters to help the Project consistently track water usage data and reduce cooling tower water use. The Proponent and the Project team will track and continue to evaluate the potential to pursue the possible credits to achieve additional water savings through the reduction of irrigation and indoor water use demands.

Energy and Atmosphere

The Project team has identified 13 likely achievable points within the Energy and Atmosphere category, and another five points that may be feasible with some further investigation.

The likely attainable credits in the Energy and Atmosphere category will be sought through reductions in overall energy consumption by cost, enhanced commissioning strategies, and advanced metering of energy subsystems to help the Proponent understand and reduce consumption. To better understand the Project's energy savings, the Alternative Energy Performance Metric was utilized. This metric allows the comparison of source energy, greenhouse gas (GHG) emissions, and time-dependent valuation (TDV) energy in addition to energy cost. The Commonwealth Building component will achieve Enhanced Refrigerant Management credit through equipment selections that utilize low impact refrigerants. Additionally, the Commonwealth Building component will purchase power from renewable sources for five years to achieve the Green Power credit.

The potential maybe credits will be monitored by the Project team to determine if additional improvements to energy performance and renewable energy production strategies can be utilized.

Materials and Resources

The Project team has identified five likely achievable points within the Materials and Resources category, and an additional five points as potential target credits. The Commonwealth Building will reduce the overall footprint of the materials and resources by utilizing sustainable waste management strategies and maximizing the declarations of environmental products, raw material sourcing and chemical ingredient of the permanently installed products. The Project team will continue to investigate the possibilities for maximizing points under Building Product Disclosure Optimization credits.

Indoor Environmental Quality

The Project team has identified four points in this category that are likely to be attainable for the Commonwealth Building, and eight points that may be feasible but need further study. Strategies such as enhanced indoor air quality control strategies, construction indoor air quality management plan and low-emitting materials will be incorporated into the design to provide a healthy indoor environment for all occupants and visitors. The Project team will continue to investigate the possibilities of pursuing additional Indoor Environmental Quality points.

Innovation

The Project team anticipates implementing Innovation and Design initiatives involving exemplary performance of some credits, as well as innovative ways to address topics not touched on in the existing credits.

The Project team aims to achieve Exemplary Performance for Access to Quality Transit by doubling the highest transit service point threshold, and aims to earn an additional Exemplary Performance point for the Reduced Parking Capacity credit by achieving at least a 60% parking reduction from the base ratios.

The Innovation in Design Credits include: developing an Education Outreach program that provides information on sustainable design and uses this project as an example; designing a Walkable Project site to encourage visitors to walk, increasing health and environmental benefits; purchasing lamps that contain minimal to zero Mercury to reduce toxic materials on site; and one ID credit for having a LEED Accredited Professional on the Project team.

Regional Priority

The four points available in the Regional Priority Category are contingent on the Project's meeting certain thresholds for credits in previous categories as determined by the USGBC.

The Project is tracking the Regional Priority credits for Rainwater Management, and the High Priority site credit is listed as a possibility, as it is dependent upon the Project's ability to achieve the credit requirements and minimum point thresholds in that category. The points in the Regional Priority category are automatically awarded pending the award of original credits to which they are linked.

4.1.3 Beacon Building

The Project team is tracking 59 LEED v4 points and has identified 24 additional potential targets for the Beacon Building. Based on the current target credits, a LEED Silver rating is anticipated. The Project incorporates a holistic approach to sustainability, while mitigating the environmental impacts of energy, water and material use. The LEED Silver certification is contingent on the final design, outcome of calculations, material procurement, and related refinements to the Beacon Building. A summary on the preliminary approach to the credit categories are outlined below and shown in the LEED checklist provided at the end of this section.

Integrative Process

The Project team participated in team meetings and collaborated with each other to evaluate the potential of implementing high performance building design and water use reduction strategies early in the design process. Preliminary water use reduction calculations and a simple box energy model were developed before the completion of the schematic design phase (see Appendix C for the energy model analysis).

Location and Transportation

The Project team has identified 17 likely achievable points within the Location and Transportation credit category along with three points that may be feasible with additional investigation. The Project site has been previously developed, and is in the densely populated Kenmore Square neighborhood that offers a range of amenities and convenient public transportation options. The diversity in public transportation options encourages building occupants and visitors to utilize these modes, as opposed to taking single occupant vehicles. Facilitating public transportation access both reduces the number of vehicles traveling to and from the Beacon Building, and thus the greenhouse gas emissions linked to this building, and can also reduce commuting costs and help attract and retain employees. A reduced parking footprint will incorporate preferred parking and electric vehicle charging stations will provide the necessary infrastructure to encourage the use of green vehicles. The Beacon Building component will provide ample bicycle storage and shower facilities to support bicycle commuters and guests.

Sustainable Sites

The Project team has identified six likely achievable points within the Sustainable Sites category. The Project is designed to minimize rainwater runoff and reduce the impact of highly absorptive surfaces that contribute to the urban heat island effect, and will implement sustainable design and construction features via Tenant Design and Construction Guidelines. The Project team has also identified two points that may be feasible but which require further investigation to determine achievability. The team will track and continue to evaluate the potential to pursue these possible credits related to the Project's continued rainwater management strategy and ability to reduce external light pollution on site.

Water Efficiency

The Project team has identified six likely achievable points, along with an additional five points that may be feasible and require additional investigation. The Beacon Building will be designed to incorporate high-efficiency water fixtures to reduce indoor water consumption; incorporate advanced water meters to help the Project consistently track water usage data and reduce cooling tower water use. Outdoor Water Use Reduction will be maximized through the use of high efficiency irrigation systems and a native landscaping scheme. The Proponent and the Project team will track and continue to evaluate the potential to pursue the possible credits to achieve additional water savings through the reduction of irrigation and indoor water use demands.

Energy and Atmosphere

The Project team has identified 13 likely achievable points in the Energy and Atmosphere category, and another five points that may be feasible pending further study and evaluation.

The 13 likely achievable points will be sought through reductions in overall energy consumption by cost, enhanced commissioning strategies, and advanced metering of energy subsystems to help the Proponent understand and reduce consumption. To better understand the Project's energy savings, the Alternative Energy Performance Metric was utilized. This metric allows the comparison of source energy, GHG emissions, and TDV energy in addition to energy cost.

The possible additional credits will be monitored by the Project team to determine if additional improvements to energy performance, renewable energy production and green power strategies can be utilized.

Materials and Resources

Out of a possible 14 points for the Materials and Resources category, the Project team has identified five likely achievable points. It is anticipated that 25% of the Project will consist of reused or salvaged materials from the demolished interior of the building to reduce waste associated with the Beacon Building.

The Beacon Building will also reduce the overall footprint of the materials and resources by utilizing sustainable waste management strategies and maximizing the declarations of environmental products, raw material sourcing and chemical ingredient of the permanently installed products. Additionally, the Project team has identified six points that may be feasible and will be studied further. The Project team will continue to investigate possibilities for maximizing points under Building Product Disclosure Optimization credits.

Indoor Environmental Quality

The Project team has identified four points in this category that will likely be achievable, and four points that may be feasible and will be studied further. Strategies such as enhanced indoor air quality control, a construction indoor air quality management plan and low-emitting materials are incorporated into the design to provide a healthy indoor environment for all occupants and visitors. The Project team will continue to investigate the possibilities of pursuing daylight and incorporation of low emitting material to further enhance the indoor environment of the space.

Innovation

The Project team anticipates implementing Innovation and Design initiatives involving exemplary performance of some credits, as well as innovative ways to address topics not touched on in the existing credits.

The Project aims to achieve Exemplary Performance for Access to Quality Transit by doubling the highest transit service point threshold. The Beacon Building aims to earn an additional Exemplary Performance point for the Reduced Parking Capacity credit by achieving at least a 60% parking reduction from the base ratios.

The Innovation in Design Credits are anticipated to include: developing an Education Outreach program that provides information on sustainable design and uses this project as an example; designing a Walkable Project site to encourage visitors to walk, increasing health and environmental benefits; purchasing lamps that contain minimal to zero mercury in order to reduce toxic materials on site; and one ID credit for having a LEED Accredited Professional on the Project team.

Regional Priority

The four points available in the Regional Priority Category are contingent on the Project meeting certain thresholds for credits in previous categories as determined by the USGBC. The Project is tracking the Regional Priority credits for Rainwater Management, and the High Priority site credit is listed as a possibility, as it is dependent on the Project's ability to achieve the credit requirements and minimum point thresholds in that category. The points in the Regional Priority category are automatically awarded pending the award of original credits to which they are linked.

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name: Kenmore Sq Redevelopment - Commonwealth Building
Date: 5/3/2018

Y	?	N			
1			Credit	Integrative Process	1

14	2	0	**Location and Transportation**		16
		N	Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
	3		Credit	High Priority Site	2
6			Credit	Surrounding Density and Diverse Uses	5
5			Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

4	2	4	**Sustainable Sites**		10
Y			Prereq	Construction Activity Pollution Prevention	Required
		1	Credit	Site Assessment	1
		2	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
2	2		Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
	1		Credit	Light Pollution Reduction	1

6	5	0	**Water Efficiency**		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
	2		Credit	Outdoor Water Use Reduction	2
3	3		Credit	Indoor Water Use Reduction	6
2			Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

13	5	15	**Energy and Atmosphere**		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
3	3		Credit	Enhanced Commissioning	6
6	2	10	Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
2			Credit	Green Power and Carbon Offsets	2

5	5	3	**Materials and Resources**		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
	2	3	Credit	Building Life-Cycle Impact Reduction	5
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1	1		Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

4	8	2	**Indoor Environmental Quality**		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
2			Credit	Enhanced Indoor Air Quality Strategies	2
1	1	1	Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
	1		Credit	Indoor Air Quality Assessment	2
	1		Credit	Thermal Comfort	1
	1		Credit	Interior Lighting	2
	3		Credit	Daylight	3
		1	Credit	Quality Views	1
	1		Credit	Acoustic Performance	1

6	0	0	**Innovation**		6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

1	1	2	**Regional Priority**		4
1			Credit	Regional Priority: Rainwater Management (2 point threshold)	1
	1		Credit	Regional Priority: High Priority Site (2 Point Threshold)	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1

54	28	26	**TOTALS**	Possible Points:	110

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

LEED v4 for BD+C: Core and Shell

Project Checklist

Project Name: Kenmore Sq Redevelopment - Beacon Building

Date: 5/3/2018

Y	?	N			
1			Credit	Integrative Process	1

17	3	0	**Location and Transportation**		20
		N	Credit	LEED for Neighborhood Development Location	20
2			Credit	Sensitive Land Protection	2
	3		Credit	High Priority Site	3
6			Credit	Surrounding Density and Diverse Uses	6
6			Credit	Access to Quality Transit	6
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

6	1	4	**Sustainable Sites**		11
Y			Prereq	Construction Activity Pollution Prevention	Required
		1	Credit	Site Assessment	1
		2	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
2	1		Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1
1			Credit	Tenant Design and Construction Guidelines	1

6	5	0	**Water Efficiency**		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
	2		Credit	Outdoor Water Use Reduction	2
3	3		Credit	Indoor Water Use Reduction	6
2			Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

13	5	15	**Energy and Atmosphere**		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
3	3		Credit	Enhanced Commissioning	6
6	2	10	Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
2			Credit	Green Power and Carbon Offsets	2

5	5	4	**Materials and Resources**		14
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
	2	4	Credit	Building Life-Cycle Impact Reduction	6
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1	1		Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

4	4	2	**Indoor Environmental Quality**		10
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
2			Credit	Enhanced Indoor Air Quality Strategies	2
1	1	1	Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
	3		Credit	Daylight	3
		1	Credit	Quality Views	1

6	0	0	**Innovation**		6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

1	1	2	**Regional Priority**		4
1			Credit	Regional Priority: Rainwater Management (2 point threshold)	1
	1		Credit	Regional Priority: High Priority Site (2 point threshold)	1
		1	Credit	Regional Priority: Specific Credit	1
		1	Credit	Regional Priority: Specific Credit	1

59	24	27	**TOTALS**	Possible Points:	110

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

4.2 Climate Change Resilience

4.2.1 Introduction

Climate change conditions considered by the Project team and reviewed below include higher maximum and mean temperatures, more frequent and longer extreme heat events, more frequent and longer droughts and more severe rainfall events. Copies of the completed Checklists for the Commonwealth Building and the Beacon Building are included in Appendix D. Preliminary energy model results are included in Appendix C.

4.2.2 Extreme Heat Events

According to "Climate Ready Boston," the City of Boston can expect that the number of days with temperatures greater than 90°F will increase. Between 1971 and 2000, Boston experienced an average of eleven days per year over 90 degrees and may experience between 25 and 90 days annually by 2070, depending on the extent of greenhouse gas emissions over the next several decades.[1] The Project design incorporates a number of measures to minimize the impact of high temperature events, including:

- Specifying materials and ground cover that minimize the heat island effect;
- Improvements to the building envelopes; and,
- Specifying high performance HVAC equipment and energy recovery ventilation systems.

The Proponent continues to evaluate a number of design features, including green roofs, which are intended to mitigate the effects of extreme heat events.

4.2.3 Rain Events

As a result of climate change, New England is expected to experience an increased frequency of intense storms that generate significant volumes of precipitation. Such precipitation events have the potential to overwhelm existing stormwater infrastructure capacity and may result in inland flooding with the potential to damage buildings. Improper conveyance of stormwater during precipitation events may also cause overflows of combined sewer systems that allow wastewater from buildings connected to the combined sewer to discharge to local waterways, or that surcharge the system and cause overflow at other locations.

To mitigate the effects of extreme precipitation events, the Project's stormwater management system will be designed to reduce the existing peak rates and volumes of

[1] Climate Ready Boston, December 7, 2016.

stormwater runoff from the Project Site, and promote groundwater recharge to the greatest extent practicable.

4.2.4 Drought Conditions

Under the high emissions scenario evaluated by Climate Ready Boston, the occurrence of droughts lasting one to three months could increase by as much as 75% over existing conditions by the end of the century. The Project will approach potential drought impacts by reducing the amount of water used both within the buildings and across the Project Site for irrigation. To minimize the Project's susceptibility to drought conditions the landscape design is anticipated to incorporate native and adaptive plant materials and high efficiency irrigation systems will be installed. The Project will include low-flow fixtures and water conserving appliances to the extent feasible to minimize the amount of water used by the building's occupants.

4.3 Renewable Energy

The Proponent will evaluate the potential for a roof-mounted solar photovoltaic (PV) system, and the availability of grants and renewables funding. The amount of space suitable for the Project is limited due to the mechanical needs of the building, the possible inclusion of a green roof on a portion of the Beacon Building, and the shadows created by the mechanical penthouses and the Citgo sign. Approximately 9,000 sf of rooftop area could potentially be used for solar PV panels, after taking into account the space available for solar PV panels, as well as space necessary around the panels, between panels, etc. Assuming 12 watts per square foot, this allows for an approximately 108 kW array. In the locations proposed, an installation of this solar array equals an annual generation of approximately 140 MW hours. The feasibility of installing a solar PV system will be further evaluated and determined at the time of construction.

Chapter 5

Urban Design

5.0 URBAN DESIGN

The design of the Project was influenced by the urban context in Kenmore Square. Each new building is designed to complement Kenmore Square's architectural character while upgrading and expanding the existing inefficient office and retail spaces to more open and modern spaces for working, dining and entertaining. The design of each building aims to meld the character of the surrounding neighborhood by maintaining the scale and horizontality of the urban context with distinct yet complementary building forms and materials. The Beacon Street scale is carried throughout the new construction underscored by the six to eight story streetwall. The ground level retail zone is pulled from one edge of the site to the other; maintaining a continuous band of retail storefronts and entrances that emphasizes the pedestrian experience. The upper floors reinforce the existing façade proportions and sight lines by maintaining a similar floor spandrel and window bay spacing rhythm demonstrated by its immediate neighbors.

Specifically, the Commonwealth Building responds to the sweeping nature of the primary thoroughfares through its double stacked setbacks. These setbacks break down the building mass, grant views of the Citgo sign, and allow for accessible terraces. Each double stacked massing pivots from the corner of Beacon Street and Commonwealth Avenue, carving away from street level to properly scale the pedestrian experience. The energy of the intersection is captured within these refined movements.

The Beacon Building is comprised of new construction attached to and integrated with the renovation of 660 Beacon Street. The floor levels will be aligned from 660 Beacon Street to the new construction, and therefore the building's mass will fit contiguously to its existing neighbor. The building's base, middle, and top will be proportioned appropriately in context. The base will be decorated by a two-story frame, its horizontal architrave carried from the existing facades. The building's middle, comprised of three floors, will be punctuated by large glazed openings, yet remain in scale to the façade articulation of 660 Beacon Street. Finally, the top will be emphasized by setting the glazed massing, housing the penthouse levels, back from the solidity of the grid. This depth will grant unprecedented views of the Citgo sign, both from the street and from the terrace above.

Design Considerations

The Project team created a number of objectives to direct the design of the Project, including:

- Pedestrian Experience: Crafting unique yet contextual street-level facades on Beacon Street, Commonwealth Avenue and Deerfield Street to create more opportunities for active retail and restaurant spaces for the surrounding neighborhood.

- Mixed-Use Program: combining retail and office occupancies, including related amenities, open space, and urban realm components to enliven and support the growth of Kenmore Square.

- Architectural Compatibility: visual relationship of the proposed building to nearby existing developments and the Citgo sign.

Chapter 6

Historic and Archaeological Resources

6.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

This section identifies the historic and archaeological resources within and in the vicinity of the Project Site, and discusses potential Project-related impacts.

6.1 Historic Resources in the Project Vicinity

6.1.1 Historic Resources on the Project Site

The Project Site is located within the Kenmore Square survey area (MHC # BOS.XC) which is included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory). The Kenmore Square Area lies at the intersection of Beacon Street, Commonwealth Avenue, and Brookline Avenue and is comprised of seven commercial resources constructed between the late 19th and mid-20th century on the north side of Kenmore Square, bounded by Beacon Street and Commonwealth Avenue on the south and Deerfield Street on the west. The site is adjacent to the Bay State Road/Back Bay West Architectural Conservation District which is comprised of three to five story brick rowhouses constructed during the late 19th and early 20th century.

541 Commonwealth Avenue

Constructed in 1894, the Westgate Apartment House (MHC # BOS.15495) is located at the intersection of Commonwealth Avenue and Deerfield Street. The six-story block features a two-story limestone base with buff brick walls above. Three continuous copper bowfront windows from the second to sixth floors are featured along the Deerfield Street elevation. A classically inspired two story recessed entry is located on the Commonwealth Avenue façade. A modern storefront alters the first floor of the rounded corner at the intersection of Commonwealth Avenue and Deerfield Street. The residential floors have been vacant for over 30 years with no capital improvements having been made, and in order to accommodate a successful commercial development, the upper level floors would need to be considerably changed.

