PUBLIC NOTICE

The Boston Redevelopment Authority ("BRA"), pursuant to Sections 80A-2 and 80B-5 of the Boston Zoning Code (“Code”), hereby gives notice that a Draft Project Impact Report for Large Project Review ("DPIR") was received by the BRA on April 11, 2016 from Northeastern University and American Campus Communities.

The Proposed Project will comprise an approximately 310,000 square foot (sf) building for student housing that will contain approximately 800 beds in apartment units on the upper floors as well as ground floor commercial space. The Columbus Avenue Student Housing Project (the “Project”) is located at 10 Burke Street, bounded by Burke Street to the east, Columbus Avenue to the north, Coventry Street to the west, and an existing building to the south.

The Proponent is seeking the issuance by the BRA of a Preliminary Adequacy Determination Waiving Further Review pursuant to Section 80B-5.4(c)(iv) of the Code. In such Preliminary Adequacy Determination, the BRA may waive further review pursuant to Section 80B-5.4(c)(iv) of the Code if, after reviewing public comments, the BRA finds that the DPIR adequately describes the Proposed Project's impacts.

The DPIR may be reviewed in the office of the Secretary of the BRA, Room 910, Boston City Hall, 9th Floor, Boston, MA 02201 between 9:00 AM and 5:00 PM, Monday through Friday, except legal holidays. Public comments on the DPIR, including the comments of public agencies, should be submitted in writing to Ms. Katelyn Sullivan, BRA Senior Project Manager, at the address stated above or at Katelyn.Sullivan@boston.gov within 60 days of the date of this notice.

BOSTON REDEVELOPMENT AUTHORITY
Teresa Polhemus
Executive Director/Secretary

Draft Project Impact Report

Columbus Avenue Student Housing

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

Submitted by:
American Campus Communities
12700 Hill Country Blvd, Suite T-200
Austin, TX 78738

and

Northeastern University
360 Huntington Avenue
Boston, MA 02115

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

In Association with:
Cube 3 Studio LLC
Elkus Manfredi Architects
Goulston & Storrs
Howard Stein Hudson Associates
Nitsch Engineering
Price Sustainability Associates
AKF Engineers

April 11, 2016

NORTHEASTERN UNIVERSITY
AMERICAN CAMPUS COMMUNITIES
Epsilon ASSOCIATES INC.

Draft Project Impact Report

Submitted Pursuant to Article 80B of the Boston Zoning Code

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April 11, 2016

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Section 1.0

Project Summary

1.0 PROJECT SUMMARY

1.1 Project Overview

Northeastern University (the University) and American Campus Communities (ACC, or the Proponent) propose to develop the approximately 23,434 square foot site at 10 Burke Street, located on the southeastern edge of the Northeastern University campus (the Project site). The Project site, which currently contains a surface parking lot, is bounded by Burke Street to the east, Columbus Avenue to the north, Coventry Street to the west, and an existing building to the south of the site. The proposed development includes the construction of an approximately 310,000 square foot (sf) building dedicated mainly to student residential use, as well as first floor commercial space and student amenities and services. The Columbus Avenue Student Housing Project (the Project) will contain approximately 207 apartment units (approximately 800 beds).

The Project will be eight stories along Columbus Avenue, consistent with the existing buildings along the street. Stepping back towards Tremont Street, the eastern half of the building will be 20 stories, and the western portion will be 16 stories. The taller portion of the building features a slender profile when viewed from both Columbus Avenue and Tremont Street. By concentrating the greatest mass of the design at mid-block, the existing streetwall along Columbus Avenue is maintained.

In addition to allowing Northeastern University to continue to achieve its housing goals, the Project will reduce student housing impacts on Boston neighborhoods. The Project will contribute to the growing identity of Columbus Avenue by integrating public and University spaces that accommodate local needs and activities. The active ground floor uses, including commercial space fronting Columbus Avenue, will animate the street and present the internal life of the campus to the public realm.

The University intends to ground lease the site to an ACC-related entity that will develop, own and operate a student residence under a dormitory license from the City of Boston. The ground lease will restrict the use of the site to student housing apartments and will give Northeastern University students in their third, fourth, and fifth years of study the first right to lease apartments. The ground lease will require that the Project be operated in accordance with the Northeastern University student code of conduct and housing standards. This partnership between a local university and a national student housing developer represents an opportunity for Boston to attract private capital to fulfill the City's ambitious student housing goals.

Prior to designing the apartment sizes and layouts, ACC conducted extensive research through an online market survey and three student focus groups to understand the Northeastern University student market and off-campus housing products. The purpose of this research was to assess the preferred unit types, unit mix, and lease structures and to understand the student-parent decision-making process. As a result of this market research, the Project has been customized to meet these demands, including a flexible lease structure to accommodate students participating in the University's co-op program, and individual leases with each student rather than a shared liability lease for the apartment.

American Campus Communities, Inc., is the largest owner, manager and developer of high-quality student housing communities in the United States with more than 150 student housing properties containing approximately 96,300 beds. The company is a fully integrated, self-managed and self-administered equity real estate investment trust (REIT) with deep expertise in the design, finance, development, construction management and operational management of student housing properties. Including its owned and third-party managed properties, ACC's total management portfolio consists of almost 200 properties with 125,800 beds in approximately 100 markets nationwide.

The proposed Project exceeds 50,000 square feet of gross floor area, and the Project is therefore subject to the requirements of Large Project Review and Institutional Master Plan Review pursuant to Article 80 of the Boston Zoning Code (the Code). An Institutional Master Plan Notification Form (IMPNF)/ Project Notification Form (PNF) was submitted on January 21, 2016. This Draft Project Impact Report (DPIR) is being submitted to the Boston Redevelopment Authority (BRA) in response to the Scoping Determination issued by the BRA dated March 11, 2016.

1.2 Development Team

Address/Location:	10 Burke Street
Developer:	American Campus Communities, Inc. 12700 Hill County Blvd., Suite T-200 Austin, TX 78738 (512) 732-1000 Jason Wills Kyle McDonald
Institution:	Northeastern University 360 Huntington Avenue Boston, MA 02115 (617) 373-2000 Kathy Spiegelman

Architect:	CUBE 3 Studio LLC 360 Merrimack Street, Building 5, Floor 3 Lawrence, MA 01843 (978) 989-9900 Brian O'Connor Peter W. Bartash Mark Rogers
	Elkus Manfredi Architects 25 Drydock Avenue Boston, MA 02210 (617) 427-1300 David Manfredi Christian Galvao
Legal Counsel:	Goulston & Storrs 400 Atlantic Avenue Boston, MA 02110 (617) 482-1776 Matthew Kiefer Doug Husid
Permitting Consultants:	Epsilon Associates, Inc. 3 Clock Tower Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Peggy Briggs Talya Moked
Transportation and Parking Consultant	Howard Stein-Hudson Associates, Inc. 11 Beacon Street, Suite 1010 Boston, MA 02108 (617) 482-7080 Guy Busa Joe SanClemente
Civil Engineer	Nitsch Engineering 2 Center Plaza, Suite 430 Boston, MA 02108 (617) 338-0063 Gary Pease

MEP Engineer	AKF Engineers 99 Bedford Street, 2nd Floor Boston, MA 02111 (617) 737-1111 Mark Harrison
Geotechnical Consultant:	Haley & Aldrich 465 Medford Street, Suite 2200 Boston, MA 02129 (617) 886-7400 Marya Gorczyca

1.3 Public Benefits

In addition to the many community benefits provided by Northeastern University, as described in the IMP Amendment, the Columbus Avenue Student Housing Project will include numerous benefits to the neighborhood and the City of Boston, including but not limited to:

- ♦ Creation of approximately 800 new apartment-style student beds, which will reduce the number of students that seek off-campus housing and the student housing impacts on Boston neighborhoods.
- ♦ Creation of approximately 1,000 construction jobs and 35 permanent and part-time jobs.

The Project will provide a variety of urban design benefits to the surrounding neighborhood, including:

- ♦ Replace a surface parking lot with active ground floor uses, including commercial space that will animate the street.
- ♦ Enhance pedestrian connections on Columbus Avenue to the University campus to the north, and beyond the site to the south of Tremont Street.
- ♦ Contribute to the growing identity of Columbus Avenue by integrating public and University spaces.
- ♦ Comply with Article 37 of the Boston Zoning Code by being Leadership in Energy and Environmental Design (LEED) certifiable anticipated at the Gold level.

1.4 Preliminary Project Schedule

It is anticipated that construction will begin in the last quarter of 2016 and will last approximately 30 months.

1.5 Consistency with Zoning

The Project site is located within: (i) the Greater Roxbury Economic Development Area (EDA) of the Roxbury Neighborhood District governed by Article 50 of the Zoning Code; (ii) the Restricted Parking Overlay District, governed by Section 3-1A(c) of the Zoning Code; and (iii) the [Northeastern] Institutional Master Plan Area; and (iv) the South End Urban Renewal Area. A small portion of the Project site is also located within the Boulevard Planning District of the Roxbury Neighborhood District.

Section 7.3.11 of Northeastern's 2013 Institutional Master Plan (IMP) described a project on the Burke Street/Columbus Avenue (South Campus) site as including Mixed Use/Office and Residential (350 to 600 beds) with a proposed building height of ten stories, approximately 175,000 to 200,000 sf of gross floor area (GFA) and an estimated floor area ratio (FAR) of 8.0 to 9.0. As described in the IMPNF/PNF, the Project has been updated and revised from that described in the IMP. The Project will now include a new building with a height of approximately 230 feet and approximately 310,000 sf of GFA, resulting in a FAR of approximately 13.3. The Project's uses are anticipated to include approximately 207 apartment uses (approximately 800 beds), consisting of two-bedroom apartments with both shared and private accommodations, as well as four-bedroom apartments with private accommodations. The Project will also include on-site paraprofessional staff and resident assistants. The Project will include accessory uses such as student amenities, including a social lounge, recreation and gaming area, fitness center, Academic Success Center, laundry room and other accessory uses such as loading and trash and recycling facilities. The Project will include approximately 3,000 sf of GFA of ground floor commercial space.

Pursuant to Article 50 of the Code, for any proposed project in the Roxbury Neighborhood District undergoing Large Project Review, required off-street parking spaces are determined through such review in accordance with the provisions of Article 80. However, as modified by the IMP, no off-street parking is required to be provided in relation to the Project and, as described in the IMPNF, the Project will not include off-street parking.

The apartments will be restricted to student housing uses through the ground lease of the Project site from the University to an ACC-related entity and will be approved under a dormitory license in accordance with Northeastern's student code of conduct and housing standards, with paraprofessional staff and resident assistants on site. As such, the dwelling uses in the Project are classified as a Dormitory, as defined in Section 2A of the Zoning Code and are, therefore, exempt from the provisions of the Mayor's Order Relative to Inclusionary Development dated December 9, 2015

As further described in the IMP, provided that "future IMP projects receive Certifications of Consistency with the IMP and a Certification[s] of Compliance under Large or Small Project Review, as may be necessary, these projects will be 'deemed to be in compliance with the use, dimensional, parking and loading requirements of the underlying zoning (including special purpose overlay districts established pursuant to Section 3-1A), notwithstanding any provision of the underlying zoning to the contrary, and without the requirement of further Zoning Relief.'" Therefore, upon approval of the amendment to the IMP, the Proponent will confirm the Project's zoning compliance through obtaining a Certification of Consistency with the IMP pursuant to Section 80D-10 of the Zoning Code and a Certification of Compliance under Large Project review pursuant to Section 80B-6 of the Zoning Code. The Proponent also anticipates requesting a Map Amendment from the Zoning Commission. Project signage is expected to be approved either through the IMP process, or through the BRA's comprehensive sign design process.

1.6 Legal Information

1.6.1 Legal Judgments Adverse to the Proposed Project

The Proponent is not aware of any legal judgments in effect or legal actions pending with respect to the Project.

1.6.2 History of Tax Arrears on Property Owned in Boston by the Proponent

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

1.6.3 Site Control/ Public Easements

The University owns the property pursuant to deeds recorded in Suffolk County Registry of Deeds in Book 19922, Page 8; Book 25067, Page 321; Book 30484, Page 101 and Book 55535, Page 84. A portion of the property is subject to certain party wall rights, although the building has been demolished. See Appendix A for a site survey.

1.7 Regulatory Controls and Permits

Table 1-1 presents a preliminary list of local, state, and federal permits and approvals that may be required for the Proposed Project. The list is based on current information about the Proposed Project and is subject to change as the design of the Project advances. Some of the permits listed may not be required, while there may be others not listed that will be needed.

Table 1-1 Preliminary List of Permits and Approvals

Agency Name	*Permit/Approval*
Federal	
Federal Aviation Administration	Determination of No Hazard to Air Navigation
State	
Department of Environmental Protection	Self-Certification (as required); Notice of Construction
Massachusetts Water Resources Authority	MWRA Sewer Use Discharge Permit; Temporary Construction Site Dewatering Permit; Discharge Permit
Local	
Boston Redevelopment Authority	Article 80D IMP Amendment; Article 80B Large Project Review; Cooperation Agreement; Boston Residents Construction Employment Plan
Boston Zoning Commission	Approval of IMP Amendment Map Amendment (if required)
Boston Civic Design Commission	Design Review
Boston Water and Sewer Commission	Site Plan Review; Water and Sewer Connection Permits; Cross Connection Backflow Prevention Approval (as required); Temporary Construction Dewatering Permit (as required)
Public Improvement Commission	Specific Repair Plan (as required); Recharge Well (as required) Permit/Agreement for Temporary Earth Retention Systems, Tie-Back Systems and Temporary Support of Subsurface Construction (as required); Permit for sign, awning, hood, canopy or marquee (as required)
Boston Transportation Department	Construction Management Plan; Transportation Access Plan Agreement
Boston Public Works Department	Curb Cut Permit(s); Street Opening Permit (as required); Street/Sidewalk Occupancy Permit (as required)
Public Safety Commission Committee on Licenses	Flammable Storage License (as required)
Boston Licensing Board	Dormitory License
Boston Inspectional Services Department	Demolition Permits; Building Permits; Certificate of Occupancy
Boston Fire Department	Permit for fuel storage (as required)

Section 2.0

Project Description

2.0 PROJECT DESCRIPTION

This Chapter describes the proposed Project in detail, including its location, Project site plan, and proposed building program.

2.1 Project Setting and Site

The Project site is an approximately 23,424 sf site located on the southeastern edge of the Northeastern University campus (see Figure 2-1). The site, which currently contains a surface parking lot, is bounded by Burke Street to the east, Columbus Avenue to the north, Coventry Street to the west, and an existing building to the south of the site. The site is an ideal location for pedestrian and transit-oriented student housing. Students can easily walk to the main Boston campus buildings and the Ruggles Station is less than a quarter-mile walk from the site. Alternatively, there is an MBTA 43 bus at the corner of the site on Burke and Tremont Streets, which connects to Ruggles Station, providing access to the Orange Line and several Commuter Rail lines.

2.2 Proposed Development

The Columbus Avenue Student Housing Project, as shown in Table 2-1 below, is an approximately 310,000 sf building for student residential use that will include ground floor commercial use as well as student amenities and services. The proposed Project will include approximately 207 apartment units (approximately 800 beds), consisting of two-bedroom apartments with both shared and private accommodations, as well as four-bedroom apartments with private accommodations. The unit sizes and mix were based on student responses to an online market survey of Northeastern University students. All apartments will be fully furnished and will include full-sized beds. The Project will not include any parking.

Every residential apartment unit has wall-mounted bike storage with for a capacity totaling 590 bikes (74 percent of building residents). Additionally, the Project will have a common secured resident bike storage room at the ground floor for 44 bikes that will include a self-service bicycle repair station. There will be another 48 bike spaces for building visitors and retail customers distributed around the site.