535-539 Commonwealth Avenue

The New England School of Photography was constructed ca. 1958 (MHC # BOS.15494). The three-story building features two replacement storefronts flanking a recessed center entrance on the ground floor, and concrete panel sheathing and ribbon windows above. A polished black granite base is featured at the ground floor with a simple cast stone cornice at the top. Black and white striped bands of stone are features at each end on the façade. Many aspects of the building do not meet current building and health and safety codes. Upgrading the building to meet the code requirements presents extensive challenges and would ultimately result in an entire gut of the interior layout and systems.

533 Commonwealth Avenue

Built in 1916 as an Overland Co. Store (MHC # BOS.15493), the Commonwealth Avenue façade of this two-story brick commercial block features a concrete enframement around the storefronts and windows above. The top of the enframement features swags and urn motifs. The three ground floor storefronts and windows above have been altered. The current façade and limited footprint would compromise an alternative design approach.

660 Beacon Street

Constructed between 1910 – 1911 for the Peerless Motor Car Company Building (MHC # BOS.7300), the six-story building is now occupied by the Barnes and Noble at Boston University Bookstore. The building features a two-story rusticated stone base with three vertical segmentally arched bays above framed by limestone piers. Storefronts and upper windows are modern extruded aluminum replacements. Situated on the roof of 660 Beacon Street is the Citgo Sign (MHC # BOS.9270).

650-656 Beacon Street

Constructed between 1910 – 1911 as a garage for the Peerless Motor Car Company Building (MHC # BOS.7299), the six-story block is comprised of three attached commercial blocks which share a common façade. The façade features a two-story rusticated stone base with red brick pilasters and brick and limestone spandrels above. Storefronts and upper windows are modern extruded aluminum replacements. Internal level changes and two internal solid brick party walls present a significant challenge to providing universal accessibility into and throughout the building. To accommodate a successful development, a majority of the upper level floors would need to be considerably changed. Additionally, upgrading the building to meet the code requirements presents extensive challenges and would ultimately result in an entire gut of the interior layout and systems resulting in little of the existing fabric left to preserve.

6.1.2 Historic Resources in the Vicinity of the Project Site

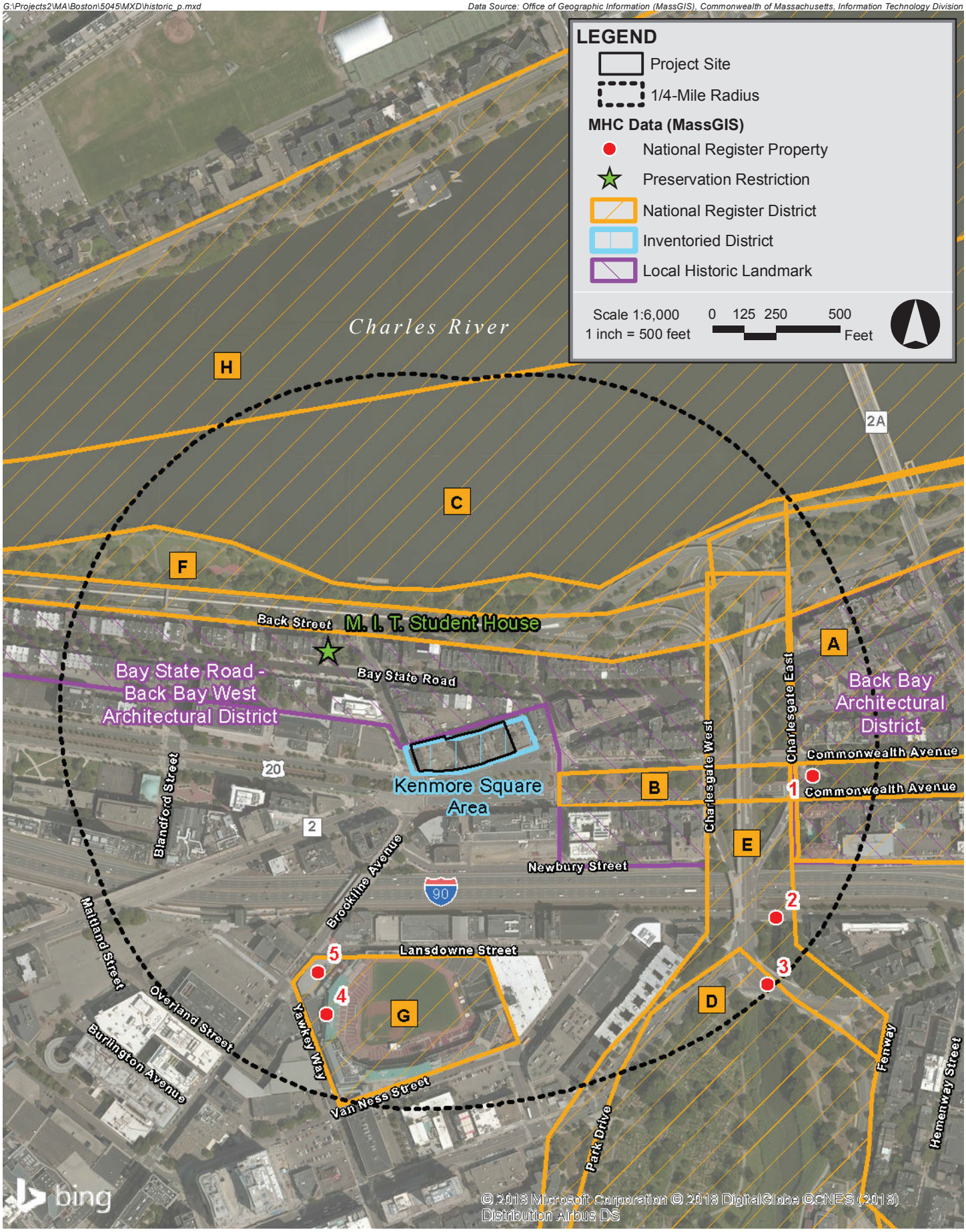
The Project Site is located within and in the vicinity of several historic resources listed in the State and National Registers of Historic Places, or included in the Inventory of Historic and Archaeological Assets of the Commonwealth. Table 6-1 identifies these resources within one-quarter mile of the Project Site and corresponds to resources depicted in Figure 6-1.

Table 6-1 Historic Resources in the Vicinity of the Project Site

No.	Historic Resource	Address	Designation*
A	Back Bay Historic District	Roughly bounded by Back St., Embankment Rd. and Arlington St., Boylston St. and Charlesgate E	NRDIS, LHD
B	Commonwealth Avenue Mall	Extends ten blocks from Arlington Street to Kenmore Square connecting the Public Garden to the Fens	NRDIS, LHD, LL
C	Charles River Basin	Follows the banks of the Charles River in Boston, Cambridge, Watertown, and Newton.	NRDIS
D	Olmstead Park	Roughly bound by Brookline Avenue, Park Drive, Boylston Street, and Fenway	NRDIS
E	Back Bay Fens	Roughly bound by Brookline Avenue, Park Drive, Boylston Street, and Fenway	NRDIS, LL
F	Charles River Esplanade	Roughly bounded by Boston University Bridge, Storrow Drive, Embankment Road, Monsignor O'Brien Highway and the Charles River.	NRDIS, LL
G	Fenway Park	Roughly bounded by Brookline Avenue, Yawkey Way, Van Ness Street and Lansdowne St.	NRIND
H	Charles River Basin Historic District	Charles River Basin, parkways, and landscape areas on both banks from Charles River Dam to the Eliot Bridge.	NRDIS
1	Leif Ericsson Statue	Commonwealth Ave.	NRDIS, LHD, LL
2	Ipswich Street Bridge over Muddy River	Ipswich Street	NRDIS
3	Boylston Street Bridge	Boylston Street	NRIND, LL
4	Fenway Park Rooftop Structures	416-426 Boylston St.	NRDIS, LL
5	John R. Smith Building	64-78 Brookline Ave.	NRIND
	M.I.T. Student House	111 Bay State Road	LHD, PR

*Designation Legend

NRIND	Individually listed on the National Register of Historic Places
NRDIS	National Register of Historic Places Historic District
NHL	National Historic Landmark
LHD	Local Historic District
LL	Local Landmark
PR	Preservation Restriction



Kenmore Square Redevelopment Boston, Massachusetts

Epsilon Associates Inc.

Figure 6-1
Historic Resources

6.2 Archaeological Resources Within the Project Site

A review of Massachusetts Historical Commission's online archaeological base maps was conducted on January 24, 2018. It found no known archeological sites within the Project Site or the immediate vicinity.

6.3 Potential Impacts to Historic Resources

6.3.1 Demolition of Existing Buildings

The proposed Project will require the demolition of six existing buildings within the Project Site; 533 Commonwealth Avenue, 535-539 Commonwealth Avenue, 541 Commonwealth Avenue, 656 Beacon Street, 652-654 Beacon Street and 650 Beacon Street. None of the buildings are listed or have been found to be eligible for listing on the National Register of Historic Places. Additionally, all of the buildings have had some level of alteration including the replacement of historic storefronts and windows. The Boston Landmarks Commission (BLC) will be afforded the opportunity to review the proposed demolition through the Article 85 Demolition Delay review process.

6.3.2 Urban Design

The Project Site is located at the center of Kenmore Square, and includes seven buildings: 650 Beacon Street, 652-654 Beacon Street, 656 Beacon Street, 660 Beacon Street (which includes the Citgo sign), 533 Commonwealth Avenue, 535-539 Commonwealth Avenue, and 541 Commonwealth Avenue. The buildings include retail and commercial spaces, with vacant residential space on the upper floors of 541 Commonwealth Avenue. Loading and service areas are located behind the buildings adjacent to a surface parking lot owned by someone other than the Proponent.

The Project Site is located in the quintessential urban environment, surrounded by a mix of uses and activity with convenient transit, bicycle, pedestrian and vehicular access to the rest of Boston and surrounding region. The site benefits from its proximity to Boston University, which is located to the north and west, which results in a significant number of students, faculty, staff and visitors frequenting nearby restaurants and shops. Kenmore Station is the main station for access to Fenway Park and Lansdowne Street to the south of the Project Site, both of which create significant activity throughout the year. To the east is the Back Bay, and further to the south is the Longwood Medical and Academic Area, both of which are major economic centers.

The Project has been designed to complement the surrounding buildings by maintaining the scale and horizontality of the urban context at Kenmore Square while also bringing new energy and dramatically improving the character of the pedestrian environment. The Commonwealth Building responds to the sweeping nature of the primary thoroughfares through its double-stacked setbacks. These setbacks break down the building mass, grant views of the Citgo sign, and allow for accessible terraces. Each double stacked massing

pivots from the corner of Beacon Street and Commonwealth Avenue. The energy of the intersection is captured within these refined movements. The Beacon Street scale is carried throughout the new construction underscored by the seven to eight story streetwall. The ground level retail zone is pulled from one edge of the site to the other; its floor to floor height commiserate with the existing structures neighboring it. The floor levels of the new construction portion of the Beacon Building will be aligned with 660 Beacon Street, therefore the building's mass will fit contiguously to its existing neighbor. The building's base, middle, and top will be proportioned appropriately in context. The base will be decorated by a two-story frame, its horizontal architrave carried from the existing facades. The building's middle, comprised of three floors, will be punctuated by large glazed openings, yet will remain in scale to the façade articulation of 660 Beacon Street. Finally, the top will be emphasized by setting the glazed massing, housing the penthouse levels, back from the solidity of the grid. This depth will grant unprecedented views of the Citgo sign, both from the street and from the terrace above.

6.3.3 Visual Impacts to Historic Resources

The Project is within the Fenway-Kenmore neighborhood of Boston, home to multiple properties listed on the State and National Registers of Historic Places. Several listed properties are located in the immediate vicinity of the Project Site including, but not limited to the Commonwealth Avenue Mall, The Olmstead Park System and Fenway Park. The Project has been designed to minimize visual impacts on historic resources.

6.3.4 Shadow Impacts to Historic Resources

A shadow impact analysis was conducted to investigate shadow impacts from the Project during three time periods (9:00 a.m., 12:00 noon, and 3:00 p.m.) during the vernal equinox (March 21), summer solstice (June 21), autumnal equinox (September 21), and winter solstice (December 21), and at 6:00 p.m. during the summer solstice and autumnal equinox. The shadow analysis presents the existing shadow and new shadow that would be created by the Project, illustrating the incremental impact of the Project. Shadow impacts to historic resources will be mitigated by the presence of other multi-story buildings already casting shadows in the area. As illustrated in the shadow study diagrams (Figures 3-5 to 3-18), during isolated time periods the Project will cast minimal net new shadow on properties and areas within the Bay State Road/Back Bay West Architectural Conservation District.

New shadow on historic resources within the Bay State Road/Back Bay West Architectural Conservation District is limited to new shadow at 6:00 p.m. on March 21, 6:00 p.m. on September 21, and 9:00 a.m., 12:00 p.m., and 3:00 p.m. on December 21; however, new shadow will be minimized by the existing shadow cast from other multi-story buildings in the area. The properties on the south side of Bay State Road will only have a moving narrow band of new shadow cast upon their secondary elevations and the property. 30 Bay State Road will only have a moving narrow band of new shadow cast upon it only at

isolated times. Net new shadow created by the Project will have no significant impacts on historic resources.

6.3.5 Wind Impacts to Historic Resources

The proposed redevelopment consists of limited changes in building massing on the Project Site. Several positive design features are included in the current design for wind control, including canopies and recessed entrances to the Commonwealth Building and Beacon Building, and the stepped south façade of the Commonwealth Building. Suitable wind comfort conditions are predicted for all public sidewalks, buildings entrances, the driveways, the above-ground terraces and surrounding pedestrian areas.

Wind speeds in the seating area around the southeast corner of the Commonwealth Building may be higher than desired for sitting, and the Project team will evaluate potential mitigation measures to lessen wind conditions, if necessary.

6.4 Consistency with Other Historic Reviews

6.4.1 Boston Landmarks Commission Article 80 Review

The submission of this PNF initiates review of the Project by the BLC under the City's Article 80 Review process.

6.4.2 Boston Landmarks Commission Article 85 Review

The proposed demolition of the existing buildings on the Project Site, including 533 Commonwealth Avenue, 535-539 Commonwealth Avenue, 541 Commonwealth Avenue, 656 Beacon Street, 652-654 Beacon Street and 650 Beacon Street will be subject to review by the BLC under Article 85 of the Boston Zoning Code. An Article 85 Application for each property will be submitted to the BLC.

6.4.3 Massachusetts Historical Commission

The MHC has review authority over projects requiring state funding, licensing, permitting and/or approvals that may have direct or indirect impacts to properties listed in the State Register of Historic Places. If a state permit is required for the Project, the MHC review process will be initiated through the filing of an MHC Project Notification Form with MHC or, if a Massachusetts Environmental Policy Act (MEPA) review is required, an Environmental Notification Form (ENF) under MEPA.

Chapter 7

Infrastructure

7.0 INFRASTRUCTURE

7.1 Introduction

This chapter describes the infrastructure systems that will support the Project. The following utilities are evaluated: wastewater, water, stormwater management, natural gas, electricity, and telecommunications. The Project is located in an urban context with a comprehensive utility service network available at the Project Site boundaries.

The Project will connect to proposed utility systems within Deerfield Street, Beacon Street, and Raleigh Street. These proposed systems ultimately connect to existing city and utility company systems in the adjacent public streets. Based on initial investigations and consultations with the appropriate agencies and utility companies, it is anticipated that the existing infrastructure systems will support the incremental increase in demand associated with the development and operation of the Project. As design progresses, all required engineering analyses will be conducted, and the final design will adhere to all applicable protocols and design standards ensuring that the Project is properly supported by available infrastructure. Detailed design of the Project's utility systems will proceed in conjunction with the design of the buildings and interior mechanical systems.

The infrastructure systems discussed herein include those owned or managed by the Boston Water and Sewer Commission (BWSC), private utility companies, and on-site infrastructure systems. There will be close coordination among these entities and with the Project design team during the design and construction process for the Project.

7.2 Regulatory Context

All connections will be designed and constructed in accordance with applicable city, state, and federal standards. The final design process for the Project will include required engineering analyses following applicable protocols and design standards, ensuring that the Project is properly supported by, and in turn properly uses the utility infrastructure of the City and private utilities. Detailed design of the Project-related utility systems will proceed in conjunction with the final design of the buildings and their interior mechanical systems.

Below is a list of anticipated reviews and approvals related to the infrastructure systems.

- All improvements and connections to BWSC infrastructure will be reviewed by BWSC as part of the Site Plan Review process. This process includes a comprehensive design review of the proposed service connections, assessment of system demands and capacity and establishment of service accounts.

- The Boston Fire Department (BFD) will review the Project with respect to fire protection measures such as access, hydrants, siamese connections, and standpipes.

- Design of the Project Site access, hydrant locations, and energy systems (gas and electric) will be coordinated with the respective system owners.

- Where new utility connections are needed and existing connections are to be capped, the excavation will be authorized by the Boston Public Works Department through the street opening permit process, as required.

Additional information on the regulatory framework for each utility system is included in subsequent sections of this chapter.

7.3 Stormwater Management

Since most of the Project Site is already impervious, the Project will not result in significant changes in the pattern of stormwater runoff. Stormwater management controls will be established in compliance with BWSC standards. The Project is expected to improve stormwater runoff quality and reduce peak flows through the use of treatment and infiltration facilities. In addition, the Project will comply with the Groundwater Conservation Overlay District requirements and infiltrate the equivalent volume of one inch of rainfall across impervious areas of the Project Site.