Table 2-1 Project Program

Project Element	*Approximate Dimension*
Student Apartments	207 Apartment Units (800 beds)
Commercial Space	3,000 sf
Total	310,000 sf
Height	Maximum height of 230 feet (20 stories)

Columbus Avenue Student Housing **Boston, Massachusetts**

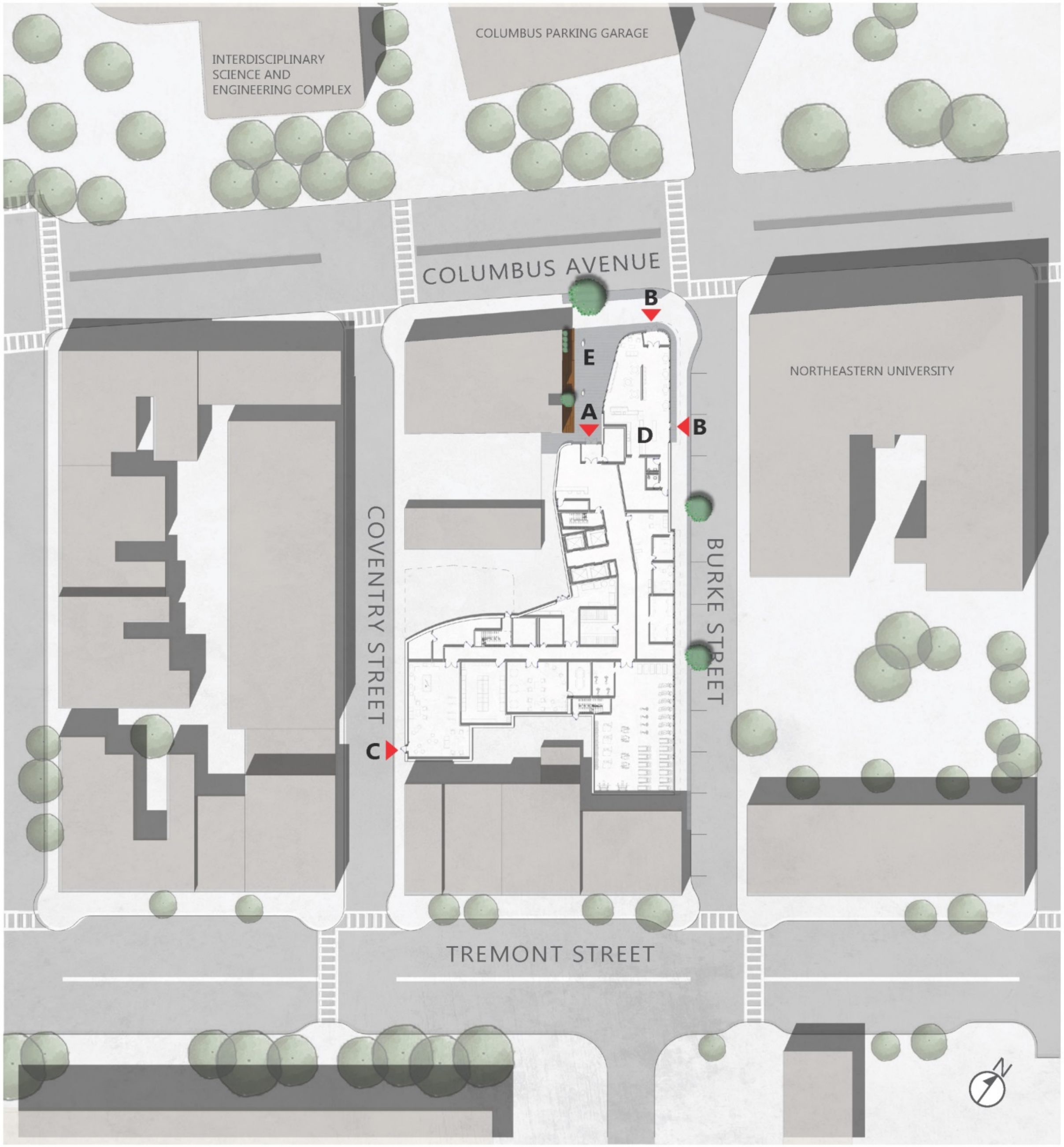
Epsilon
ASSOCIATES INC.

Figure 2-1
Aerial Site Locus

The Project will host a spectrum of student amenities, including a social lounge, recreation and gaming area, fitness center, Academic Success Center, and laundry room. Additionally, there will be on-site paraprofessional staff and resident assistants available. To contribute to the surrounding neighborhood, the building will include commercial space on the ground floor. These active ground floors uses will animate the street and present the internal life of the campus to the public realm. Figures 2-2 to 2-8 present a site plan, floor plans, sections, and elevations.

The Project will be eight stories along Columbus Avenue, similar in scale to the existing buildings along the street. Stepping back towards Tremont Street, the eastern half of the building will be 20 stories, and the western portion will be 16 stories. The taller portion of the building features a slender profile when viewed from both Columbus Avenue and Tremont Street. By concentrating the greatest mass of the design at mid-block, the existing streetwall along Columbus Avenue is maintained.

The building height can be described by three distinct categories that speak to the relationship between people and the areas of the building which are experienced from different distances. These distances are: close-, mid-, and long-range. In each case, the façade and massing are designed to address individuals at the scale which most closely affects their degree of experience. The character of Burke and Coventry Streets is and will be defined by the nature of the close-range experience – the proposed Project contains active amenity spaces along Burke Street to reinforce a sense of transparency and openness at the street level. At both Burke and Coventry Streets, close attention will be paid to the articulation, materiality, and treatment of façade as it meets the first floor and becomes an element of the pedestrian realm. The design team is exploring options for the introduction of trees along Burke Street to further soften the pedestrian edge. At the mid-range distance, the building massing weaves itself into the existing built environment along Columbus by stepping down to the height of an adjacent 8-story building. The building is buffered by existing low-rise buildings along Tremont Avenue. For individuals traveling along Columbus or Tremont Avenues, the intersections with Coventry and Burke Streets will preserve their existing scale and serve as a transition to the taller building height concentrated toward the middle of the block. The 17-story mass on Coventry Street will be clad with a material that has a color and texture reminiscent of the surrounding built environment. The size and placement of window openings will allow the building skin to feel light and transparent when viewed from a mid-range distance. The totality of the building will be experienced mostly by individuals viewing the building from a long-range distance, where its height will be viewed in context of nearby high-rises such as International Village, the ISEC building, GrandMarc, MassArt, and others.



LEGEND

A - Primary Resident Entry
B - Retail Entry
C - Secondary Resident Entry
D - Retail Space
E - Entry Terrace

Columbus Avenue Student Housing **Boston, Massachusetts**

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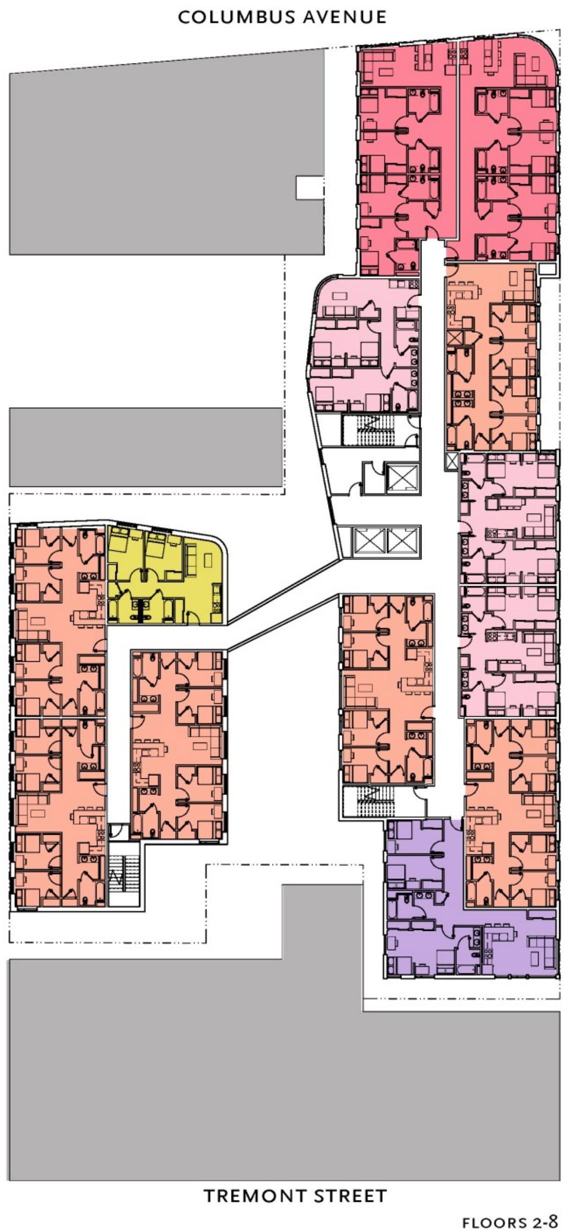
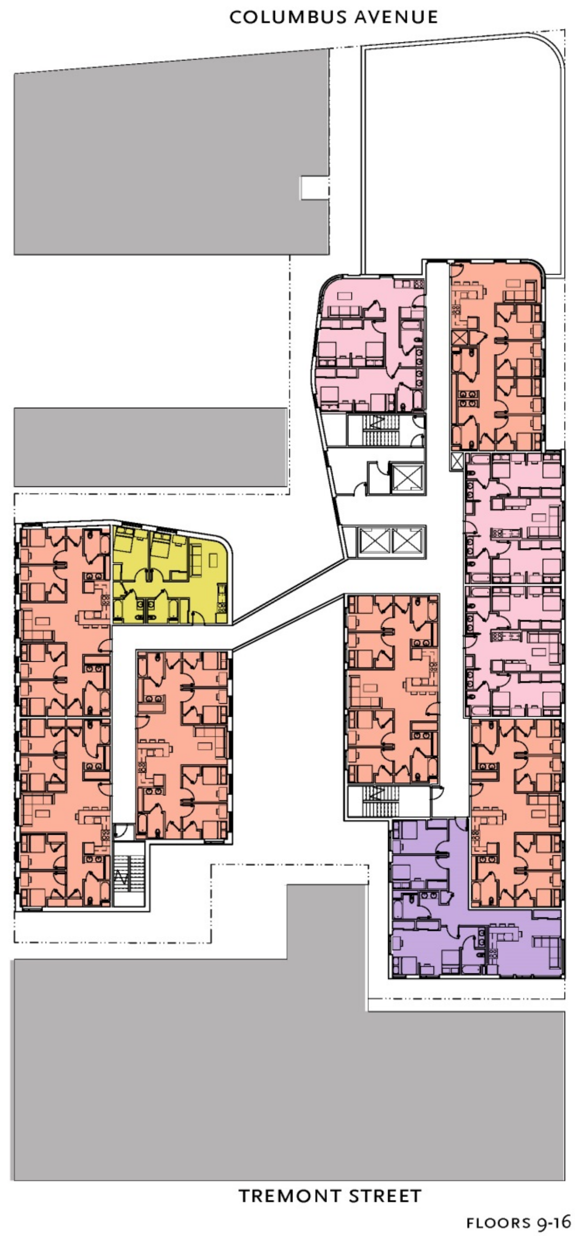
Figure 2-2

Site Plan





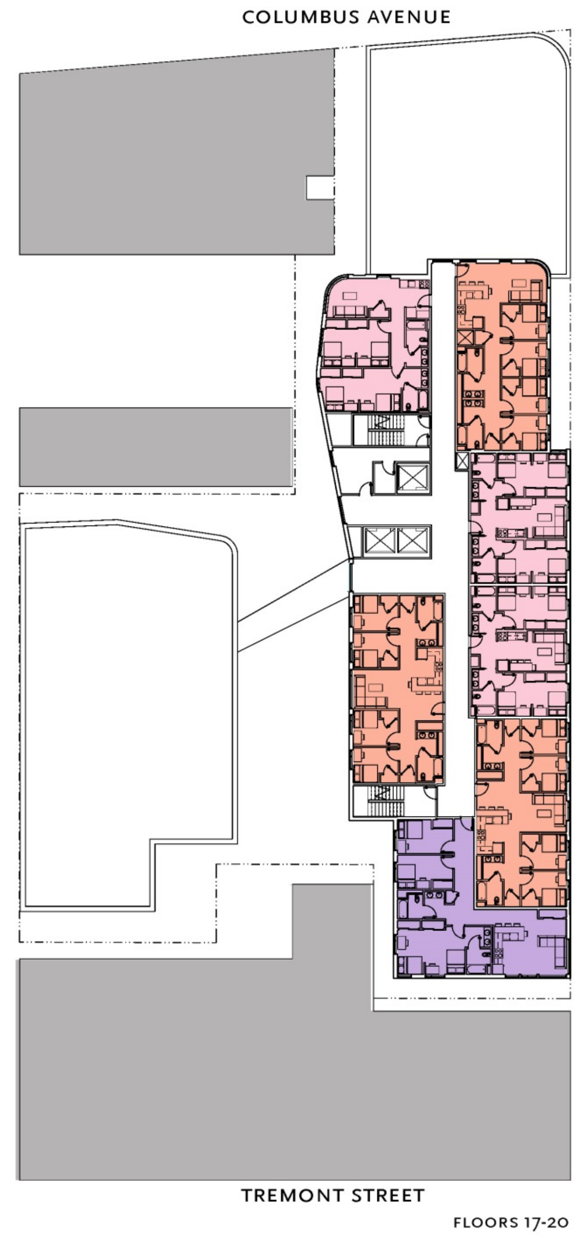


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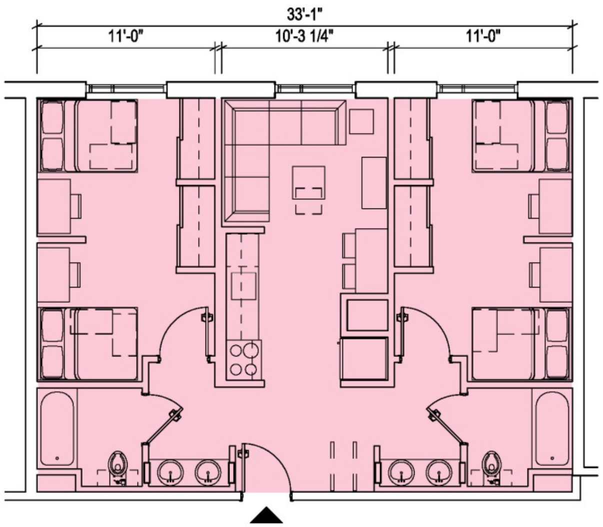
Figure 2-3

Typical Floor Plans



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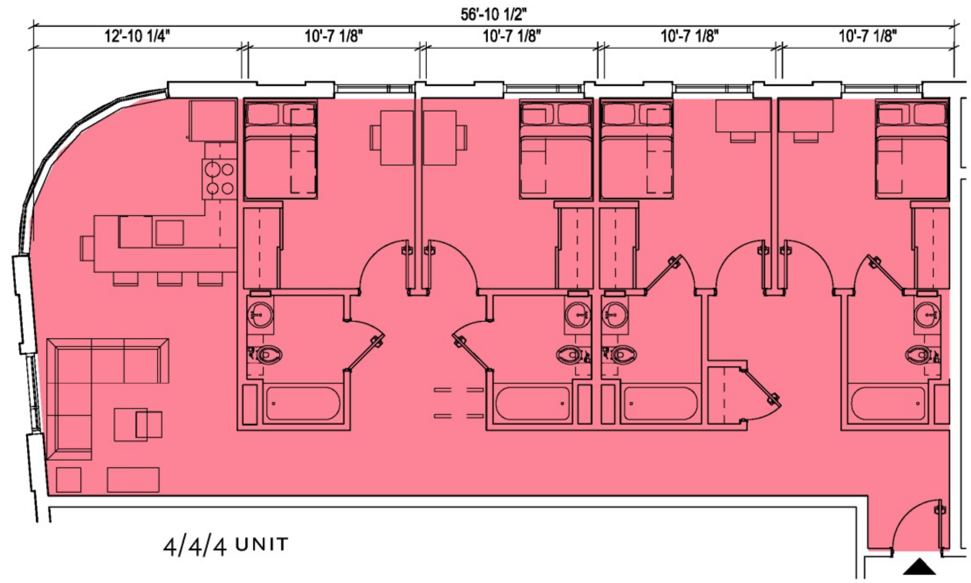