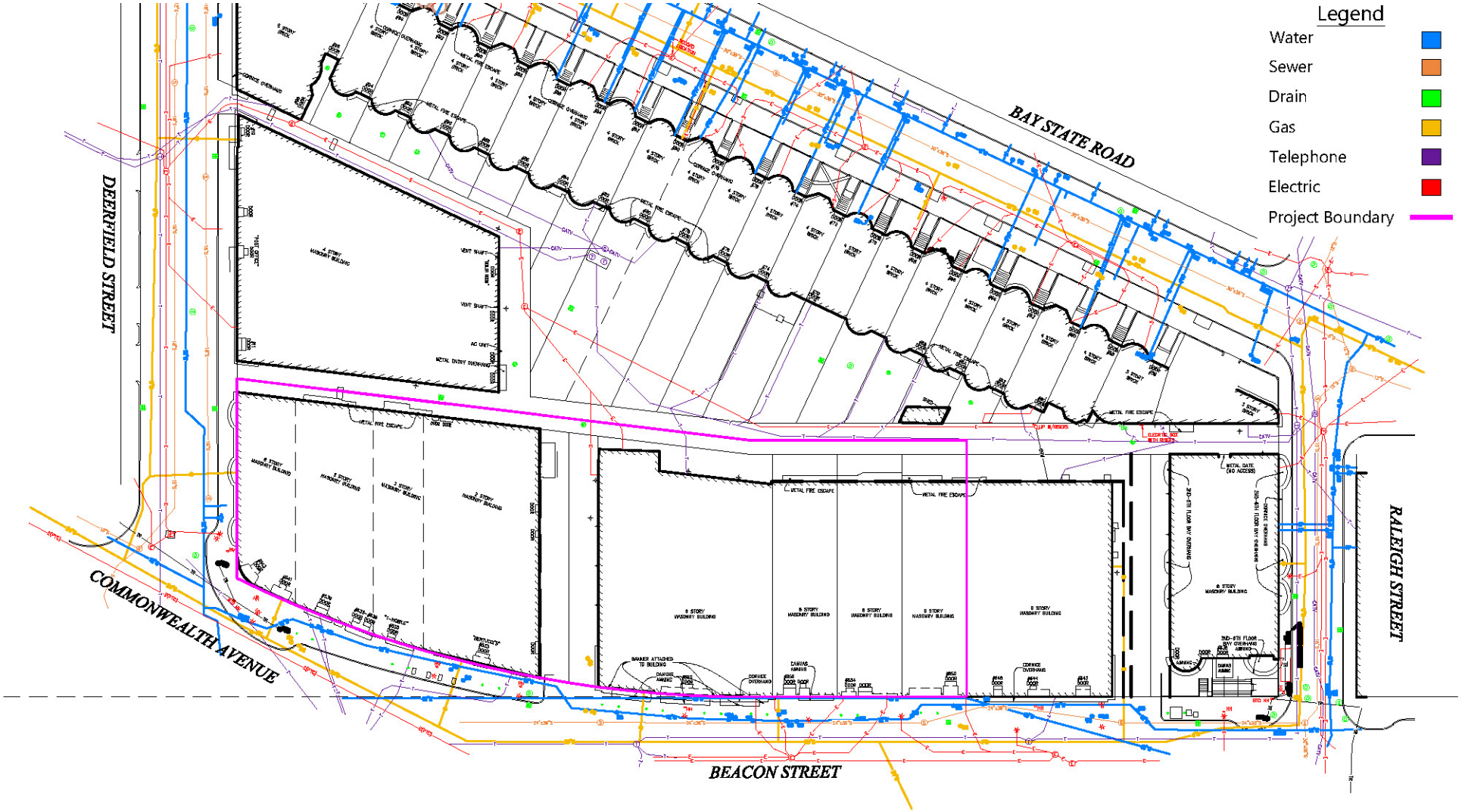
7.3.1 Existing Drainage Conditions

Figure 7-1 shows the existing drainage facilities serving the Project Site. Record information shows on-site drainage generally flows north towards the Charles River. Beacon Street, Commonwealth Avenue and Deerfield Street contain BWSC-owned drainage infrastructure adjacent to the Project Site. Site run-off is collected through a series of catch basins throughout the street and is directed towards the Charles River via the existing 9-foot by 11-foot Muddy River Conduit in Deerfield Street.

7.3.2 Proposed Drainage Approach

The Project will incorporate stormwater management and treatment systems that will improve water quality, reduce runoff volume and control peak rates of runoff in comparison to existing conditions. The Project will provide infiltration that retains site runoff while providing treatment and peak flow mitigation, in accordance with stormwater standards and BWSC. Additionally, to better ensure improved water quality from the Project Site, a "Don't Dump, Drains to Charles River" casting will be installed at all new catch basins, area drains, and trench drains.

Stormwater runoff calculations will be done for existing and proposed conditions during the BWSC permitting process for the 2-, 10-, 25- and 100-year storm events. During construction, measures will be implemented to minimize water quality impacts and avoid impacts to abutters.



Kenmore Square Redevelopment **Boston, Massachusetts**

Figure 7-1
Existing Utilities

7.4 Sanitary Sewage

7.4.1 Existing Sewer System

BWSC owns and maintains the sanitary sewer lines near the Project Site (Figure 7-1). These include the two 18-inch sewers which run in Deerfield Street and a 24-inch by 36-inch sewer in Beacon Street. The existing site currently generates approximately 15,770 gallons per day of wastewater based on MassDEP 310 CMR 15.203 flow factors for the existing commercial/retail uses of the Project Site, but not including the vacant residential space.

7.4.2 Proposed Sewage Flow and Connection

Generation rates from the Massachusetts State Environmental Code (Title 5) were used to estimate the Project's sewage generation rates. Table 7-1 below presents the estimated sanitary sewage flow for the Project.

Table 7-1 Estimated Sanitary Sewage Flow

Use	Sewage Generation Rate[1]	Proposed Size/Quantity	Estimated Sewage Generation (GPD)
Retail	50 GPD/1000 SF	28,765 SF	1,438
Office	75 GPD/1000 SF	253,735 SF	19,030
	Total Proposed		20,468
	Total Existing		15,770
	Net New Total		4,698

GPD = Gallons per day
SF = Square Feet
1 Based on MassDEP 310 CMR 15.203 flow calculation factors.

The Project will generate an estimated 20,468 gallons per day of sewage (4,698 net new gallons per day). The Project proposes to connect to the 18-inch sewer within Deerfield Street. The size and number of services will be determined as the design develops. All connections will be coordinated with BWSC.

7.5 Domestic Water and Fire Protection

7.5.1 Existing Water Supply System

BWSC owns and maintains the water mains near the Project Site (Figure 7-1). BWSC record drawings show that the streets surrounding the Project Site are serviced by southern low service mains. The existing buildings on-site are separately serviced from Deerfield Street and Beacon Street. The existing mains are 12-inches in Deerfield Street and Beacon Street, with a 48-inch main in Commonwealth Avenue that continues into Beacon Street. The installation dates of these pipes vary, from ductile iron pipe installed in 1997 to cast iron pipe installed in 1895. The existing water infrastructure provides a high level of service and

diversity to Kenmore Square. Additionally, currently three public fire hydrants are near the Project Site.

7.5.2 Proposed Water Demand and Connection

Domestic water demand is based on estimated sewage generation with an added factor of 10 percent for consumption, system losses, and other use. Based upon sewage generation rates outlined in the MassDEP Sewer Connection and Extension Regulations, 310 CMR 15.203.f, the Project will require approximately 22,515 gallons of water per day (5,168 net new gallons per day). However, appropriate low-flow and low-consumption plumbing fixtures will be utilized to achieve a reduction in water usage at a minimum of 20 percent over the baseline to comply with Article 37 of the Boston Zoning Code.

The Project will connect to the 12-inch water main in Deerfield Street with redundant fire protection and domestic services. New water connections will be designed in accordance with BWSC design standards and requirements. Water services to new buildings will be metered in accordance with BWSC's Site Plan Requirements and Site Review Process. The review includes, but is not limited to, sizing of domestic water and fire protection services, calculation of meter sizing, sizing and location of booster pumps (if required, by MEP Engineer), backflow prevention design, and location of hydrants and siamese connections to conform to BWSC and BFD requirements. The Proponent will provide for the meter connection to the BWSC's automatic meter reading system. Fire protection connections on the Project Site will also need approval of the BFD.

7.6 Other Utilities

7.6.1 Natural Gas Service

National Grid owns and operates the natural gas mains and services near the Project Site. The site survey indicates a 24-inch gas main in Beacon Street and a 6-inch gas main in Deerfield Street.

The Proponent will work with National Grid to confirm adequate system capacity as the design for the building is advanced.

7.6.2 Electrical Service

Eversource owns and operates the electric facilities near the Project Site. The survey, provided by Nitsch Engineering, indicates underground power facilities in Deerfield Street and Beacon Street along the frontage of the Project Site. As the design of the Project progresses, the Proponent's electrical engineer and civil engineer will coordinate with Eversource on future configurations of the power system and connections.

Energy conservation measures will be an integral part of the Project-related infrastructure design. All buildings will be designed to include energy-efficient and water-conservation

features for mechanical, electrical, architectural, and structural systems, assemblies, and materials, where feasible and reasonable.

7.6.3 Telephone and Telecommunications

Verizon owns and operates the telephone facilities and services near the Project Site. The survey, provided by Nitsch Engineering, indicates that there are active conduits and manholes in Deerfield Street and Beacon Street, where the existing building is currently being serviced. Given the existing infrastructure, telephone service for the Project Site could be provided from Deerfield Street or Beacon Street as the Project plans to extend telephone systems to service the proposed buildings. The configuration of the proposed service will be developed with Verizon as the design progresses.

7.6.4 Protection of Utilities During Construction

During construction, infrastructure will be protected using sheeting and shoring, temporary relocations, and/or construction staging as required. The 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 contractor will also be required to provide adequate notification to the utility owner prior to any work commencing on their utility.

Chapter 8

Coordination with other Governmental Agencies

8.0 COORDINATION WITH OTHER GOVERNMENTAL AGENCIES

8.1 Architectural Access Board Requirements

The Project will comply with the requirements of the Architectural Access Board and the standards of the Americans with Disabilities Act. The Accessibility Checklist for each Project Component is included in Appendix E.

8.2 Massachusetts Environmental Policy Act

The Project is not anticipated to require review by the Massachusetts Environmental Policy Act (MEPA) Office of the Massachusetts Executive Office of Energy and Environmental Affairs. Current plans do not call for the Project to receive any state permits or state funding or involve any state land transfers.

8.3 Massachusetts Historical Commission

The MHC has review authority over projects requiring state funding, licensing, permitting and/or approvals that may have direct or indirect impacts to properties listed in the State Register of Historic Places. If a state permit is required for the Project, the MHC review process will be initiated through the filing of an MHC Project Notification Form with MHC or, if a Massachusetts Environmental Policy Act (MEPA) review is required, an Environmental Notification Form (ENF) under MEPA.

8.4 Boston Landmarks Commission

The proposed demolition of the existing buildings on the Project site, including 533 Commonwealth Avenue, 535-539 Commonwealth Avenue, 541 Commonwealth Avenue, 656 Beacon Street, 652-654 Beacon Street and 650 Beacon Street will be subject to review by the BLC under Article 85 of the Boston Zoning Code. An Article 85 Application for each property will be submitted to the BLC.

Appendix A

Survey

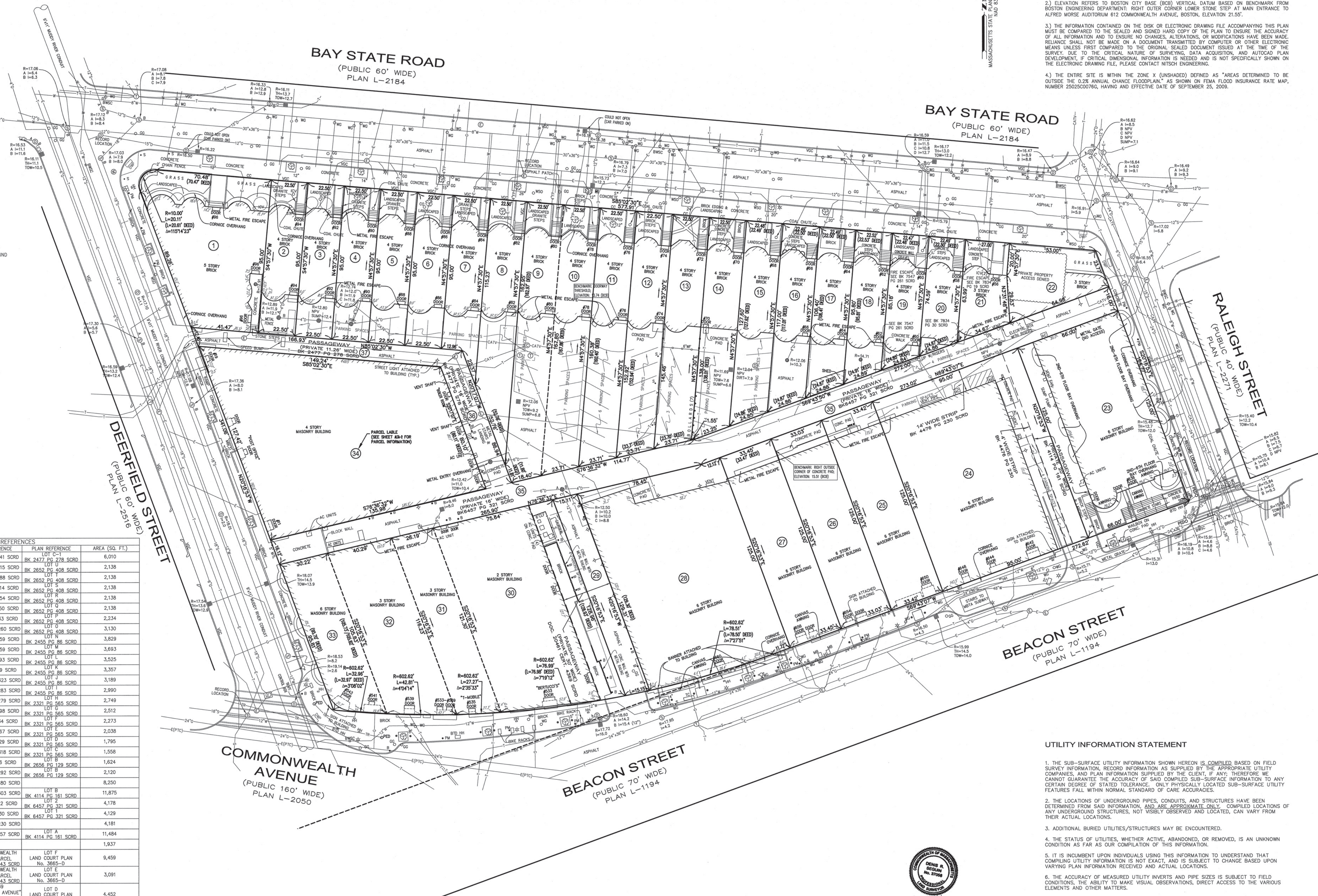
NOTES

1.) THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF NITSCH ENGINEERING. IT IS ISSUED TO BOSTON UNIVERSITY FOR PURPOSES RELATED DIRECTLY AND SOLELY TO NITSCH ENGINEERING'S SCOPE OF SERVICES UNDER CONTRACT WITH BOSTON UNIVERSITY FOR BAY STATE, RALEIGH, BEACON, COMMONWEALTH, DEERFIELD BLOCK LAND SURVEYING SERVICES. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT AND PROJECT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN AUTHORIZATION IS GIVEN THEREFOR BY NITSCH ENGINEERING.

2.) ELEVATION REFERS TO BOSTON CITY BASE (BCB) VERTICAL DATUM BASED ON BENCHMARK FROM BOSTON ENGINEERING DEPARTMENT: RIGHT OUTER CORNER LOWER STONE STEP AT MAIN ENTRANCE TO ALFRED MORSE AUDITORIUM 612 COMMONWEALTH AVENUE, BOSTON, ELEVATION 21.55'.

3.) THE INFORMATION CONTAINED ON THE DISK OR ELECTRONIC DRAWING FILE ACCOMPANYING THIS PLAN MUST BE COMPARED TO THE SEALED AND SIGNED HARD COPY OF THE PLAN TO ENSURE THE ACCURACY OF ALL INFORMATION AND TO ENSURE NO CHANGES, ALTERATIONS, OR MODIFICATIONS HAVE BEEN MADE. RELIANCE SHALL NOT BE MADE ON A DOCUMENT TRANSMITTED BY COMPUTER OR OTHER ELECTRONIC MEANS UNLESS FIRST COMPARED TO THE ORIGINAL SEALED DOCUMENT ISSUED AT THE TIME OF THE SURVEY. DUE TO THE CRITICAL NATURE OF SURVEYING, DATA ACQUISITION, AND AUTOCAD PLAN DEVELOPMENT, IF CRITICAL DIMENSIONAL INFORMATION IS NEEDED AND IS NOT SPECIFICALLY SHOWN ON THE ELECTRONIC DRAWING FILE, PLEASE CONTACT NITSCH ENGINEERING.

4.) THE ENTIRE SITE IS WITHIN THE ZONE X (UNSHADED) DEFINED AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN." AS SHOWN ON FEMA FLOOD INSURANCE RATE MAP, NUMBER 25025C0076G, HAVING AND EFFECTIVE DATE OF SEPTEMBER 25, 2009.