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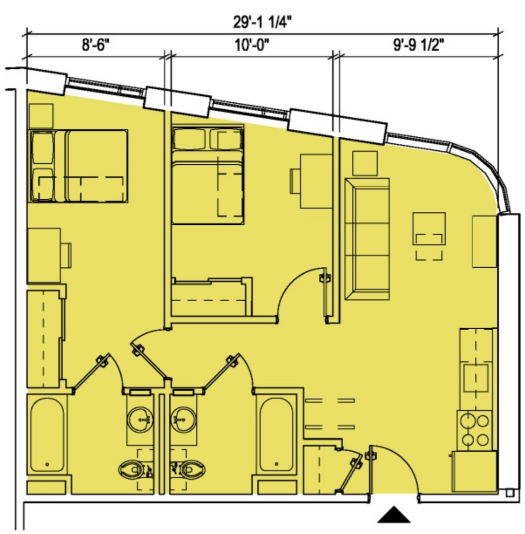

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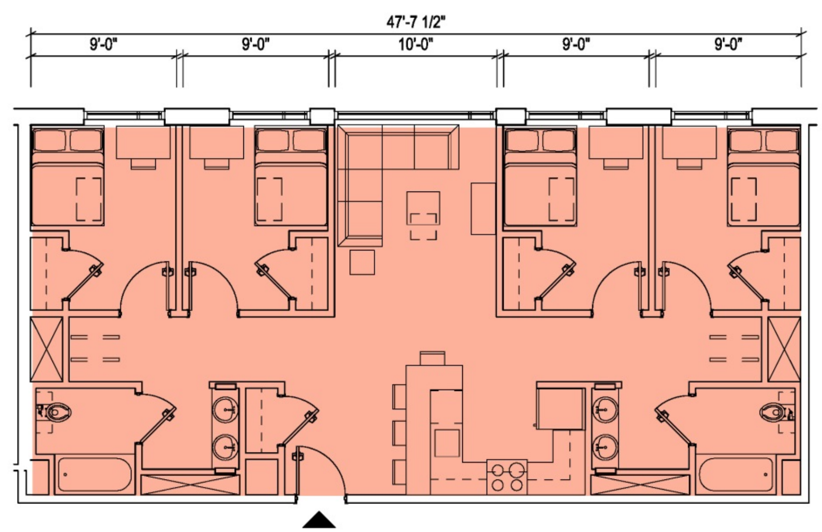

4/2/4 UNIT

Columbus Avenue Student Housing   Boston, Massachusetts

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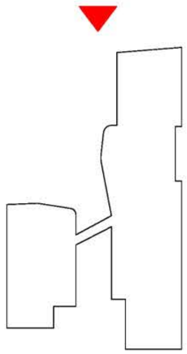
Figure 2-4

Unit Plans



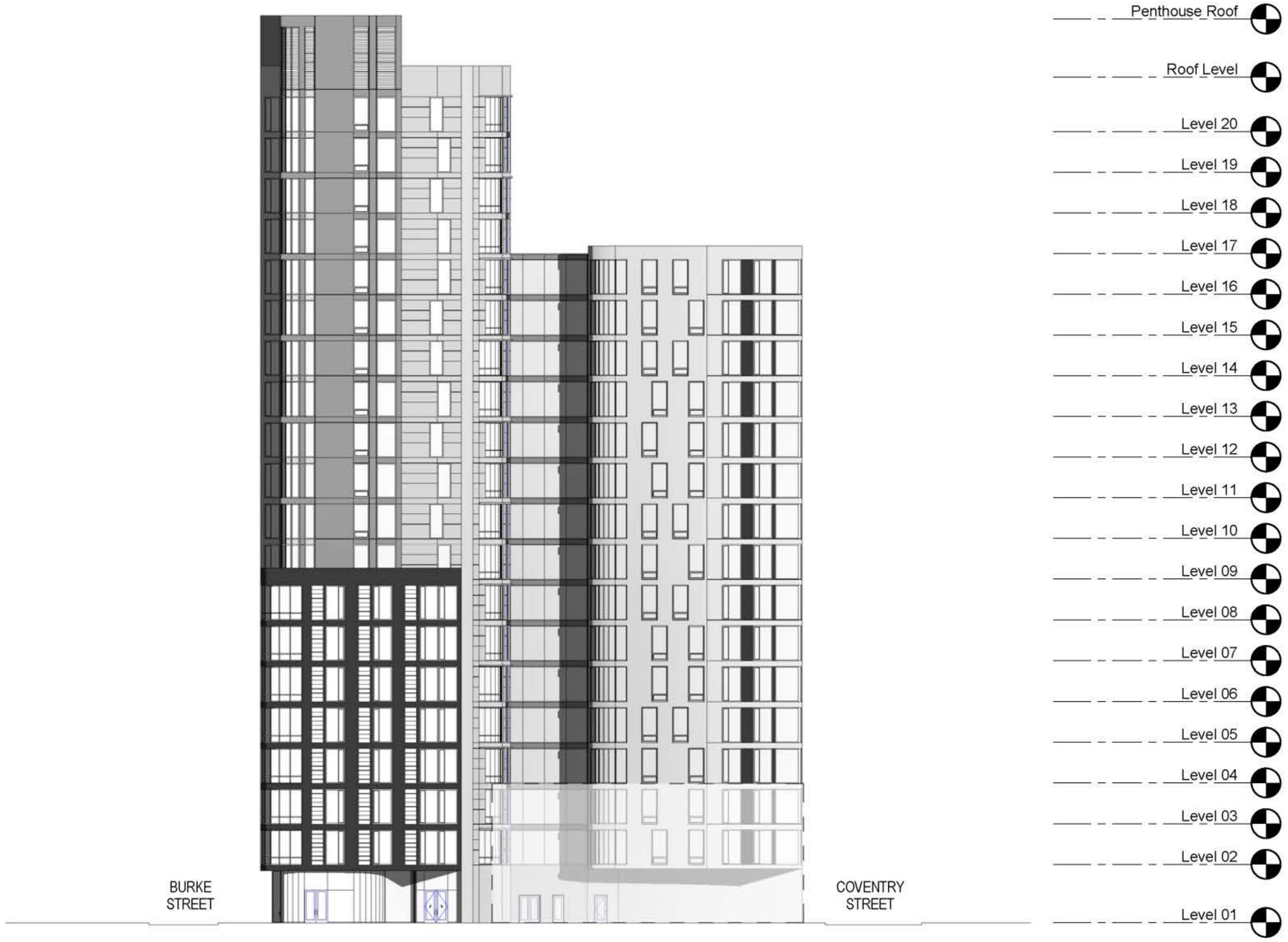


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Figure 2-5

North Elevation

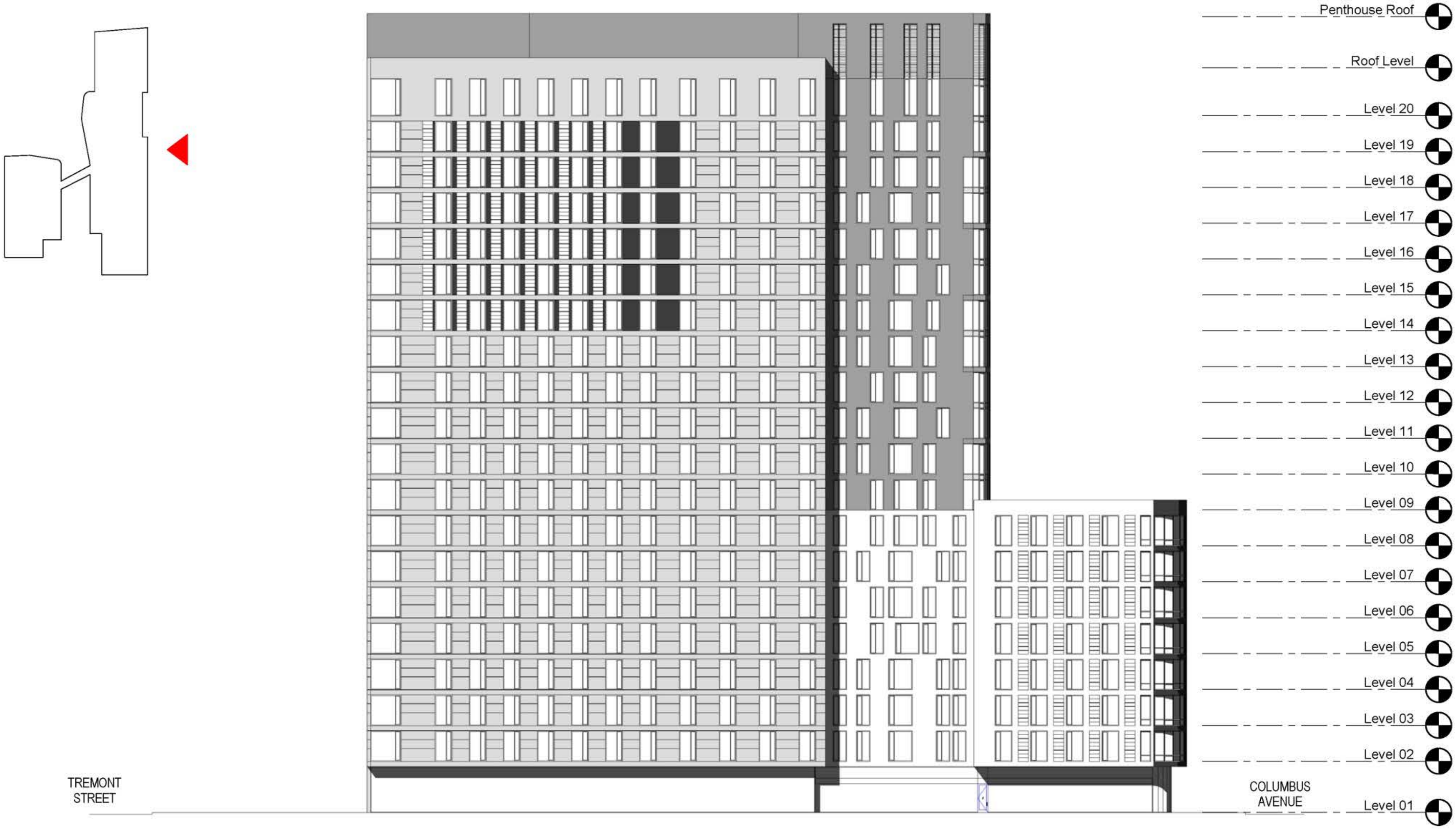

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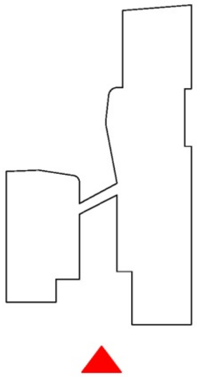
Figure 2-6