LEGEND

Symbol	Description
	CATCH BASIN
	CABLE TELEVISION MANHOLE
	DRAIN MANHOLE
	ELECTRIC MANHOLE
	MISCELLANEOUS MANHOLE
	SEWER MANHOLE
	TELEPHONE MANHOLE
	WATER MANHOLE
GSO	GAS SHUT-OFF
WSO	WATER SHUT-OFF
GG	GAS GATE
WG	WATER GATE
BWW	BOSTON WATER WORKS
	FIRE HYDRANT
DS	DOWN SPOUT
UP	UTILITY POLE
UP W/ UE	UTILITY POLE WITH CONDUIT LINE TO GROUND
	LIGHT POLE
LB	LIGHT BOLLARD
LL	LANDSCAPE LIGHT
HH	HAND HOLE
TC	TRASH CAN
FACB	FIRE ALARM CALL BOX
MP	METAL POST
CP	CONCRETE POST
PM	PARKING METER
S	SIGN POST
12"	DECIDUOUS TREE WITH TRUNK DIAMETER
12"	CONIFEROUS TREE WITH TRUNK DIAMETER
	HANDICAP PARKING
601x43	SPOT ELEVATION
CLF	CHAIN LINK FENCE
BB	BITUMINOUS CONCRETE BERM
SGC	SLOPED GRANITE CURB
VGC	VERTICAL GRANITE CURB
VCC	VERTICAL CONCRETE CURB
WCR	WHEELCHAIR RAMP
LST	LANDSCAPE TIMBER
R=	RIM ELEVATION EQUALS
I=	INVERT ELEVATION EQUALS
TH=	TOP OF HOOD ELEVATION EQUALS
NPV	NO PIPES VISIBLE
TOW=	TOP OF WATER
TW	TOP OF WALL ELEVATION
CATV	UNDERGROUND CABLE TELEVISION LINE
D	UNDERGROUND DRAIN LINE
E	UNDERGROUND ELECTRIC LINE
G	UNDERGROUND GAS LINE
S	UNDERGROUND SEWER LINE
T	UNDERGROUND TELEPHONE LINE
W	UNDERGROUND WATER LINE
OHW	OVERHEAD WIRES
	MONITORING WELL
	BENCH MARK
SCRD	SUFFOLK COUNTY REGISTRY OF DEEDS

PROPERTY OWNER REFERENCES

PARCEL	OWNER	DEED REFERENCE	PLAN REFERENCE	AREA (SQ. FT.)
1	TRUSTEES OF BOSTON UNIVERSITY	BK 7659 PG 141 SCRD	LOT C-1 BK 2477 PG 278 SCRD	6,010
2	TRUSTEES OF BOSTON UNIVERSITY	BK 9080 PG 515 SCRD	LOT U BK 2652 PG 408 SCRD	2,138
3	TRUSTEES OF BOSTON UNIVERSITY	BK 8055 PG 488 SCRD	LOT T BK 2652 PG 408 SCRD	2,138
4	TRUSTEES OF BOSTON UNIVERSITY	BK 8051 PG 314 SCRD	LOT S BK 2652 PG 408 SCRD	2,138
5	TRUSTEES OF BOSTON UNIVERSITY	BK 8920 PG 454 SCRD	LOT R BK 2652 PG 408 SCRD	2,138
6	TRUSTEES OF BOSTON UNIVERSITY	BK 9061 PG 150 SCRD	LOT Q BK 2652 PG 408 SCRD	2,138
7	TRUSTEES OF BOSTON UNIVERSITY	BK 9059 PG 33 SCRD	LOT P BK 2652 PG 408 SCRD	2,234
8	TRUSTEES OF BOSTON UNIVERSITY	BK 10247 PG 260 SCRD	LOT O BK 2652 PG 408 SCRD	3,130
9	TRUSTEES OF BOSTON UNIVERSITY	BK 9456 PG 259 SCRD	LOT N BK 2455 PG 86 SCRD	3,829
10	TRUSTEES OF BOSTON UNIVERSITY	BK 9456 PG 259 SCRD	LOT M BK 2455 PG 86 SCRD	3,693
11	TRUSTEES OF BOSTON UNIVERSITY	BK 9796 PG 193 SCRD	LOT L BK 2455 PG 86 SCRD	3,525
12	TRUSTEES OF BOSTON UNIVERSITY	BK 9897 PG 9 SCRD	LOT K BK 2455 PG 86 SCRD	3,357
13	LIHUA GE THEMO	BK 28602 PG 323 SCRD	LOT J BK 2455 PG 86 SCRD	3,189
14	TRUSTEES OF BOSTON UNIVERSITY	BK 13240 PG 283 SCRD	LOT I BK 2455 PG 86 SCRD	2,990
15	TRUSTEES OF BOSTON UNIVERSITY	BK 13240 PG 279 SCRD	LOT H BK 2321 PG 565 SCRD	2,749
16	THETA XI HOUSING CORPORATION	BK 4927 PG 298 SCRD	LOT G BK 2321 PG 565 SCRD	2,512
17	THETA XI HOUSING CORPORATION	BK 7966 PG 34 SCRD	LOT F BK 2321 PG 565 SCRD	2,273
18	TRUSTEES OF BOSTON UNIVERSITY	BK 9072 PG 267 SCRD	LOT E BK 2321 PG 565 SCRD	2,038
19	TRUSTEES OF BOSTON UNIVERSITY	BK 9065 PG 129 SCRD	LOT D BK 2321 PG 565 SCRD	1,795
20	TRUSTEES OF BOSTON UNIVERSITY	BK 43398 PG 318 SCRD	LOT C BK 2321 PG 565 SCRD	1,558
21	TRUSTEES OF BOSTON UNIVERSITY	BK 9897 PG 6 SCRD	LOT B BK 2656 PG 129 SCRD	1,624
22	PAUL M. MARINO & MARISA I. MARINO	BK 49028 PG 292 SCRD	LOT B BK 2656 PG 129 SCRD	2,120
23	THE BELVOIR CONDOMINIUM	BK 33067 PG 180 SCRD		8,250
24	TRUSTEES OF BOSTON UNIVERSITY	BK 22484 PG 303 SCRD	LOT B BK 4114 PG 161 SCRD	11,875
25	TRUSTEES OF BOSTON UNIVERSITY	BK 28143 PG 2 SCRD	LOT 2 BK 6457 PG 321 SCRD	4,178
26	TRUSTEES OF BOSTON UNIVERSITY	BK 32100 PG 30 SCRD	LOT 1 BK 6457 PG 321 SCRD	4,129
27	TRUSTEES OF BOSTON UNIVERSITY	BK 27095 PG 230 SCRD		4,181
28	TRUSTEES OF BOSTON UNIVERSITY	BK 20115 PG 257 SCRD	LOT A BK 4114 PG 161 SCRD	11,484
29	UNKNOWN			1,937
30	TRUSTEES OF BOSTON UNIVERSITY	"533 COMMONWEALTH AVENUE" PARCEL BK 43711 PG 243 SCRD	LOT F LAND COURT PLAN No. 3665-D	9,459
31	TRUSTEES OF BOSTON UNIVERSITY	"535 COMMONWEALTH AVENUE" PARCEL BK 43711 PG 243 SCRD	LOT E LAND COURT PLAN No. 3665-D	3,091
32	TRUSTEES OF BOSTON UNIVERSITY	"537-539 COMMONWEALTH AVENUE" PARCEL BK 43711 PG 243 SCRD	LOT D LAND COURT PLAN No. 3665-C	4,452
33	TRUSTEES OF BOSTON UNIVERSITY	"541 COMMONWEALTH AVENUE" PARCEL BK 43711 PG 243 SCRD		3,030
34	TRUSTEES OF BOSTON UNIVERSITY	"PARCEL 3" BK 9070 PG 567 SCRD	LOT C-2 BK 2477 PG 278 SCRD	14,007
35	16' PRIVATE PASSAGE WAY		BK 6457 PG 321	8,623
36	16' PRIVATE PASSAGE WAY		BK 2477 PG 278	1,336
37	11.26' PRIVATE PASSAGE WAY		BK 2477 PG 278	1,780

GRAPHIC SCALE

20 10 0 20 40 60

SCALE: 1"=20'

UTILITY INFORMATION STATEMENT

1. THE SUB-SURFACE UTILITY INFORMATION SHOWN HEREON IS COMPILED BASED ON FIELD SURVEY INFORMATION, RECORD INFORMATION AS SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES, AND PLAN INFORMATION SUPPLIED BY THE CLIENT, IF ANY; THEREFORE WE CANNOT GUARANTEE THE ACCURACY OF SAID COMPILED SUB-SURFACE INFORMATION TO ANY CERTAIN DEGREE OF STATED TOLERANCE. ONLY PHYSICALLY LOCATED SUB-SURFACE UTILITY FEATURES FALL WITHIN NORMAL STANDARD OF CARE ACCURACIES.

2. THE LOCATIONS OF UNDERGROUND PIPES, CONDUITS, AND STRUCTURES HAVE BEEN DETERMINED FROM SAID INFORMATION, AND ARE APPROXIMATE ONLY. COMPILED LOCATIONS OF ANY UNDERGROUND STRUCTURES, NOT VISIBLY OBSERVED AND LOCATED, CAN VARY FROM THEIR ACTUAL LOCATIONS.

3. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED.

4. THE STATUS OF UTILITIES, WHETHER ACTIVE, ABANDONED, OR REMOVED, IS AN UNKNOWN CONDITION AS FAR AS OUR COMPILATION OF THIS INFORMATION.

5. IT IS INCUMBENT UPON INDIVIDUALS USING THIS INFORMATION TO UNDERSTAND THAT COMPILING UTILITY INFORMATION IS NOT EXACT, AND IS SUBJECT TO CHANGE BASED UPON VARYING PLAN INFORMATION RECEIVED AND ACTUAL LOCATIONS.

6. THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES IS SUBJECT TO FIELD CONDITIONS, THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS AND OTHER MATTERS.

7. THE PROPER UTILITY ENGINEERING/COMPANY SHOULD BE CONSULTED AND THE ACTUAL LOCATIONS OF SUBSURFACE STRUCTURES SHOULD BE VERIFIED IN THE FIELD (V.I.F.) BEFORE PLANNING FUTURE CONNECTIONS. CONTACT THE DIG SAFE CALL CENTER AT 1-888-344-7233, SEVENTY-TWO HOURS PRIOR TO EXCAVATION, BLASTING, GRADING, AND/OR PAVING.

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- Civil Engineering
- Land Surveying
- Transportation Engineering
- Structural Engineering
- Green Infrastructure
- Planning
- GIS

PROJECT # 11253
FILE: 11253_ALTA1.dwg
SCALE: 1"=20'
DATE: 2-10-2016
PROJECT MANAGER: DRS
FIELD BOOK: 631/634
DRAFTED BY: JCC
CHECKED BY:

REV.	COMMENTS	DATE
A	PASSAGEWAY AREAS ADDED TO TABLE	5/2/2016

REVISIONS

EXISTING CONDITIONS PLAN

BAY STATE, RALEIGH, BEACON, COMMONWEALTH, DEERFIELD BLOCK
BOSTON, MASSACHUSETTS

PREPARED FOR:
BOSTON UNIVERSITY
1 SILBER WAY, SUITE 914, BOSTON, MA 02215

SHEET: EX-1
OF 1 REV. A

Appendix B

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 MOVES computer program generated motor vehicle emissions used in the garage stationary source analysis along with the mobile source CAL3QHC modeling and mesoscale analysis. The model input parameters were provided by MassDEP. Emission rates were derived for 2017 and 2022 for speed limits of idle, 10, 15, and 25 mph for use in the microscale analyses.

MOVES CO Emission Factor Summary

Carbon Monoxide Only

		2017	2022
Free Flow	25 mph	2.611	1.947
Right Turns	10 mph	4.058	2.991
Left Turns	15 mph	3.508	2.624
Queues	Idle	8.013	3.833

Notes: Winter CO emission factors are higher than Summer and are conservatively used
Urban Unrestricted Roadway type used

CAL3QHC

For the intersection studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOVES. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 321 cm was used for the intersection due to the presence of water and fields near the intersection. Idle emission rates for queue links were based on 0 mph emission rates derived in MOVES. Emission rates for speeds of 10, 15, and 25 mph were used for right turn, left turn, and free flow links, respectively.

Raw Background Concentrations

POLLUTANT	AVERAGING TIME	Form	2014	2015	2016	Units	ppm/ppb to $\mu g/m^3$ Conversion Factor	2014-2016 Background Concentration ($\mu g/m^3$)	Location
SO_2 [1][5]	1-Hour [4]	99th %	9.7	5.5	4.1	ppb	2.62	16.9	Kenmore Sq., Boston
	3-Hour [6]	H2H	9.4	4.4	3.8	ppb	2.62	24.6	Kenmore Sq., Boston
	24-Hour	H2H	5	2.9	2	ppb	2.62	13.1	Kenmore Sq., Boston
	Annual	H	0.942418	0.531508	0.425324	ppb	2.62	2.5	Kenmore Sq., Boston
PM-10	24-Hour	H2H	53	30	30	$\mu g/m^3$	1	53	Kenmore Sq., Boston
	Annual	H	15.034483	14.20339	14.125	$\mu g/m^3$	1	15.0	Kenmore Sq., Boston
PM-2.5	24-Hour [4]	98th %	14.6	14.5	13	$\mu g/m^3$	1	14.0	Kenmore Sq., Boston
	Annual [4]	H	6.053782	6.50087	6.215596	$\mu g/m^3$	1	6.3	Kenmore Sq., Boston
NO_2 [3]	1-Hour [4]	98th %	49	56	47	ppb	1.88	95.3	Kenmore Sq., Boston
	Annual	H	17.16805	17.300328	15.03510	ppb	1.88	32.5	Kenmore Sq., Boston
CO [2][6]	1-Hour	H2H	1.3	1.362	2.409	ppm	1146	2760.7	Harrison Ave., Boston
	8-Hour	H2H	1.1	0.9	1.8	ppm	1146	2062.8	Harrison Ave., Boston
Ozone	8-Hour	H4H	0.054	0.056	0.058	ppm	1963	113.9	Harrison Ave., Boston
Lead	Rolling 3-Month	H	0.0142	0.0157	0.0174	$\mu g/m^3$	1	0.017	Harrison Ave., Boston

Notes:

From 2014-2016 EPA's AirData Website

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

[2] CO reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1146 $\mu g/m^3$.

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

[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] CO monitor at Kenmore Square was deactivated in January 2015. Harrison Avenue monitor used for 2015 and 2016.

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

Appendix C

Energy Model Analysis

ENERGY MODELING ANALYSIS

PROJECT NAME: Kenmore Square: Commonwealth and Beacon Buildings

PROJECT NUMBER: B1708026.000

DATE: May 8, 2018

The purpose of this memo is to present the modeled energy performance of Kenmore Square Commonwealth and Beacon Buildings with respect to the Massachusetts Stretch Energy code and LEED v4 for New Construction. Energy modeling has been performed using eQUEST v3.65 energy simulation software.

The project will consist of two core & shell office buildings located in Boston, MA. The Commonwealth Building is a new 8-story office building with a gross floor area of approximately 165,500 square feet (including garage). The Beacon Building consists of an existing 6-story structure that will be renovated into office space and a new 7-story addition that will also include office. The total combined gross floor area of the Beacon Building is approximately 130,000 square feet.

Each building meets the LEED-NC v4 and Stretch Code Requirements. The annual energy results are summarized in Tables 1 and 2 below.

Table 1: Commonwealth Building Annual Energy Summary

Proposed Design	Electricity (kWh)	Natural Gas (therms)	Annual Energy Use (MMBtu)	Annual GHG Emmissions (kg CO2 Emissions)	EUI (kBtu/SF)
Baseline (ASHRAE 90.1-2013)	1,380,462	22,295	6,940	471,398	**53.4**
Proposed Design	1,488,695	3,225	5,402	397,782	**41.6**

Table 1: Beacon Building Annual Energy Summary

Proposed Design	Electricity (kWh)	Natural Gas (therms)	Annual Energy Use (MMBtu)	Annual GHG Emmissions	EUI (kBtu/SF)
Baseline (ASHRAE 90.1-2013)	1,231,560	20,985	6,301	426,366	**48.5**
Proposed Design	1,371,628	3,245	5,004	367,955	**38.5**

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LEED Compliance:

To comply with the minimum energy requirements of LEED v4 credit Optimize Energy Performance, the design must achieve 5% energy savings relative to an ASHRAE 90.1-2010 Baseline. To benefit the claimed savings for the project, the Alternative Energy Performance Metric was utilized. This metric allows the comparison of source energy, GHG emissions, and time-dependent valuation (TDV) energy in addition to energy cost.

When using the Alternative Energy Performance Metric, the Commonwealth Building shows savings of 18.9% and the Beacon Building shows savings of 17.1% as compared to ASHRAE 90.1-2013, which is more stringent than the LEED requirement (90.1-2010). This satisfies the requirements of LEED prerequisite Minimum Energy Performance and demonstrates the potential to earn 6-8 points under credit Optimize Energy Performance.

Stretch Code Complaince:

To comply with the minimum energy requirements of the Massachusetts Stretch Energy code, the design must achieve at least 10% site energy savings relative to ASHRAE 90.1-2013 Appendix G. The Commonwealth Building shows savings of 22.2% and Beacon Building shows savings of 20.6%. This exceeds the requirements of the MA Stretch Code.

Energy Conservation Measures:

The energy conservation measures (ECMs) considered in this analysis include:

- Improved Glass Assembly U-value and SHGC
- High Performance LED lighting with reduced lighting power density
- Dedicated outside air unit with energy recovery wheel
- Variable Refridgerant Flow Units (VRF)

Energy Modeling Intent and Limitations:

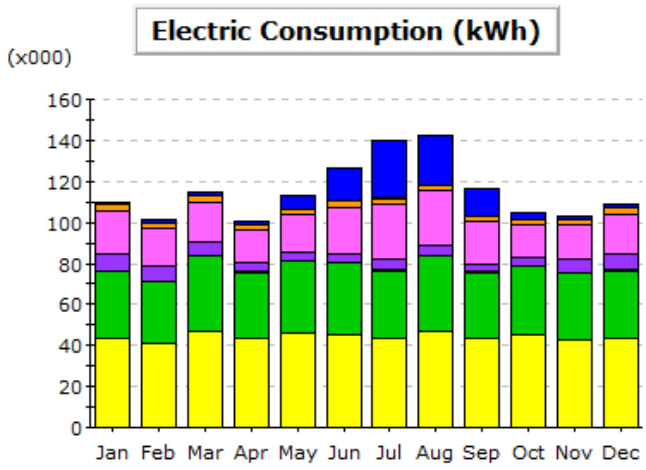
The energy modeling process is intended to provide a comparison of annual energy use and cost among multiple designs. These results are not predictive of actual utility bills. Actual energy use may differ from the simulation results due to variations in occupancy, controls and maintenance, weather, changes in energy rates, and the general precision of the simulation program.

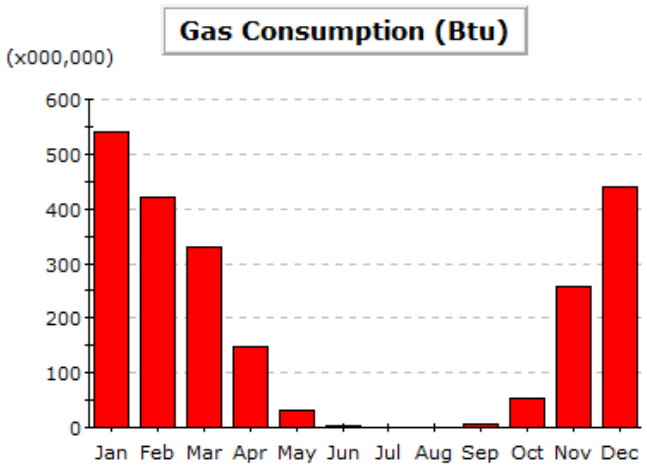
ENERGY MODEL SUMMARY OF INPUT ASSUMPTIONS

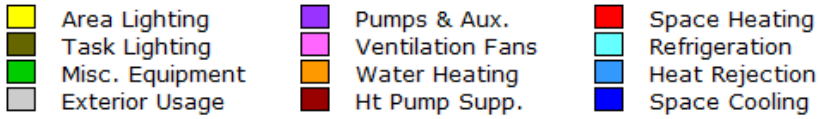
Summary of Assumptions	Proposed Design	ASHRAE 90.1-2013 Baseline MA Stretch Code
General Building Information		
Space use type	Commonwealth Bldg: Office + Parking Garage Beacon Bldg: Office	Commonwealth Bldg: Office + Parking Garage Beacon Bldg: Office
Conditioned Square Feet	Commonwealth Bldg: 130,000 SF + 40,000 Parking Garage Beacon Bldg: 130,000 SF	Same as proposed
Occupancy Hours	M-F: 7am - 6pm WEH: 9am - 3pm	Same as proposed
Temperature Setpoints	Cooling: 75-82°F Heating: 64-70°F	Same as proposed
Building Envelope (Construction Assemblies)		
Roofs	R-30 Continuous Insulation Entirely Above Deck (U-0.032)	R-30 Continuous Insulation Entirely Above Deck (U-0.032)
Walls	Precast with overall U-0.055	Steel Framed R-13 cavity + R-10 continuous (U-0.055)
Fenestration and Shading		
Vertical fenestration area (of Wall area)	Commonwealth Bldg: 51% Glass Beacon Bldg: 60% Glass	WWR = 40%
Vertical Glazing U-factor	Glass = U-0.40	Glass = U-0.42
Vertical Glazing SHGC	SHGC = 0.35	SHGC = 0.40
HVAC (Air-side)		
HVAC System Type	Air-cooled Variable Refridgerant flow system providing heating and cooling Rooftop Energy Recovery Unit supplying 100% outside air to office. Air-cooled DX and Hot Water Heating	System #7: VAV Rooftop Unit With HW Reheat - System per Floor
Unitary Efficiency	ERU DX cooling: 10.0 EER ERU Gas Heating = 80% Efficiency VRF DX Cooling: 11 EER VRF Heat Pump Heating: 4.5 COP	N/A
Fan System Operation	On continuously during occupied hours. Cycled to meet load during unoccupied hours.	On continuously during occupied hours. Cycled to meet load during unoccupied hours.
Outdoor Air Design Min. Ventilation	ASHRAE 62.1-2013 Compliant	ASHRAE 62.1-2013 Compliant
Economizer High-Limit Shutoff	ERU is 100% outside air - no economizer control	System #7: Outdoor Air Temperature with 70°F shutoff limit
Design Airflow Rates (Conditioned Spaces)	Auto sized based on 20F supply air to room air delta-T	Auto sized based on 20F supply air to room air delta-T
Minimum Supply Flow	Per ASHRAE 90.1-2013 Section G3.1.3.13 VAV - 30% Turndown Ratio	Per ASHRAE 90.1-2013 Section G3.1.3.13 VAV - 30% Turndown Ratio
Total System Fan Power (Conditioned)	ERU - 0.0015 kW/cfm VRF - 0.00019 kW/cfm	Per ASHRAE 90.1-2013 G3.1.2.9 System #7 VAV - 0.0013 kW/cfm
Pressure Drop Adjustments	-Particulate filtration Credit MERV 13 -Sound Attenuation -ERV in applicable systems	-Particulate filtration Credit MERV 13 -Sound Attenuation -ERV in applicable systems
Exhaust Air Energy Recovery	70% effective enthalpy wheel on ERU	50% effective enthalpy wheel on all VAV Systems as required by ASHRAE 90.1-2013 Table 6.5.6.1
Demand Control Ventilation	N/A	N/A
Supply Air Temperature Reset Parameters	N/A	Load Reset on VAV systems from 55F-60F

HVAC (Water-side)		
Number of Chillers	N/A	2
Chiller Part-Load Controls	N/A	No VSD
Chiller Capacity (Per Chiller)	N/A	≥150 and <300 Tons
Chiller Efficiency	N/A	0.59 kW/ton (full load) (Per Stretch Code 2-of-6 Enhancements)
Chilled Water Loop Supply Temperature	N/A	44
Chilled Water (CHW) Loop Delta-T	N/A	12
CHW Loop Temp Reset Parameters	N/A	54F @ 60F OA, 44F @ 80F OA
CHW Loop Configuration3	N/A	Primary/Secondary
Number of Primary CHW Pumps	N/A	1 per chiller
Primary CHW Pump Power	N/A	11 W/GPM
Primary CHW Pump Speed Control	N/A	One Speed
Secondary CHW Pump Power	N/A	11 W/GPM
Secondary CHW Pump Speed Control	N/A	Variable Speed
Number of Cooling Towers / Fluid Coolers	N/A	1
Cooling Tower Fan Control	N/A	Variable Speed
Condenser Water Leaving Temperature	N/A	81
Condenser Water (CW) Loop Delta-T	N/A	10
CW Loop Temp Reset Parameters	N/A	Maintain 70°F when weather permits, floating up to leaving water temperature at design conditions
CW Loop Configuration	N/A	Primary Only
Number of CW Pumps	N/A	1 per chiller
CW Pump Power	N/A	19 W/GPM
CW Pump Speed Control	N/A	One Speed
Water-side Economizer for Free Cooling	N/A	No
Number of Boilers	N/A	2
Boiler Part-Load Controls	N/A	Staged
Boiler Capacity (Per Boiler)	N/A	N/A
Boiler Efficiency	N/A	90% Natural Draft (Per Stretch Code 2-of-6 Enhancements)
Boiler Water Loop Supply Temperature	N/A	180°F
Hot Water or Steam (HW) Loop Delta-T	N/A	50°F
HW Loop Reset Parameters	N/A	150°F @ 50°F OA, 180°F @ 20°F OA
HW Loop Configuration	N/A	Primary Only
Number of Primary HW Pumps	N/A	2
Primary HW Pump Power	N/A	19W/GPM
Primary HW Pump Speed Control	N/A	Variable Speed
Domestic Water Heating		
DHW Equipment Type	Electric Resistance Water Heater	Electric Resistance Water Heater
Equipment Efficiency	Energy Factor = 0.963 per ASHRAE 90.1-2013 Table 7.8	Energy Factor = 0.963 per ASHRAE 90.1-2013 Table 7.8
Temperature Controls	120°F Constant	120°F Constant
DHW Flow	Standard Flow Fixtures	Standard Flow Fixtures
Lighting		
Interior Lighting Power Calc Method	Building Area Method	Space-by-space
Interior Lighting Power Density (W/sf)	Office = 0.78 W/sf Lobby = 0.72 W/sf Retail = 1.51 W/sf Corridor = 0.52 W/sf Mechanical = 0.76 W/sf Garage = 0.17 W/sf	(Note - 10% reduction taken from ASHRAE 90.1-2013 values per stretch code requirements) Office = 0.88 W/sf Lobby = 0.81 W/sf Retail = 1.51 W/sf Corridor = 0.59 W/sf Mechanical = 0.855 W/sf Garage = 0.19 W/sf
Miscellaneous		
Receptacle Equipment	Office = 1.00 W/sf	Office = 1.00 W/sf
Garage	Garage fans = 9kW with CO/VFD control	Garage fans = 9kW with CO/VFD control
Escalators and Elevators	Elevator = Average Operating Load of 30 kW	Same as proposed

BASELINE RESULTS – COMMONWEALTH BUILDING







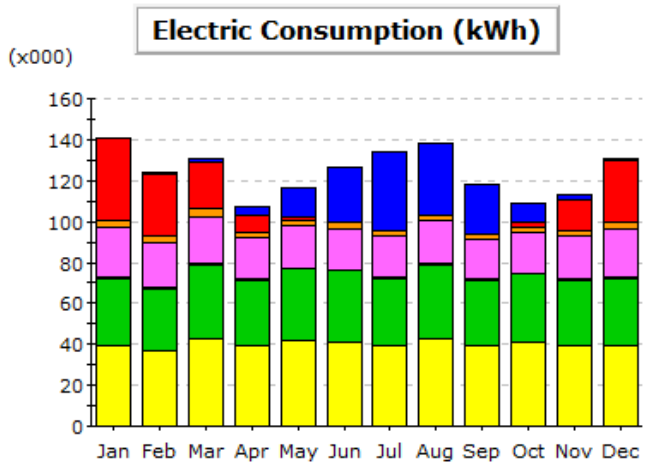
Electric Consumption (kWh x000)

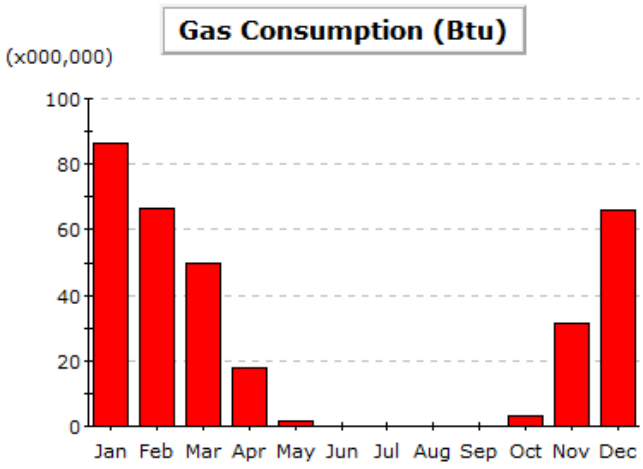
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	1.5	1.3	1.3	1.5	6.7	15.9	27.3	23.9	13.5	3.0	1.5	1.5	98.9
Heat Reject.	-	-	-	0.0	0.1	0.2	0.5	0.4	0.2	0.0	0.0	-	1.3
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	3.3	3.2	3.6	3.0	2.9	2.7	2.4	2.6	2.3	2.5	2.7	3.1	34.2
Vent. Fans	20.6	18.0	18.7	15.5	18.3	22.9	27.6	27.0	21.1	16.5	16.8	19.5	242.5
Pumps & Aux.	8.4	7.3	7.0	4.5	3.8	4.2	5.0	4.6	3.6	3.8	6.4	7.8	66.5
Ext. Usage	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.4
Misc. Equip.	32.3	30.4	36.2	32.3	34.9	34.7	32.5	36.2	32.3	33.6	32.1	32.5	399.9
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	43.7	40.6	47.3	43.3	46.1	45.5	43.9	47.3	43.3	44.9	43.1	43.9	532.6
Total	110.1	101.3	114.5	100.5	113.1	126.5	139.5	142.2	116.7	104.7	102.9	108.6	1,380.5

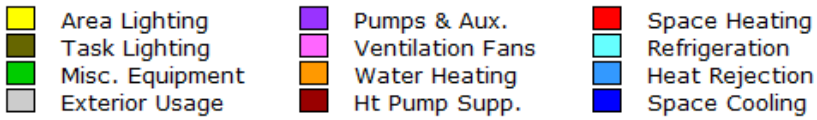
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	539.4	420.9	330.6	148.2	32.5	2.7	0.0	-	6.0	53.5	256.2	439.7	2,229.5
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	539.4	420.9	330.6	148.2	32.5	2.7	0.0	-	6.0	53.5	256.2	439.7	2,229.5

PROPOSED RESULTS – COMMONWEALTH BUILDING







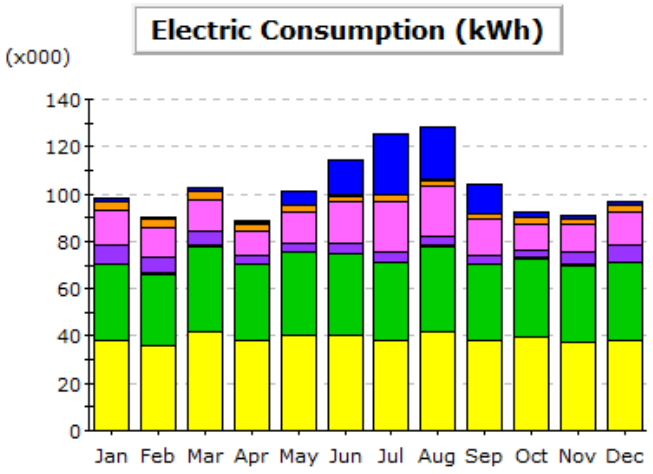
Electric Consumption (kWh x000)

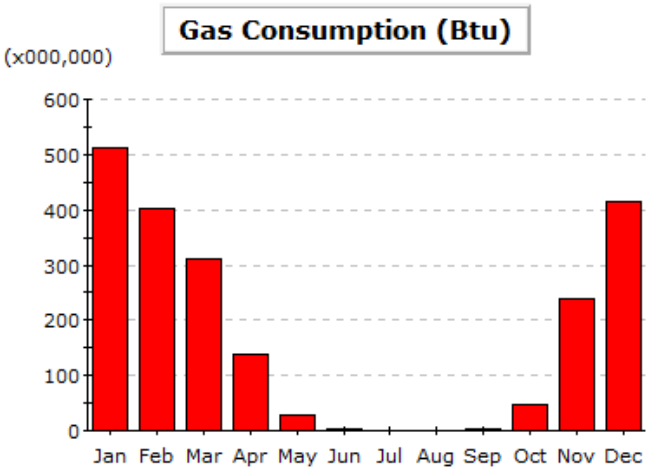
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.7	1.0	2.3	3.7	14.3	26.8	38.0	35.1	23.8	9.6	2.3	1.2	159.0
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	39.8	30.4	22.5	8.3	1.6	0.3	0.0	-	0.0	1.9	15.1	30.3	150.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	3.3	3.2	3.6	3.0	2.9	2.7	2.4	2.6	2.3	2.5	2.7	3.1	34.2
Vent. Fans	24.7	21.7	22.9	19.9	20.5	20.1	20.5	20.8	19.5	20.2	21.1	23.6	255.3
Pumps & Aux.	0.3	0.3	0.3	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.3	2.6
Ext. Usage	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.4
Misc. Equip.	32.3	30.4	36.2	32.3	34.9	34.7	32.5	36.2	32.3	33.6	32.1	32.5	399.9
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	39.6	36.9	42.9	39.2	41.8	41.2	39.8	42.9	39.2	40.7	39.0	39.8	482.9
Total	141.1	124.2	131.0	107.1	116.5	126.3	133.8	138.2	117.7	108.9	112.8	131.1	1,488.7

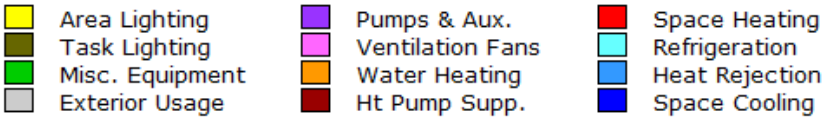
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	86.34	66.60	49.67	18.01	1.62	-	-	-	0.03	3.21	31.29	65.72	322.48
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	86.34	66.60	49.67	18.01	1.62	-	-	-	0.03	3.21	31.29	65.72	322.48

BASELINE RESULTS – BEACON BUILDING







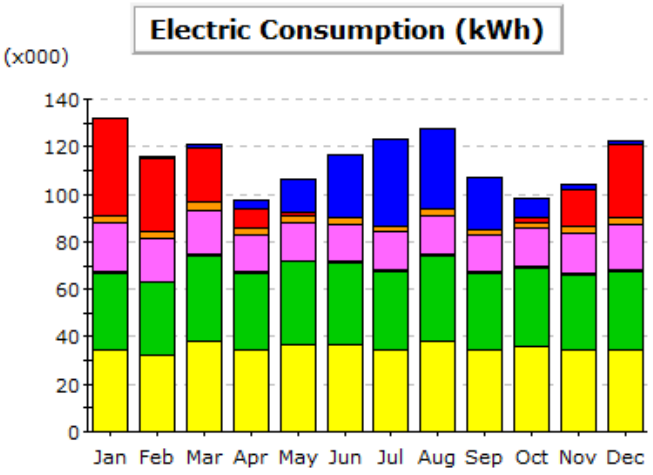
Electric Consumption (kWh x000)

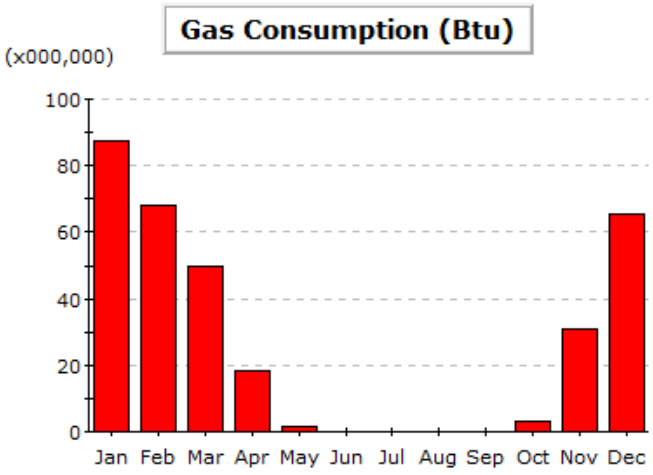
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	1.4	1.2	1.2	1.3	5.8	14.6	25.3	21.8	12.1	2.6	1.3	1.3	90.0
Heat Reject.	-	-	-	0.0	0.1	0.2	0.4	0.3	0.2	0.0	0.0	-	1.2
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	3.3	3.2	3.6	3.0	2.9	2.7	2.4	2.6	2.3	2.5	2.7	3.1	34.2
Vent. Fans	15.0	13.0	13.1	10.3	12.9	17.6	21.4	21.0	15.6	11.0	11.6	14.0	176.4
Pumps & Aux.	7.7	6.6	6.3	3.8	3.4	3.8	4.5	4.0	3.3	3.3	5.4	6.9	58.9
Ext. Usage	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.4
Misc. Equip.	32.3	30.4	36.2	32.3	34.9	34.7	32.5	36.2	32.3	33.6	32.1	32.5	399.9
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	38.0	35.6	41.7	37.8	40.5	40.0	38.3	41.7	37.8	39.2	37.6	38.3	466.4
Total	98.1	90.3	102.3	88.9	100.8	114.0	125.2	127.9	104.0	92.5	91.1	96.4	1,231.6

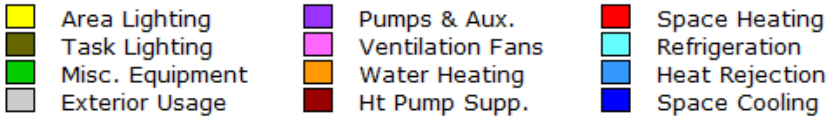
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	512.3	401.7	310.5	138.7	27.9	2.1	0.0	-	4.6	48.2	239.3	413.1	2,098.5
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	512.3	401.7	310.5	138.7	27.9	2.1	0.0	-	4.6	48.2	239.3	413.1	2,098.5

PROPOSED RESULTS – BEACON BUILDING







Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.4	0.5	1.6	3.1	13.7	26.2	36.9	33.7	22.4	8.4	1.7	0.9	149.5
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	40.8	31.0	22.7	8.1	1.5	0.2	0.0	-	0.0	1.9	15.7	31.2	153.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	3.3	3.2	3.6	3.0	2.9	2.7	2.4	2.6	2.3	2.5	2.7	3.1	34.2
Vent. Fans	20.2	17.6	18.5	15.7	16.1	15.9	16.1	16.4	15.3	15.9	16.9	19.1	203.5
Pumps & Aux.	0.3	0.3	0.3	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.3	2.6
Ext. Usage	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.4
Misc. Equip.	32.3	30.4	36.2	32.3	34.9	34.7	32.5	36.2	32.3	33.6	32.1	32.5	399.9
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	34.6	32.3	37.9	34.4	36.8	36.4	34.8	37.9	34.4	35.7	34.2	34.8	424.2
Total	132.2	115.8	121.0	97.2	106.4	116.7	123.3	127.4	107.3	98.4	103.9	122.1	1,371.6

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	87.42	67.94	49.66	18.09	1.56	-	-	-	0.03	3.22	31.15	65.41	324.48
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	87.42	67.94	49.66	18.09	1.56	-	-	-	0.03	3.22	31.15	65.41	324.48

--END--

Appendix D

Climate Change Questionnaires

Boston Planning & Development Agency
Climate Resiliency Report Summary

Submitted: 05/09/2018 09:08:27

A.1 - Project Information

Project Name:	Kenmore Square Redevelopment - Commonwealth Building			
Project Address:	533-541 Commonwealth Avenue			
Filing Type:	Initial (PNF, EPNF, NPC or other substantial filing)			
Filing Contact:	Geoff Starsiak	Epsilon Associates	gstarsiak@epsilonassociates.com	978-897-7100
Is MEPA approval required?	No	MEPA date:		

A.2 - Project Team

Owner / Developer:	Related Beal
Architect:	Stantec and Roger Ferris+Partners
Engineer:	WSP
Sustainability / LEED:	WSP
Permitting:	Epsilon Associates
Construction Management:	

A.3 - Project Description and Design Conditions

List the principal Building Uses:	Commercial, Retail
List the First Floor Uses:	Retail, Lobbies
List any Critical Site Infrastructure and or Building Uses:	None

Site and Building:

Site Area (SF):	47500	Building Area (SF):	140000
Building Height (Ft):	110	Building Height (Stories):	8
Existing Site Elevation – Low (Ft BCB):	18.6	Existing Site Elevation – High (Ft BCB):	18.6
Proposed Site Elevation – Low (Ft BCB):	18.6	Proposed Site Elevation – High (Ft BCB):	18.6
Proposed First Floor Elevation (Ft BCB):	18.6	Below grade spaces/levels (#):	2

Article 37 Green Building:

LEED Version - Rating System:	LEED v4 BD+C NC	LEED Certification:	Yes
Proposed LEED rating:	Silver	Proposed LEED point score (Pts.):	54

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Climate Resiliency Report Summary

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Building Envelope:

When reporting R values, differentiate between R discontinuous and R continuous. For example, use "R13" to show R13 discontinuous and use R10c.i. to show R10 continuous. When reporting U value, report total assembly U value including supports and structural elements.