East Elevation



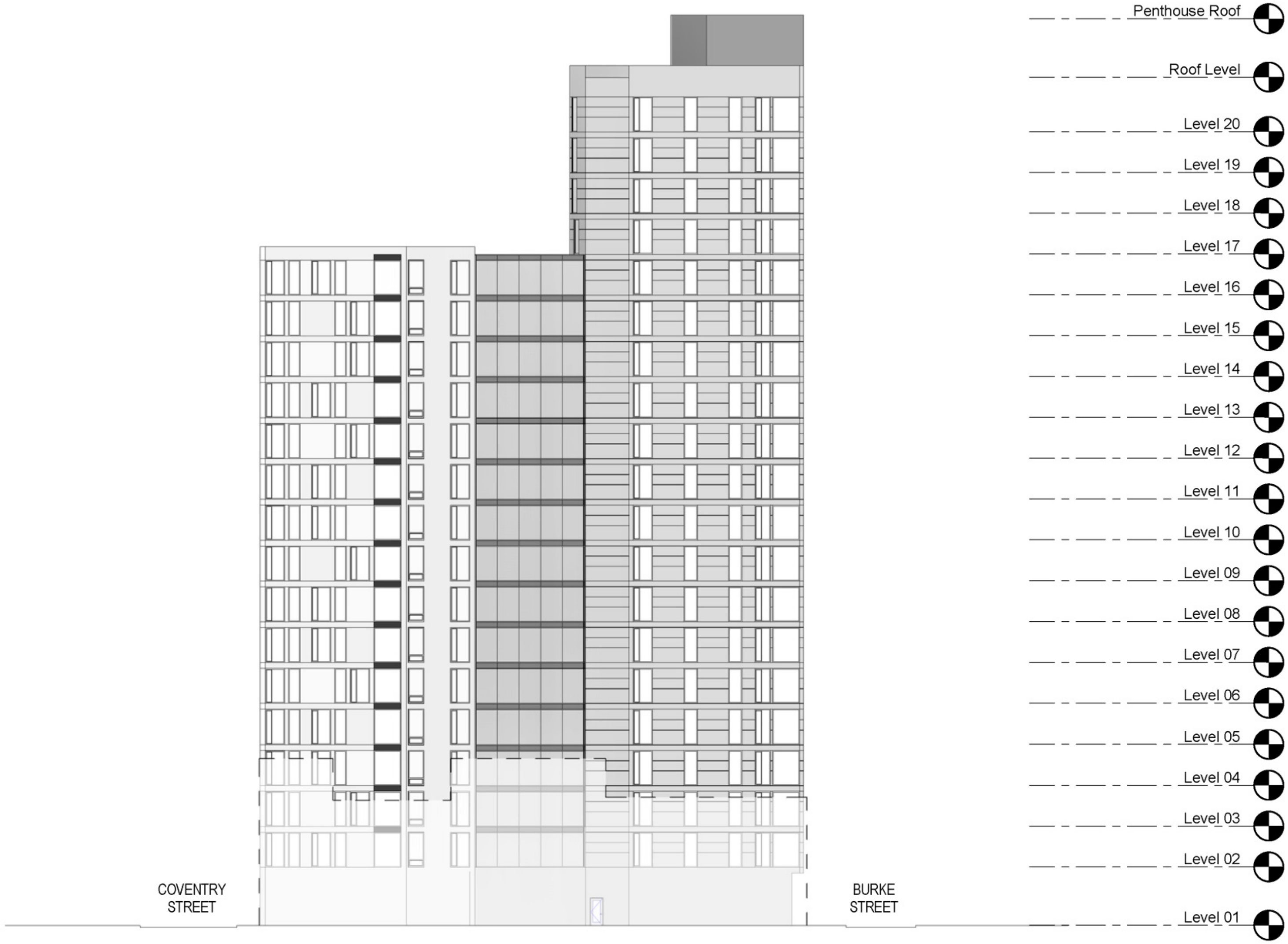


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Figure 2-7

South Elevation

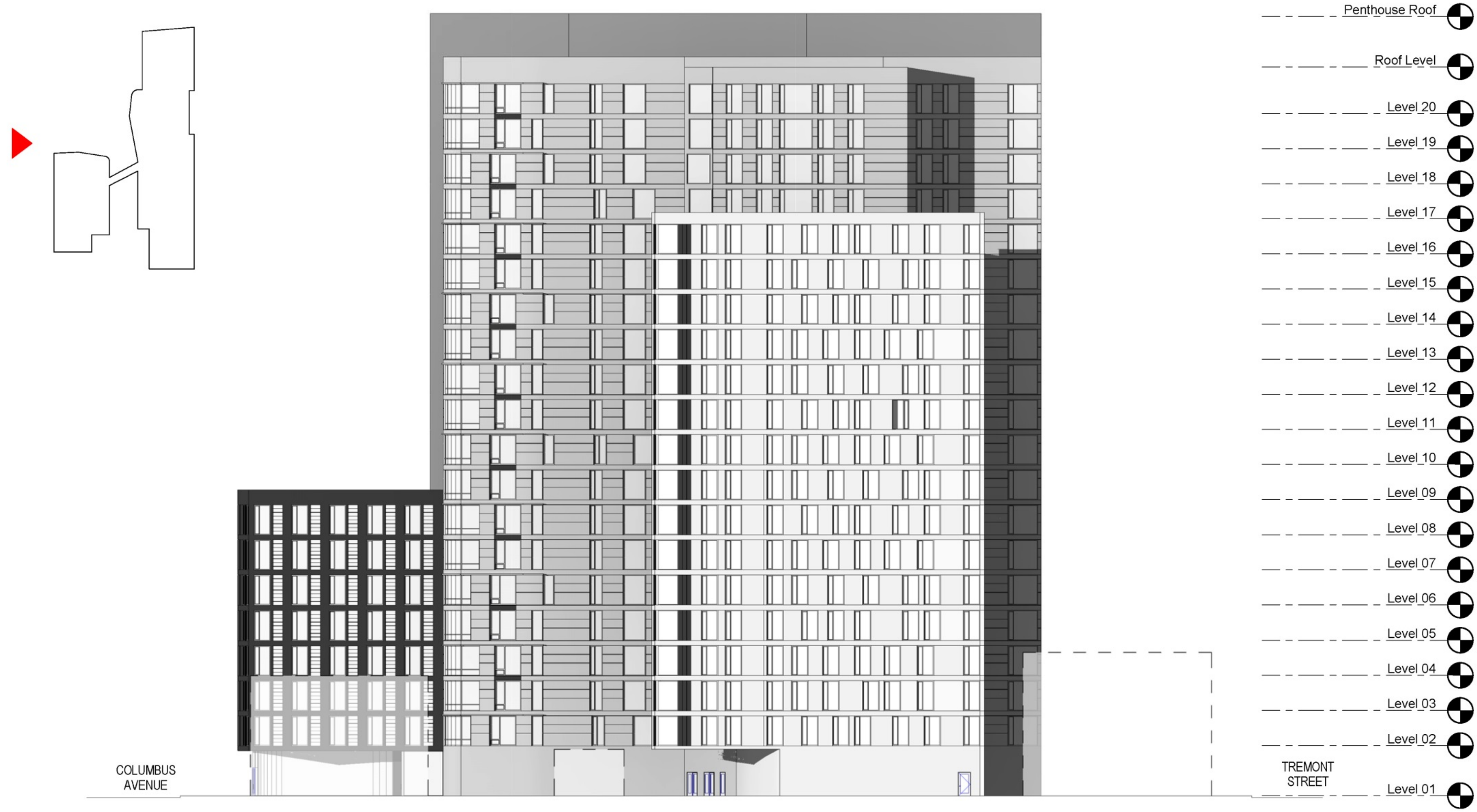

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Figure 2-8

West Elevation

The proposed Project will continue the ongoing transformation and revitalization of Columbus Avenue on the South Campus that began during the 2000 IMP. This Project will contribute to the pattern of residential infill that Northeastern has undertaken in recent years, anchored by International Village at the end of Columbus Avenue. The Project will contribute to the growing identity of Columbus Avenue by integrating public and University spaces that accommodate local needs and activities.

2.3 Property Management

2.3.1 On-site Staff

At American Campus Communities, each property includes on-site personnel dedicated to each of the functional areas of operations discussed in this section. In addition, the corporate office employs fully staffed teams to support the on-site staff with residence life, business operations, facilities maintenance, property marketing, leasing administration, accounting and financial reporting, information technology and training/staff development. Site personnel are properly trained, utilize the best systems in the industry and always have a dedicated resource expert at their disposal to assist in meeting residents' and institutional clients' needs.

Properties are staffed to maintain high standards of customer service and property maintenance. On-site staff typically includes, at a minimum, a general manager, assistant general manager, bookkeeper, leasing manager, maintenance supervisor, maintenance technicians and ports, a resident director and resident assistants.

Resident Assistants (RAs)

The RA is one of the most important positions in a community. This property will be staffed with approximately 18-20 RAs. They serve as representatives of the entire community's service team and residence life program. The RAs are often the residents' first and most frequent point of contact. Their work enhances the quality of life for residents and is essential in attaining ACC's residence life mission and objective. RAs are responsible for the most fundamental levels of service to provide for the clean, safe and quiet enjoyment of the facilities.

RAs are both service representatives and residents of the community. As such, they must act as a liaison between residents and other team members in situations ranging from helping a resident fill out a maintenance work order to knowing when to involve the General Manager in an emergency. RAs focus on enhancing the total living experience by making the proposed communities a fun place to live through activities, programs and individual engagement with residents.

Topics covered during the Resident Assistant training include:

- Community building;
- Peer advising;
- Campus resources;
- Emergency response;
- Programming;
- Conflict mediation; and
- Customer service.

Community Programming

Community programming is based on ACC's New Directions in Programming model to help students develop interpersonal, academic and life management skills. The residence life programming model is designed to provide residents with numerous opportunities to learn about academic success and personal growth. This is accomplished through meaningful interactions between the RAs and the residents, as well as creating positive relationships among the residents themselves.

Community engagement programs are those that encourage the residents to be productive and positive members of the property community. Programs in this component would:

- Help create a sense of community;
- Teach residents how to make behavior choices that impact the community positively;
- Provide residents the opportunity to explore issues of diversity and multiculturalism; and
- Demonstrate ways to limit the impact on the environment through sustainable life choices.

2.3.2 Student Code of Conduct

The Northeastern Student Code of Conduct will apply to all students residing in the student housing owned and operated by ACC just as it applies to all Northeastern students. The Code of Conduct document will be attached to all leases.

The Code of Student Conduct applies on campus as well as off campus. The University sets guidelines for the behavior of its students. The guidelines are established to promote student conduct that does not adversely affect the educational mission of the University or its relationship with the surrounding community, sister institutions, or members of the University community. Student behavior occurring off campus in violation of the Code, or local, state, federal, or host country laws and that could affect the educational mission of the University or its relationship with the surrounding community may subject students to discipline as noted in the Code of Student Conduct. The Code of Conduct will be enforced by the Northeastern Office of Student Conduct and Conflict Resolution (OSCCR) for Northeastern students.

The Code of Conduct document can be found at: www.northeastern.edu/osccr/code-of-student-conduct/

Because ACC is highly confident in the market demand for the project, ACC considers the scenario where the building is not filled exclusively with Northeastern students highly unlikely. However unlikely, in such a situation, ACC would monitor any non-Northeastern residents, and adjust policies to accommodate ACC policies will be customized, but typically cover the following:

- Use of premises;
- Guest policies;
- Common and public uses;
- Emergency plans and fire safety;
- Rules and regulations; and
- Safety regulations.

Section 3.0

Transportation Component

3.0 TRANSPORTATION

3.1. Introduction

This section summarizes the existing transportation conditions in the Project area, discusses site access, future area development projects, Project trip generation estimates, transportation impacts, proposed mitigation, and transportation demand management for the proposed Project.

3.2 Project Description

The Project site is located at Northeastern University's Burke Street lot and has frontage on Columbus Avenue, Burke Street, and Coventry Street (see Site Plan Figure 3-1). The Project will replace the existing surface parking lot with a new student residence facility for use by Northeastern that would provide approximately 207 residential units with 800 beds and approximately 3,000 sf of ground floor commercial space.

The proposed building will eliminate approximately 58 existing surface parking spaces used by Northeastern faculty and staff. Given that the proposed building will be student residences, and the proximity to the Northeastern campus and a wide variety of public transit services, no parking will be provided with the Project. Vehicles that currently park in the existing lot would, in the future, park in the Columbus Garage or in one of several other University owned parking facilities, which have adequate available supply to accommodate this demand.