Roof:	30	Exposed Floor :	N/A
Foundation Wall:	N/A	Slab Edge (at or below grade):	F-0.52

Vertical Above-grade Assemblies (%'s are of total vertical area and together should total 100%):

Area of Opaque Curtain Wall & Spandrel Assembly:	N/A	Wall & Spandrel Assembly Value:	N/A
Area of Framed & Insulated / Standard Wall:	49	Wall Value:	18
Area of Vision Window:	51	Window Glazing Assembly Value:	
		Window Glazing SHGC:	
Area of Doors:		Door Assembly Value :	

Energy Loads and Performance

For this filing – describe how energy loads & performance were determined	Energy modeling using eQuest v3.65 with ASHRAE 90.1-2013 baseline		
Annual Electric (kWh):	1488695	Peak Electric (kW):	850
Annual Heating (MMbtu/hr):	322.5	Peak Heating (MMbtu):	3.25
Annual Cooling (Tons/hr):	181423	Peak Cooling (Tons):	400
Energy Use - Below ASHRAE 90.1 - 2013 (%):	22.2	Have the local utilities reviewed the building energy performance?:	No
Energy Use - Below Mass. Code (%):	22.2	Energy Use Intensity (kBtu/SF):	41.6

Back-up / Emergency Power System

Electrical Generation Output (kW):	500	Number of Power Units:	1
System Type (kW):	Diesel generator	Fuel Source:	Diesel

Emergency and Critical System Loads (in the event of a service interruption)

Electric (kW):	450	Heating (MMbtu/hr):	25
		Cooling (Tons/hr):	6

B – Greenhouse Gas Reduction and Net Zero / Net Positive Carbon Building Performance

Reducing greenhouse gas emissions is critical to avoiding more extreme climate change conditions. To achieve the City's goal of carbon-neutrality by 2050 the performance of new buildings will need to progressively improve to carbon net zero and net positive.

B.1 – GHG Emissions - Design Conditions

For this filing - Annual Building GHG Emissions (Tons): 438

For this filing - describe how building energy performance has been integrated into project planning, design, and engineering and any supporting analysis or modeling:

Energy modeling has been ever-present throughout the process of the design. The design options will be analyzed for energy savings and energy cost savings at 100% SD, 100% DD, and 100% CD.

Describe building specific passive energy efficiency measures including orientation, massing, building envelop, and systems:

Improved Glass Assembly U-value and SHGC.
Energy Recovery has been included to incorporate energy and waste-heat savings.
Occupancy sensors will be applied throughout the building.
Daylighting controls are expected to be used where feasible.
High performance fixtures such as LED (light emitting diodes) will be installed throughout the project.
Energy Star appliance will be specified where applicable.
HVAC equipment will be design to maximize efficiency and exceed code standard.

Describe building specific active energy efficiency measures including high performance equipment, controls, fixtures, and systems:

It is expected that premium motors will be used in the mechanical, electrical, and plumbing systems and other mechanical equipment such as elevators (where applicable).
Lighting controls will enable controllability and energy savings throughout the project.
Dedicated outside air unit with energy recovery wheel.
Variable Refrigerant Flow Units (VRF).

Describe building specific load reduction strategies including on-site renewable energy, clean energy, and storage systems:

Currently, these are not part of the design but will be analyzed as the project and budget progress.

Describe any area or district scale emission reduction strategies including renewable energy, central energy plants, distributed energy systems, and smart grid infrastructure:

The utilization of centralized electricity-based VRF systems are highly efficient. The team did not utilize a plant outside of the building beyond electricity from the available grid. Should the grid become a smart grid, the building will be enabled to adapt to that technology.

Describe any energy efficiency assistance or support provided or to be provided to the project:

The team will be meeting with Eversource and National Grid to determine and finalize the options for rebates and incentives for technologies and controls in the building.

B.2 - GHG Reduction - Adaptation Strategies

Describe how the building and its systems will evolve to further reduce GHG emissions and achieve annual carbon net zero and net positive performance (e.g. added efficiency measures, renewable energy, energy storage, etc.) and the timeline for meeting that goal (by 2050):

The current systems are reliant on an efficient form of electricity from the grid, which has reduced its emissions by more than 15% over the past 5 years. This trend is likely to continue with regulations, and in addition, the amenity space and outside areas are structurally sound for the implementation of solar in the future.

C - Extreme Heat Events

Annual average temperature in Boston increased by about 2˚F in the past hundred years and will continue to rise due to climate change. By the end of the century, the average annual temperature could be 56° (compared to 46° now) and the number of days above 90° (currently about 10 a year) could rise to 90.

C.1 – Extreme Heat - Design Conditions

Temperature Range - Low (Deg.):	8	Temperature Range - High (Deg.):	91
Annual Heating Degree Days:	5641	Annual Cooling Degree Days	2897

What Extreme Heat Event characteristics will be / have been used for project planning

Days - Above 90° (#):	60	Days - Above 100° (#):	30
Number of Heatwaves / Year (#):	6	Average Duration of Heatwave (Days):	5

Describe all building and site measures to reduce heat-island effect at the site and in the surrounding area:

The project will include high-albedo roof materials, new street trees and other landscaping to minimize the heat island effect.

C.2 - Extreme Heat – Adaptation Strategies

Describe how the building and its systems will be adapted to efficiently manage future higher average temperatures, higher extreme temperatures, additional annual heatwaves, and longer heatwaves:

The building will include high performance heating, cooling, and ventilation, lighting controls, building system controls, healthy/resilient materials, and energy recovery.

Describe all mechanical and non-mechanical strategies that will support building functionality and use during extended interruptions of utility services and infrastructure including proposed and future adaptations:

In the event of an extended utility service interruption, it is anticipated that the building will be closed.

Boston Planning & Development Agency
Climate Resiliency Report Summary

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D - Extreme Precipitation Events

From 1958 to 2010, there was a 70 percent increase in the amount of precipitation that fell on the days with the heaviest precipitation. Currently, the 10-Year, 24-Hour Design Storm precipitation level is 5.25". There is a significant probability that this will increase to at least 6" by the end of the century. Additionally, fewer, larger storms are likely to be accompanied by more frequent droughts.

D.1 – Extreme Precipitation - Design Conditions

What is the project design precipitation level? (In. / 24 Hours)	6

Describe all building and site measures for reducing storm water run-off:

The project will incorporate stormwater management and treatment systems that will improve water quality, reduce runoff volume and control peak rates of runoff in comparison to existing conditions. The project will provide infiltration that retains site runoff while providing treatment and peak flow mitigation, in accordance with stormwater standards and BWSC. The project will incorporate methods included in the Complete Streets Guidelines to improve stormwater infiltration on-site.

D.2 - Extreme Precipitation - Adaptation Strategies

Describe how site and building systems will be adapted to efficiently accommodate future more significant rain events (e.g. rainwater harvesting, on-site storm water retention, bio swales, green roofs):

The project will utilize on site storm water retention to infiltrate and reuse water on site.

E – Sea Level Rise and Storms

Under any plausible greenhouse gas emissions scenario, the sea level in Boston will continue to rise throughout the century. This will increase the number of buildings in Boston susceptible to coastal flooding and the likely frequency of flooding for those already in the floodplain.

Is any portion of the site in a FEMA Special Flood Hazard Area?	No	What Zone:	
What is the current FEMA SFHA Zone Base Flood Elevation for the site (Ft BCB)?			
Is any portion of the site in the BPDA Sea Level Rise Flood Hazard Area (see SLR-FHA online map)?	No		

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Climate Resiliency Report Summary

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If you answered YES to either of the above questions, please complete the following questions.
Otherwise you have completed the questionnaire; thank you!

E.1 – Sea Level Rise and Storms – Design Conditions

Proposed projects should identify immediate and future adaptation strategies for managing the flooding scenario represented by the Sea Level Rise Flood Hazard Area (SLR-FHA), which includes 3.2' of sea level rise above 2013 tide levels, an additional 2.5" to account for subsidence, and the 1% Annual Chance Flood. After using the SLR-FHA to identify a project's Sea Level Rise Base Flood Elevation, proponents should calculate the Sea Level Rise Design Flood Elevation by adding 12" of freeboard for buildings, and 24" of freeboard for critical facilities and infrastructure and any ground floor residential units.

What is the Sea Level Rise - Base Flood Elevation for the site (Ft BCB)?

What is the Sea Level Rise - Design Flood Elevation for the site (Ft BCB)?

First Floor Elevation (Ft BCB):

What are the Site Elevations at Building (Ft BCB)?

What is the Accessible Route Elevation (Ft BCB)?

Describe site design strategies for adapting to sea level rise including building access during flood events, elevated site areas, hard and soft barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe how the proposed Building Design Flood Elevation will be achieved including dry / wet flood proofing, critical systems protection, utility service protection, temporary flood barriers, waste and drain water back flow prevention, etc.:

Describe how occupants might shelter in place during a flooding event including any emergency power, water, and waste water provisions and the expected availability of any such measures:

Describe any strategies that would support rapid recovery after a weather event:

E.2 – Sea Level Rise and Storms – Adaptation Strategies

Describe future site design and or infrastructure adaptation strategies for responding to sea level rise including future elevating of site areas and access routes, barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe future building adaptation strategies for raising the Sea Level Rise Design Flood Elevation and further protecting critical systems, including permanent and temporary measures:

Thank you for completing the Boston Climate Change Checklist!

For questions or comments about this checklist or Climate Change best practices, please contact:
John.Dalzell@boston.gov

Boston Planning & Development Agency
Climate Resiliency Report Summary

boston planning & development agency

Submitted: 05/09/2018 09:27:26

A.1 - Project Information

Project Name:	Kenmore Square Redevelopment - Beacon Building			
Project Address:	650-660 Beacon Street			
Filing Type:	Initial (PNF, EPNF, NPC or other substantial filing)			
Filing Contact:	Geoff Starsiak	Epsilon Associates	gstarsiak@epsilonassociates.com	978-9-897-7100
Is MEPA approval required?	No	MEPA date:		

A.2 - Project Team

Owner / Developer:	Related Beal
Architect:	Stantec and Roger Ferris + Partners
Engineer:	WSP
Sustainability / LEED:	WSP
Permitting:	Epsilon Associates
Construction Management:	

A.3 - Project Description and Design Conditions

List the principal Building Uses:	Commercial, Retail
List the First Floor Uses:	Retail, Lobbies
List any Critical Site Infrastructure and or Building Uses:	None

Site and Building:

Site Area (SF):	47500	Building Area (SF):	142500
Building Height (Ft):	93	Building Height (Stories):	7
Existing Site Elevation – Low (Ft BCB):	18.6	Existing Site Elevation – High (Ft BCB):	18.6
Proposed Site Elevation – Low (Ft BCB):		Proposed Site Elevation – High (Ft BCB):	18.6
Proposed First Floor Elevation (Ft BCB):	18.6	Below grade spaces/levels (#):	1

Article 37 Green Building:

LEED Version - Rating System:	LEED v4 BD+C CS	LEED Certification:	Yes
Proposed LEED rating:	Silver	Proposed LEED point score (Pts.):	59

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Building Envelope:

When reporting R values, differentiate between R discontinuous and R continuous. For example, use "R13" to show R13 discontinuous and use R10c.i. to show R10 continuous. When reporting U value, report total assembly U value including supports and structural elements.

Roof:	30	Exposed Floor :	N/A
Foundation Wall:	N/A	Slab Edge (at or below grade):	F-0.52

Vertical Above-grade Assemblies (%'s are of total vertical area and together should total 100%):

Area of Opaque Curtain Wall & Spandrel Assembly:	N/A	Wall & Spandrel Assembly Value:	N/A
Area of Framed & Insulated / Standard Wall:	40	Wall Value:	18
Area of Vision Window:	60	Window Glazing Assembly Value:	
		Window Glazing SHGC:	
Area of Doors:		Door Assembly Value :	

Energy Loads and Performance

For this filing – describe how energy loads & performance were determined	1371628		
Annual Electric (kWh):	1371628	Peak Electric (kW):	800
Annual Heating (MMbtu/hr):	324.5	Peak Heating (MMbtu):	3.25
Annual Cooling (Tons/hr):	170387	Peak Cooling (Tons):	400
Energy Use - Below ASHRAE 90.1 - 2013 (%):	20.6	Have the local utilities reviewed the building energy performance?:	No
Energy Use - Below Mass. Code (%):	20.6	Energy Use Intensity (kBtu/SF):	38.5

Back-up / Emergency Power System

Electrical Generation Output (kW):	500	Number of Power Units:	1
System Type (kW):	Diesel generator	Fuel Source:	Diesel

Emergency and Critical System Loads (in the event of a service interruption)

Electric (kW):	450	Heating (MMbtu/hr):	25
		Cooling (Tons/hr):	6

B – Greenhouse Gas Reduction and Net Zero / Net Positive Carbon Building Performance

Reducing greenhouse gas emissions is critical to avoiding more extreme climate change conditions. To achieve the City's goal of carbon-neutrality by 2050 the performance of new buildings will need to progressively improve to carbon net zero and net positive.

B.1 – GHG Emissions - Design Conditions

For this filing - Annual Building GHG Emissions (Tons): 405

For this filing - describe how building energy performance has been integrated into project planning, design, and engineering and any supporting analysis or modeling:

Energy modeling has been ever-present throughout the process of the design. The design options will be analyzed for energy savings and energy cost savings at 100% SD, 100% DD, and 100% CD.

Describe building specific passive energy efficiency measures including orientation, massing, building envelop, and systems:

Improved Glass Assembly U-value and SHGC.
Energy Recovery has been included to incorporate energy and waste-heat savings.
Occupancy sensors will be applied throughout the building.
Daylighting controls are expected to be used where feasible.
High performance fixtures such as LED (light emitting diodes) will be installed throughout the project.
Energy Star appliance will be specified where applicable.
HVAC equipment will be design to maximize efficiency and exceed code standard.

Describe building specific active energy efficiency measures including high performance equipment, controls, fixtures, and systems:

It is expected that premium motors will be used in the mechanical, electrical, and plumbing systems and other mechanical equipment such as elevators (where applicable).
Lighting controls will enable controlability and energy savings throughout the project.
Dedicated outside air unit with energy recovery wheel.
Variable Refridgerant Flow Units (VRF).

Describe building specific load reduction strategies including on-site renewable energy, clean energy, and storage systems:

Currently, these are not part of the design but will be analyzed as the project and budget progress.

Describe any area or district scale emission reduction strategies including renewable energy, central energy plants, distributed energy systems, and smart grid infrastructure:

The utilization of centralized electricity-based VRF systems are highly efficient. The team did not utilize a plant outside of the building beyond electricity from the available grid. Should the grid become a smart grid, the building will be enabled to adapt to that technology.

Describe any energy efficiency assistance or support provided or to be provided to the project:

The team will be meeting with Eversource and National Grid to determine and finalize the options for rebates and incentives for technologies and controls in the building.

B.2 - GHG Reduction - Adaptation Strategies

Describe how the building and its systems will evolve to further reduce GHG emissions and achieve annual carbon net zero and net positive performance (e.g. added efficiency measures, renewable energy, energy storage, etc.) and the timeline for meeting that goal (by 2050):

The current systems are reliant on an efficient form of electricity from the grid, which is has reduced its emissions by more than 15% over the past 5 years. This trend is likely to continue with regulations, and in addition, the amenity space and outside areas are structurally sound for the implementation of solar in the future.

C - Extreme Heat Events

Annual average temperature in Boston increased by about 2˚F in the past hundred years and will continue to rise due to climate change. By the end of the century, the average annual temperature could be 56° (compared to 46° now) and the number of days above 90° (currently about 10 a year) could rise to 90.

C.1 – Extreme Heat - Design Conditions

Temperature Range - Low (Deg.):	8	Temperature Range - High (Deg.):	91
Annual Heating Degree Days:	5641	Annual Cooling Degree Days	2897

What Extreme Heat Event characteristics will be / have been used for project planning

Days - Above 90° (#):	60	Days - Above 100° (#):	30
Number of Heatwaves / Year (#):	6	Average Duration of Heatwave (Days):	5

Describe all building and site measures to reduce heat-island effect at the site and in the surrounding area:

The Project will include high-albedo roof materials, new street trees and other landscaping to minimize the heat island effect. The project team is also studying the feasibility of incorporating a green roof.

C.2 - Extreme Heat – Adaptation Strategies

Describe how the building and its systems will be adapted to efficiently manage future higher average temperatures, higher extreme temperatures, additional annual heatwaves, and longer heatwaves:

The building will include high performance heating, cooling, and ventilation, lighting controls, building system controls, healthy/resilient materials, and energy recovery.

Describe all mechanical and non-mechanical strategies that will support building functionality and use during extended interruptions of utility services and infrastructure including proposed and future adaptations:

	In the event of an extended utility service interruption, it is anticipated that the building will be closed.

D - Extreme Precipitation Events

From 1958 to 2010, there was a 70 percent increase in the amount of precipitation that fell on the days with the heaviest precipitation. Currently, the 10-Year, 24-Hour Design Storm precipitation level is 5.25". There is a significant probability that this will increase to at least 6" by the end of the century. Additionally, fewer, larger storms are likely to be accompanied by more frequent droughts.

D.1 – Extreme Precipitation - Design Conditions

What is the project design precipitation level? (In. / 24 Hours)	6

Describe all building and site measures for reducing storm water run-off:

The project will incorporate stormwater management and treatment systems that will improve water quality, reduce runoff volume and control peak rates of runoff in comparison to existing conditions. The project will provide infiltration that retains site runoff while providing treatment and peak flow mitigation, in accordance with stormwater standards and BWSC. The project will incorporate methods included in the Complete Streets Guidelines to improve stormwater infiltration on-site. The feasibility of a green roof is being studied.

D.2 - Extreme Precipitation - Adaptation Strategies

Describe how site and building systems will be adapted to efficiently accommodate future more significant rain events (e.g. rainwater harvesting, on-site storm water retention, bio swales, green roofs):

The project will utilize on site storm water retention to sustainably infiltrate and reuse stormwater on site. The feasibility of a green roof is being studied.

E – Sea Level Rise and Storms

Under any plausible greenhouse gas emissions scenario, the sea level in Boston will continue to rise throughout the century. This will increase the number of buildings in Boston susceptible to coastal flooding and the likely frequency of flooding for those already in the floodplain.

Is any portion of the site in a FEMA Special Flood Hazard Area?	No	What Zone:	
What is the current FEMA SFHA Zone Base Flood Elevation for the site (Ft BCB)?			

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Is any portion of the site in the BPDA Sea Level Rise Flood Hazard Area (see SLR-FHA online map)?	No

If you answered YES to either of the above questions, please complete the following questions.
Otherwise you have completed the questionnaire; thank you!

E.1 – Sea Level Rise and Storms – Design Conditions

Proposed projects should identify immediate and future adaptation strategies for managing the flooding scenario represented by the Sea Level Rise Flood Hazard Area (SLR-FHA), which includes 3.2' of sea level rise above 2013 tide levels, an additional 2.5" to account for subsidence, and the 1% Annual Chance Flood. After using the SLR-FHA to identify a project's Sea Level Rise Base Flood Elevation, proponents should calculate the Sea Level Rise Design Flood Elevation by adding 12" of freeboard for buildings, and 24" of freeboard for critical facilities and infrastructure and any ground floor residential units.

What is the Sea Level Rise - Base Flood Elevation for the site (Ft BCB)?			
What is the Sea Level Rise - Design Flood Elevation for the site (Ft BCB)?		First Floor Elevation (Ft BCB):	
What are the Site Elevations at Building (Ft BCB)?		What is the Accessible Route Elevation (Ft BCB)?	

Describe site design strategies for adapting to sea level rise including building access during flood events, elevated site areas, hard and soft barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe how the proposed Building Design Flood Elevation will be achieved including dry / wet flood proofing, critical systems protection, utility service protection, temporary flood barriers, waste and drain water back flow prevention, etc.:

Describe how occupants might shelter in place during a flooding event including any emergency power, water, and waste water provisions and the expected availability of any such measures:

Describe any strategies that would support rapid recovery after a weather event:

E.2 – Sea Level Rise and Storms – Adaptation Strategies

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Describe future site design and or infrastructure adaptation strategies for responding to sea level rise including future elevating of site areas and access routes, barriers, wave / velocity breaks, storm water systems, utility services, etc.:

Describe future building adaptation strategies for raising the Sea Level Rise Design Flood Elevation and further protecting critical systems, including permanent and temporary measures:

Thank you for completing the Boston Climate Change Checklist!

For questions or comments about this checklist or Climate Change best practices, please contact:
John.Dalzell@boston.gov

Appendix E

Accessibility Checklist

Article 80 – Accessibility Checklist

A requirement of the Boston Planning & Development Agency (BPDA)
Article 80 Development Review Process

The Mayor's Commission for Persons with Disabilities strives to reduce architectural, procedural, attitudinal, and communication barriers that affect persons with disabilities in the City of Boston. In 2009, a Disability Advisory Board was appointed by the Mayor to work alongside the Commission in creating universal access throughout the city's built environment. The Disability Advisory Board is made up of 13 volunteer Boston residents with disabilities who have been tasked with representing the accessibility needs of their neighborhoods and increasing inclusion of people with disabilities.

In conformance with this directive, the BDPA has instituted this Accessibility Checklist as a tool to encourage developers to begin thinking about access and inclusion at the beginning of development projects, and strive to go beyond meeting only minimum MAAB / ADAAG compliance requirements. Instead, our goal is for developers to create ideal design for accessibility which will ensure that the built environment provides equitable experiences for all people, regardless of their abilities. As such, any project subject to Boston Zoning Article 80 Small or Large Project Review, including Institutional Master Plan modifications and updates, must complete this Accessibility Checklist thoroughly to provide specific detail about accessibility and inclusion, including descriptions, diagrams, and data.

For more information on compliance requirements, advancing best practices, and learning about progressive approaches to expand accessibility throughout Boston's built environment. Proponents are highly encouraged to meet with Commission staff, prior to filing.

Accessibility Analysis Information Sources:

1. Americans with Disabilities Act – 2010 ADA Standards for Accessible Design
   http://www.ada.gov/2010ADAstandards_index.htm
2. Massachusetts Architectural Access Board 521 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
3. Massachusetts State Building Code 780 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/building-codebbrs.html
4. Massachusetts Office of Disability – Disabled Parking Regulations
   http://www.mass.gov/anf/docs/mod/hp-parking-regulations-summary-mod.pdf
5. MBTA Fixed Route Accessible Transit Stations
   http://www.mbta.com/riding_the_t/accessible_services/
6. City of Boston – Complete Street Guidelines
   http://bostoncompletestreets.org/
7. City of Boston – Mayor's Commission for Persons with Disabilities Advisory Board
   www.boston.gov/disability
8. City of Boston – Public Works Sidewalk Reconstruction Policy
   http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
9. City of Boston – Public Improvement Commission Sidewalk Café Policy
   http://www.cityofboston.gov/images_documents/Sidewalk_cafes_tcm3-1845.pdf

Glossary of Terms:

1. ***Accessible Route*** – A continuous and unobstructed path of travel that meets or exceeds the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 20
2. ***Accessible Group 2 Units*** – Residential units with additional floor space that meet or exceed the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 9.4
3. ***Accessible Guestrooms*** – Guestrooms with additional floor space, that meet or exceed the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 8.4
4. ***Inclusionary Development Policy (IDP)*** – Program run by the BPDA that preserves access to affordable housing opportunities, in the City. For more information visit: http://www.bostonplans.org/housing/overview
5. ***Public Improvement Commission (PIC)*** – The regulatory body in charge of managing the public right of way. For more information visit: https://www.boston.gov/pic
6. ***Visitability*** – A place's ability to be accessed and visited by persons with disabilities that cause functional limitations; where architectural barriers do not inhibit access to entrances/doors and bathrooms.

1. Project Information:

If this is a multi-phased or multi-building project, fill out a separate Checklist for each phase/building.

Project Name:	**Kenmore Square Redevelopment – Commonwealth Building**
Primary Project Address:	**533 to 541 Commonwealth Avenue**
Total Number of Phases/Buildings:	**One new building**
Primary Contact (Name / Title / Company / Email / Phone):	**Alex Provost, Related Beal, aprovost@relatedbeal.com**
Owner / Developer:	**Related Beal**
Architect:	**Stantec Architecture (Executive Architect), Roger Ferris + Partners (Design Architect)**
Civil Engineer:	**VHB**
Landscape Architect:	**Kyle Zick Landscape Architecture**
Permitting:	**Epsilon Associates**
Construction Management:	**TBD**

At what stage is the project at time of this questionnaire? Select below:

☑***PNF / Expanded PNF Submitted***	Draft / Final Project Impact Report Submitted	BPDA Board Approved
BPDA Design Approved	Under Construction	Construction Completed:

Do you anticipate filing for any variances with the Massachusetts Architectural Access Board (MAAB)? ***If yes,*** identify and explain.	No, we do not anticipate filing for any variances.

2. Building Classification and Description:

This section identifies preliminary construction information about the project including size and uses.

What are the dimensions of the project?

Site Area:	*20,032 SF*	Building Area:	*140,000 GSF*
Building Height:	*110 FT.*	Number of Stories:	*8 Flrs.*

First Floor Elevation:	18.6	Is there below grade space:		*Yes*
What is the Construction Type? (Select most appropriate type)				
	Wood Frame	Masonry	☑**Steel Frame**	☑**Concrete**
What are the principal building uses? (IBC definitions are below – select all appropriate that apply)				
	Residential – One - Three Unit	Residential - Multi-unit, Four +	Institutional	Educational
	☑**Business**	☑**Mercantile**	Factory	Hospitality
	Laboratory / Medical	Storage, Utility and Other		
List street-level uses of the building:	*Retail, lobbies*			

3. Assessment of Existing Infrastructure for Accessibility:

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

Provide a description of the neighborhood where this development is located and its identifying topographical characteristics:	The project is located in Kenmore Square, which is a dense commercial area with a variety of uses. The area is relatively flat with sidewalks throughout.
List the surrounding accessible MBTA transit lines and their proximity to development site: commuter rail / subway stations, bus stops:	Kenmore Station, which serves the Green Line, is across from the project site and is accessible. Five accessible bus routes also stop at the station.
List the surrounding institutions: hospitals, public housing, elderly and disabled housing developments, educational facilities, others:	The site is adjacent to Boston University and is near the Longwood Medical and Academic Area.
List the surrounding government buildings: libraries, community centers, recreational facilities, and other related facilities:	None in the immediate neighborhood.

4. Surrounding Site Conditions – Existing:

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

Is the development site within a historic district? ***If yes,*** identify which district:	No
Are there sidewalks and pedestrian	There are two existing ramps on site at the corner of Beacon and Deerfield

ramps existing at the development site? ***If yes***, list the existing sidewalk and pedestrian ramp dimensions, slopes, materials, and physical condition at the development site:	Street. Both ramps are brick and in good condition. One of the two ramps have detectable warnings and neither have a level landing. There are existing brick sidewalks on site in good condition with cross slopes ranging from 1%-4%. Both ramps and sidewalks will be reconstructed as part of the new development.
Are the sidewalks and pedestrian ramps existing-to-remain? ***If yes,*** have they been verified as ADA / MAAB compliant (with yellow composite detectable warning surfaces, cast in concrete)? ***If yes,*** provide description and photos:	The existing sidewalks and ramps will be reconstructed to ADA/MAAB standards as part of the project.
5. Surrounding Site Conditions – Proposed *This section identifies the proposed condition of the walkways and pedestrian ramps around the development site. Sidewalk width contributes to the degree of comfort walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may create dangerous conditions that force people to walk in the street. Wider sidewalks allow people to walk side by side and pass each other comfortably walking alone, walking in pairs, or using a wheelchair.*	
Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? ***If yes***, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, or Boulevard.	Mixed Use
What are the total dimensions and slopes of the proposed sidewalks? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone:	Frontage Zone: 0-2' Pedestrian Zone: 8'-10' Greenscape/Furnishing Zone: 1'-6" to 9' Curb Zone: 6"
List the proposed materials for each Zone. Will the proposed materials be on private property or will the proposed materials be on the City of Boston pedestrian right-of-way?	Pedestrian Zone: Concrete Frontage Zone: Concrete unit pavers & concrete Greenscape/Furnishing Zone: Pervious concrete unit pavers, concrete unit pavers Curb Zone: Granite curbing & bituminous concrete

Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way? ***If yes,*** what are the proposed dimensions of the sidewalk café or furnishings and what will the remaining right-of-way clearance be?	Sidewalk cafes are programmed under the proposed building canopy of the Commonwealth Building within private property. Furnishings will be programmed for the pedestrian right of way in the furnishing zone. An 8' wide minimum pedestrian zone is maintained throughout the project.
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the Public Improvement Commission (PIC)?	The pedestrian right-of-way is not on private property.
Will any portion of the Project be going through the PIC? ***If yes,*** identify PIC actions and provide details.	The project will seek PIC approval for Specific Repairs on Beacon and Deerfield Street for curb realignment, tree pits, permeable pavers, bike racks, benches, etc. Any additional actions will be determined as the design progresses.
6. Accessible Parking: *See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirement counts and the Massachusetts Office of Disability – Disabled Parking Regulations*.	
What is the total number of parking spaces provided at the development site? Will these be in a parking lot or garage?	60 parking spaces will be provided at the Commonwealth Building within the below grade garage.
What is the total number of accessible spaces provided at the development site? How many of these are "Van Accessible" spaces with an 8 foot access aisle?	At the Commonwealth Building, 3 accessible spaces will be provided; 1 of the 3 will be van accessible.
Will any on-street accessible parking spaces be required? ***If yes,*** has the proponent contacted the Commission for Persons with Disabilities regarding this need?	This has not been determined.
Where is the accessible visitor parking located?	Accessible visitor parking will be provided in the basement.
Has a drop-off area been identified?	A drop off location has not yet been identified. If it is determined that a drop

If yes, will it be accessible?	off is required, it will be designed to be accessible.
7. Circulation and Accessible Routes: *The primary objective in designing smooth and continuous paths of travel is to create universal access to entryways and common spaces, which accommodates persons of all abilities and allows for visitability with neighbors.*	
Describe accessibility at each entryway: Example: Flush Condition, Stairs, Ramp, Lift or Elevator:	All entryways will be accessible with a flush condition.
Are the accessible entrances and standard entrance integrated? ***If yes,*** *describe.* ***If no,*** what is the reason?	Yes, all entryways will grant accessible entrance.
If project is subject to Large Project Review/Institutional Master Plan, describe the accessible routes way-finding / signage package.	The way-finding/signage package has not been developed at this stage of design.
8. Accessible Units (Group 2) and Guestrooms: (If applicable) *In order to facilitate access to housing and hospitality, this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing and hotel rooms.*	
What is the total number of proposed housing units or hotel rooms for the development?	NA
If a residential development, how many units are for sale? How many are for rent? What is the breakdown of market value units vs. IDP (Inclusionary Development Policy) units?	NA
If a residential development, how many accessible Group 2 units are being proposed?	NA
If a residential development, how many accessible Group 2 units will also be IDP units? ***If none***, describe reason.	NA

If a hospitality development, how many accessible units will feature a wheel-in shower? Will accessible equipment be provided as well? ***If yes,*** provide amount and location of equipment.	NA
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs / thresholds at entry, step to balcony, others. ***If yes,*** provide reason.	NA
Are there interior elevators, ramps or lifts located in the development for access around architectural barriers and/or to separate floors? ***If yes,*** describe:	NA
9. Community Impact: *Accessibility and inclusion extend past required compliance with building codes. Providing an overall scheme that allows full and equal participation of persons with disabilities makes the development an asset to the surrounding community.*	
Is this project providing any funding or improvements to the surrounding neighborhood? Examples: adding extra street trees, building or refurbishing a local park, or supporting other community-based initiatives?	This has not been determined.
What inclusion elements does this development provide for persons with disabilities in common social and open spaces? Example: Indoor seating and TVs in common rooms; outdoor seating and barbeque grills in yard. Will all of these spaces and features provide accessibility?	All common spaces within the project will be accessible.
Are any restrooms planned in	No, the entrance lobbies will not include restrooms that are accessible to the

common public spaces? ***If yes,*** will any be single-stall, ADA compliant and designated as "Family"/ "Companion" restrooms? ***If no***, explain why not.	public.
Has the proponent reviewed the proposed plan with the City of Boston Disability Commissioner or with their Architectural Access staff? ***If yes,*** did they approve? ***If no,*** what were their comments?	No, the plans have not been reviewed with the City of Boston Disability Commissioner or with their Architectural Access staff.
Has the proponent presented the proposed plan to the Disability Advisory Board at one of their monthly meetings? Did the Advisory Board vote to support this project? ***If no,*** what recommendations did the Advisory Board give to make this project more accessible?	No, the plans have not been presented to the Disability Advisory Board.

10. Attachments

Include a list of all documents you are submitting with this Checklist. This may include drawings, diagrams, photos, or any other material that describes the accessible and inclusive elements of this project.

Provide a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations, including route distances.

Provide a diagram of the accessible route connections through the site, including distances.

Provide a diagram the accessible route to any roof decks or outdoor courtyard space? (if applicable)

Provide a plan and diagram of the accessible Group 2 units, including locations and route from accessible entry.
NA

Provide any additional drawings, diagrams, photos, or any other material that describes the inclusive and accessible elements of this project.

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-
-
-

Article 80 | ACCESSIBILTY CHECKLIST

This completes the Article 80 Accessibility Checklist required for your project. Prior to and during the review process, Commission staff are able to provide technical assistance and design review, in order to help achieve ideal accessibility and to ensure that all buildings, sidewalks, parks, and open spaces are usable and welcoming to Boston's diverse residents and visitors, including those with physical, sensory, and other disabilities.

For questions or comments about this checklist, or for more information on best practices for improving accessibility and inclusion, visit www.boston.gov/disability, or our office:

The Mayor's Commission for Persons with Disabilities
1 City Hall Square, Room 967,
Boston MA 02201.

Architectural Access staff can be reached at:

accessibility@boston.gov | patricia.mendez@boston.gov | sarah.leung@boston.gov | 617-635-3682

Article 80 – Accessibility Checklist

A requirement of the Boston Planning & Development Agency (BPDA)
Article 80 Development Review Process

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   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
3. Massachusetts State Building Code 780 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/building-codebbrs.html
4. Massachusetts Office of Disability – Disabled Parking Regulations
   http://www.mass.gov/anf/docs/mod/hp-parking-regulations-summary-mod.pdf
5. MBTA Fixed Route Accessible Transit Stations
   http://www.mbta.com/riding_the_t/accessible_services/
6. City of Boston – Complete Street Guidelines
   http://bostoncompletestreets.org/
7. City of Boston – Mayor's Commission for Persons with Disabilities Advisory Board
   www.boston.gov/disability
8. City of Boston – Public Works Sidewalk Reconstruction Policy
   http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
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6. ***Visitability*** – A place's ability to be accessed and visited by persons with disabilities that cause functional limitations; where architectural barriers do not inhibit access to entrances/doors and bathrooms.

1. Project Information:

If this is a multi-phased or multi-building project, fill out a separate Checklist for each phase/building.

Project Name:	**Kenmore Square Redevelopment – Beacon Building**
Primary Project Address:	**642 to 660 Beacon Street,**
Total Number of Phases/Buildings:	**Renovation of one existing building and the construction of one new building**
Primary Contact (Name / Title / Company / Email / Phone):	**Alex Provost, Related Beal, aprovost@relatedbeal.com**
Owner / Developer:	**Related Beal**
Architect:	**Stantec Architecture (Executive Architect), Roger Ferris + Partners (Design Architect)**
Civil Engineer:	**VHB**
Landscape Architect:	**Kyle Zick Landscape Architecture**
Permitting:	**Epsilon Associates**
Construction Management:	**TBD**

At what stage is the project at time of this questionnaire? Select below:

☑***PNF / Expanded PNF Submitted***	Draft / Final Project Impact Report Submitted	BPDA Board Approved
BPDA Design Approved	Under Construction	Construction Completed:

Do you anticipate filing for any variances with the Massachusetts Architectural Access Board (MAAB)? ***If yes,*** identify and explain.	No, we do not anticipate filing for any variances.

2. Building Classification and Description:

This section identifies preliminary construction information about the project including size and uses.

What are the dimensions of the project?

Site Area:	*23,972 SF*	Building Area:	*135,000 GSF*
Building Height:	*93 FT.*	Number of Stories:	*7 Flrs.*

First Floor Elevation:	18.6	Is there below grade space:		*Yes*
What is the Construction Type? (Select most appropriate type)				
	Wood Frame	☑Masonry	☑**Steel Frame**	☑**Concrete**
What are the principal building uses? (IBC definitions are below – select all appropriate that apply)				
	Residential – One - Three Unit	Residential - Multi-unit, Four +	Institutional	Educational
	☑**Business**	☑**Mercantile**	Factory	Hospitality
	Laboratory / Medical	Storage, Utility and Other		
List street-level uses of the building:	*Retail, lobbies*			

3. Assessment of Existing Infrastructure for Accessibility:

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

Provide a description of the neighborhood where this development is located and its identifying topographical characteristics:	The project is located in Kenmore Square, which is a dense commercial area with a variety of uses. The area is relatively flat with sidewalks throughout.
List the surrounding accessible MBTA transit lines and their proximity to development site: commuter rail / subway stations, bus stops:	Kenmore Station, which serves the Green Line, is across from the project site and is accessible. Five accessible bus routes also stop at the station.
List the surrounding institutions: hospitals, public housing, elderly and disabled housing developments, educational facilities, others:	The site is adjacent to Boston University and is near the Longwood Medical and Academic Area.
List the surrounding government buildings: libraries, community centers, recreational facilities, and other related facilities:	None in the immediate neighborhood.

4. Surrounding Site Conditions – Existing:

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

Is the development site within a historic district? ***If yes,*** identify which district:	No
Are there sidewalks and pedestrian	There are two existing ramps on site at the corner of Beacon and Deerfield

ramps existing at the development site? ***If yes***, list the existing sidewalk and pedestrian ramp dimensions, slopes, materials, and physical condition at the development site:	Street. Both ramps are brick and in good condition. One of the two ramps have detectable warnings and neither have a level landing. There are existing brick sidewalks on site in good condition with cross slopes ranging from 1%-4%. Both ramps and sidewalks will be reconstructed as part of the new development.
Are the sidewalks and pedestrian ramps existing-to-remain? ***If yes,*** have they been verified as ADA / MAAB compliant (with yellow composite detectable warning surfaces, cast in concrete)? ***If yes,*** provide description and photos:	The existing sidewalks and ramps will be reconstructed to ADA/MAAB standards as part of the project.
5. Surrounding Site Conditions – Proposed *This section identifies the proposed condition of the walkways and pedestrian ramps around the development site. Sidewalk width contributes to the degree of comfort walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may create dangerous conditions that force people to walk in the street. Wider sidewalks allow people to walk side by side and pass each other comfortably walking alone, walking in pairs, or using a wheelchair.*	
Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? ***If yes***, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, or Boulevard.	Mixed Use
What are the total dimensions and slopes of the proposed sidewalks? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone:	Frontage Zone: 0-2' Pedestrian Zone: 8'-10' Greenscape/Furnishing Zone: 1'-6" to 9' Curb Zone: 6"
List the proposed materials for each Zone. Will the proposed materials be on private property or will the proposed materials be on the City of Boston pedestrian right-of-way?	Pedestrian Zone: Concrete Frontage Zone: Concrete unit pavers & concrete Greenscape/Furnishing Zone: Pervious concrete unit pavers, concrete unit pavers Curb Zone: Granite curbing & bituminous concrete

Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way? ***If yes,*** what are the proposed dimensions of the sidewalk café or furnishings and what will the remaining right-of-way clearance be?	Furnishings will be programmed for the pedestrian right of way in the furnishing zone. An 8' wide minimum pedestrian zone is maintained throughout the project.
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the Public Improvement Commission (PIC)?	The pedestrian right-of-way is not on private property.
Will any portion of the Project be going through the PIC? ***If yes,*** identify PIC actions and provide details.	The project will seek PIC approval for Specific Repairs on Beacon and Deerfield Street for curb realignment, tree pits, permeable pavers, bike racks, benches, etc. Any additional actions will be determined as the design progresses.
6. Accessible Parking: *See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirement counts and the Massachusetts Office of Disability – Disabled Parking Regulations*.	
What is the total number of parking spaces provided at the development site? Will these be in a parking lot or garage?	60 parking spaces will be provided at the Commonwealth Building within the below grade garage. (No spaces are being provided at the Beacon Building.)
What is the total number of accessible spaces provided at the development site? How many of these are "Van Accessible" spaces with an 8 foot access aisle?	At the Commonwealth Building, 3 accessible spaces will be provided; 1 of the 3 will be van accessible
Will any on-street accessible parking spaces be required? ***If yes,*** has the proponent contacted the Commission for Persons with Disabilities regarding this need?	This has not been determined
Where is the accessible visitor parking located?	Accessible visitor parking will be provided in the basement
Has a drop-off area been identified? ***If yes,*** will it be accessible?	A drop off location has not yet been identified. If it is determined that a drop off is required, it will be designed to be accessible.

7. Circulation and Accessible Routes: *The primary objective in designing smooth and continuous paths of travel is to create universal access to entryways and common spaces, which accommodates persons of all abilities and allows for visitability with neighbors.*	
Describe accessibility at each entryway: Example: Flush Condition, Stairs, Ramp, Lift or Elevator:	All entryways will be accessible with a flush condition.
Are the accessible entrances and standard entrance integrated? ***If yes,*** *describe.* ***If no,*** what is the reason?	Yes, all entryways will grant accessible entrance
If project is subject to Large Project Review/Institutional Master Plan, describe the accessible routes way-finding / signage package.	The way-finding/signage package has not been developed at this stage of design.
8. Accessible Units (Group 2) and Guestrooms: (If applicable) *In order to facilitate access to housing and hospitality, this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing and hotel rooms.*	
What is the total number of proposed housing units or hotel rooms for the development?	NA
If a residential development, how many units are for sale? How many are for rent? What is the breakdown of market value units vs. IDP (Inclusionary Development Policy) units?	NA
If a residential development, how many accessible Group 2 units are being proposed?	NA
If a residential development, how many accessible Group 2 units will also be IDP units? ***If none***, describe reason.	NA

If a hospitality development, how many accessible units will feature a wheel-in shower? Will accessible equipment be provided as well? ***If yes,*** provide amount and location of equipment.	NA
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs / thresholds at entry, step to balcony, others. ***If yes,*** provide reason.	NA
Are there interior elevators, ramps or lifts located in the development for access around architectural barriers and/or to separate floors? ***If yes,*** describe:	NA
9. Community Impact: *Accessibility and inclusion extend past required compliance with building codes. Providing an overall scheme that allows full and equal participation of persons with disabilities makes the development an asset to the surrounding community.*	
Is this project providing any funding or improvements to the surrounding neighborhood? Examples: adding extra street trees, building or refurbishing a local park, or supporting other community-based initiatives?	This has not been determined
What inclusion elements does this development provide for persons with disabilities in common social and open spaces? Example: Indoor seating and TVs in common rooms; outdoor seating and barbeque grills in yard. Will all of these spaces and features provide accessibility?	All common spaces within the project will be accessible
Are any restrooms planned in	No, the entrance lobbies will not include restrooms that are accessible to the

common public spaces? ***If yes,*** will any be single-stall, ADA compliant and designated as "Family"/ "Companion" restrooms? ***If no***, explain why not.	public.
Has the proponent reviewed the proposed plan with the City of Boston Disability Commissioner or with their Architectural Access staff? ***If yes,*** did they approve? ***If no,*** what were their comments?	No, the plans have not been reviewed with the City of Boston Disability Commissioner or with their Architectural Access staff
Has the proponent presented the proposed plan to the Disability Advisory Board at one of their monthly meetings? Did the Advisory Board vote to support this project? ***If no,*** what recommendations did the Advisory Board give to make this project more accessible?	No, the plans have not been presented to the Disability Advisory Board

10. Attachments

Include a list of all documents you are submitting with this Checklist. This may include drawings, diagrams, photos, or any other material that describes the accessible and inclusive elements of this project.

Provide a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations, including route distances.

Provide a diagram of the accessible route connections through the site, including distances.

Provide a diagram the accessible route to any roof decks or outdoor courtyard space? (if applicable)

Provide a plan and diagram of the accessible Group 2 units, including locations and route from accessible entry.
NA

Provide any additional drawings, diagrams, photos, or any other material that describes the inclusive and accessible elements of this project.

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Article 80 | ACCESSIBILTY CHECKLIST

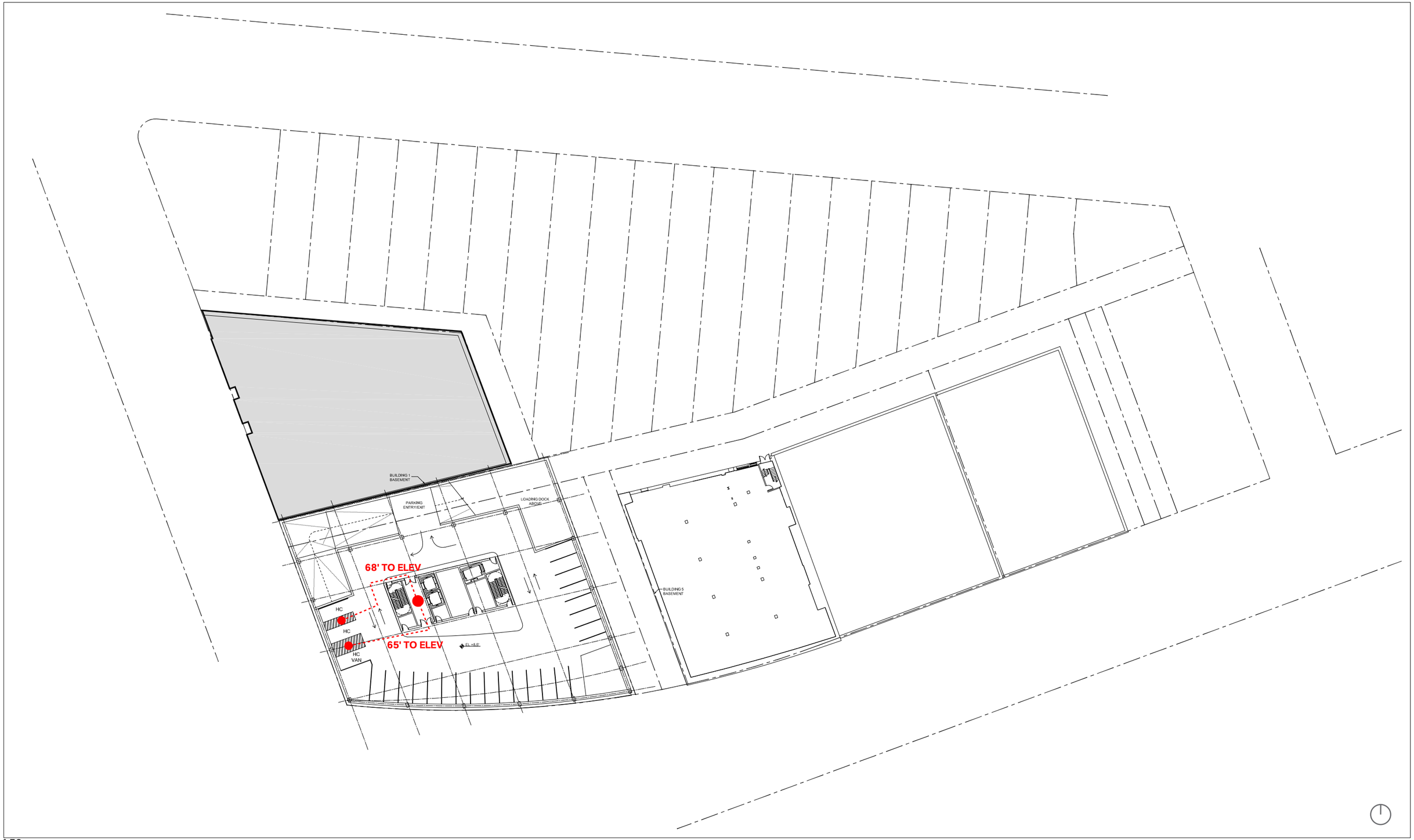
This completes the Article 80 Accessibility Checklist required for your project. Prior to and during the review process, Commission staff are able to provide technical assistance and design review, in order to help achieve ideal accessibility and to ensure that all buildings, sidewalks, parks, and open spaces are usable and welcoming to Boston's diverse residents and visitors, including those with physical, sensory, and other disabilities.

For questions or comments about this checklist, or for more information on best practices for improving accessibility and inclusion, visit www.boston.gov/disability, or our office:

The Mayor's Commission for Persons with Disabilities
1 City Hall Square, Room 967,
Boston MA 02201.

Architectural Access staff can be reached at:

accessibility@boston.gov | patricia.mendez@boston.gov | sarah.leung@boston.gov | 617-635-3682



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ACCESSIBLE ACCESS POINT

ACCESSIBLE ROUTE

RELATED BEAL | Kenmore Square
Boston, MA

ACCESSIBILITY DIAGRAM - PARKING LEVEL B1

Roger Ferris + Partners

RELATED BEAL

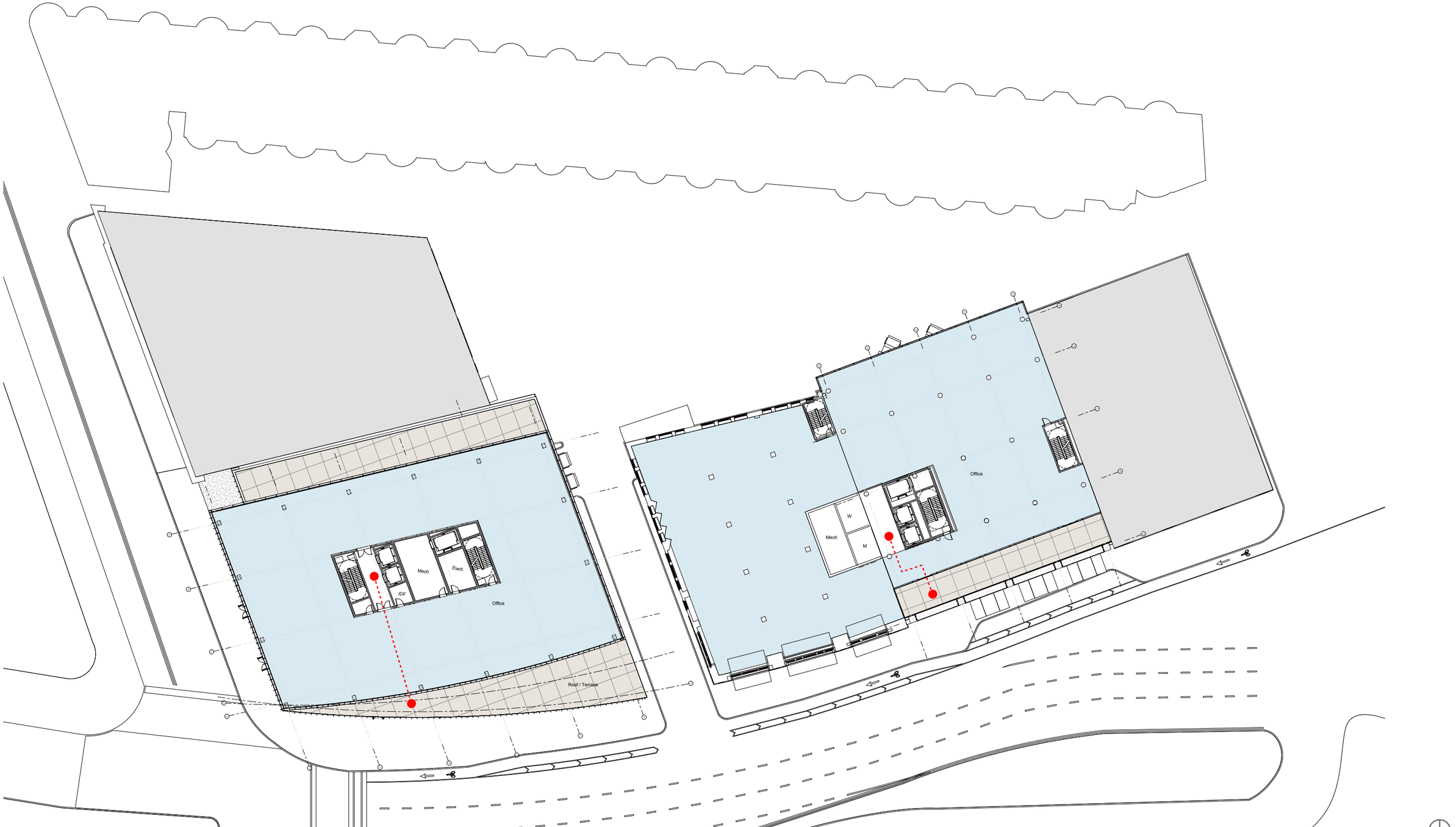
Kenmore Square
Boston, MA

ACCESSIBILITY DIAGRAM - GROUND LEVEL

ACCESSIBLE ACCESS POINT

ACCESSIBLE ROUTE

Roger Ferris + Partners



RELATED BEAL

Kenmore Square
Boston, MA

ACCESSIBILITY DIAGRAM - TYPICAL FLOOR

ACCESSIBLE ACCESS POINT

ACCESSIBLE ROUTE

Roger Ferris + Partners