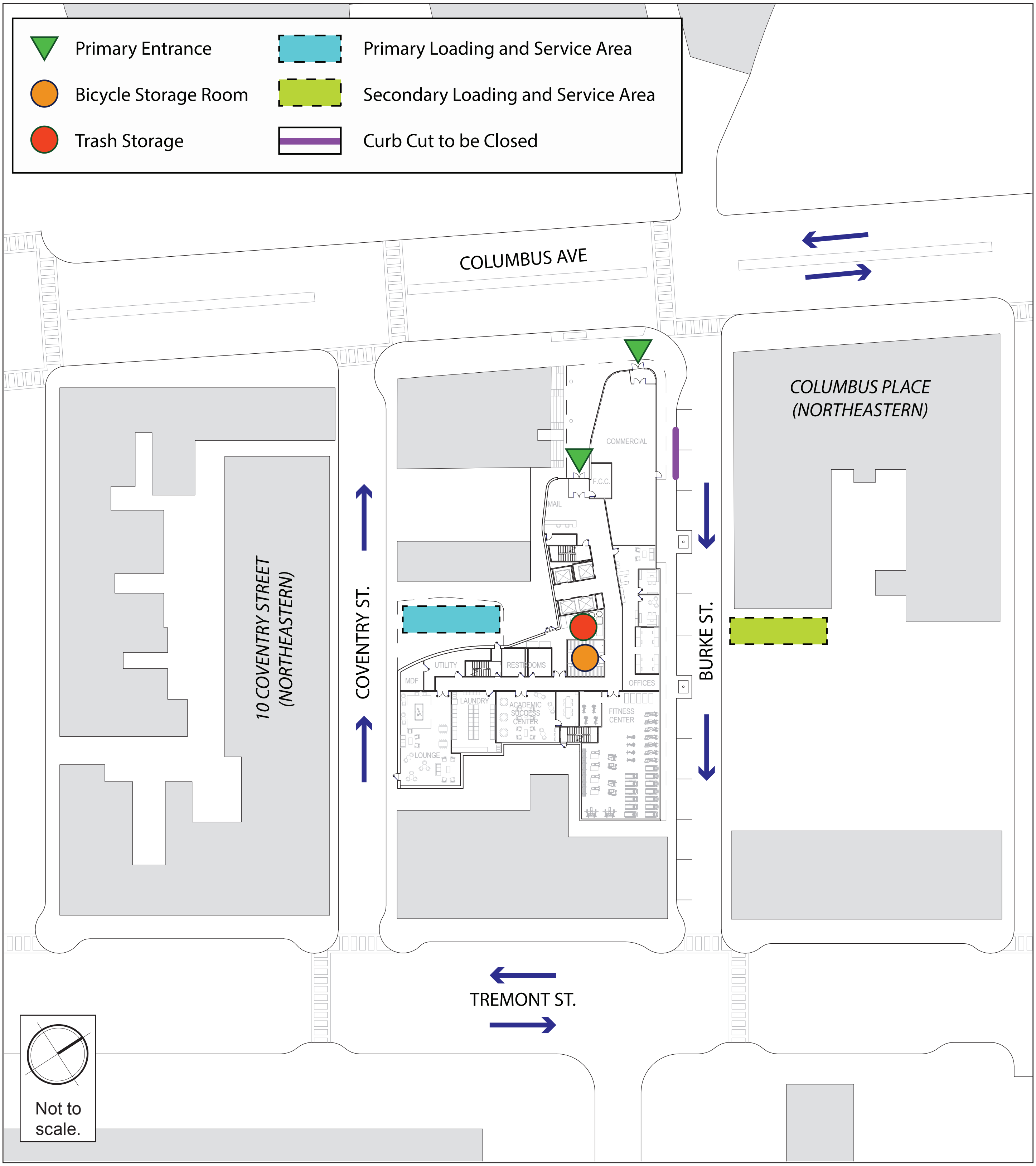
No increases in student enrollment are anticipated with the addition of this Project. With the proposed development of this Project, the proportion of students living in on-campus housing will increase and trips to and from the campus will decrease.

3.3 Site Access

The site is conveniently located within Northeastern's south campus and within walking distance of a variety of transportation alternatives, including public transportation, Hubway shared bicycles, and Zipcar and Enterprise shared vehicles.

The new building's entrances to the residential lobby and commercial use will be on Columbus Avenue. The Project will also provide pedestrian and streetscape improvements, where necessary, along Columbus Avenue, Burke Street, and Coventry Street adjacent to the site.

Loading and service activities will occur either on-site in a dedicated area off of Coventry Street or within the adjacent Columbus Place loading area off of Burke Street. The existing curb cut on Burke Street would be closed.



Columbus Avenue Student Housing **Boston, Massachusetts**

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Figure 3-1
Site Plan

The Project proposes to provide a secure bicycle storage room at the ground level, in-room bicycle storage, and outdoor bicycle racks for visitors and guests, described in Section 3.4 below.

3.4 Existing Transportation Conditions

This section describes existing pedestrian and bicycle conditions, roadway conditions, transit and car-sharing availability, parking supply and activity, and loading conditions in the vicinity of the site.

Existing Roadway Conditions

Columbus Avenue, an urban principal arterial, runs east-west from Melnea Cass Boulevard to Arlington Street in Park Square and again from Tremont Street to Walnut Avenue in Roxbury. Within the study area, Columbus Avenue provides one travel lane and an on-street bicycle lane in each direction separated by an approximately seven-foot wide cobblestone median. On-street parking and sidewalks are provided along both sides of the roadway in the study area. In the vicinity of the Project site, the Southwest Corridor pathway runs along the north side of the roadway and provides two separate pathways for bicycle and pedestrian use.

Tremont Street, an urban principal arterial, extends from Huntington Avenue in Mission Hill to Cambridge Street in Downtown Boston. Tremont Street runs primarily east-west in the vicinity of the study area with two travel lanes and on-street parking in each direction. Sidewalks are provided along both sides. Within the vicinity of the site, sidewalks are in fair to good condition.

Burke Street, a local roadway, is one-way southbound from Columbus Avenue to Tremont Street. Burke Street consists of one travel lane with on-street parking located along the west side of the roadway. Sidewalks are provided along both sides of the roadway and were observed to be in fair to poor condition.

Coventry Street, a local roadway, is one-way northbound from Tremont Street to Columbus Avenue. Coventry Street consists of one travel lane with on-street parking located along the west side of the roadway. Sidewalks are provided along both sides of the roadway and were observed to be in fair to good condition along the west side of the roadway and poor condition along the east side of the roadway.

Existing Intersection Conditions

Columbus Avenue/Coventry Street is an unsignalized intersection with three approaches. The Columbus Avenue eastbound approach consists of a shared left-turn/through/right-turn lane, a bicycle lane, and a parking lane. The westbound approach consists of a shared left-turn/through/right-turn lane, a bicycle lane, and a parking lane. The Columbus Avenue eastbound and westbound travel lanes are separated by an approximately seven-foot wide cobblestone median. Parking along Columbus Avenue in the vicinity of the intersection is resident parking or two hour parking Monday through Friday from 8:00 a.m. until 6:00 p.m. The Coventry Street northbound approach operates under stop control and consists of one shared left-/right-turn lane. Parking along Coventry Street in the vicinity of the intersection is all unrestricted on the west side and signed for no parking on the east side of the roadway.

The Southwest Corridor multi-use path runs along the north side of Columbus Avenue and sidewalks are provided along the south side. Crosswalks and ramps are provided across the east and south legs of the intersection approaches. Pavement markings at the intersection are in poor condition. The curb ramps are in fair condition, but are not provided with tactile warning panels.

Columbus Avenue/Burke Street/Columbus Garage Driveway is an unsignalized intersection with three approaches. The Columbus Avenue eastbound approach consists of a shared left-turn/through/right-turn lane, a bicycle lane, and a parking lane. The Columbus Avenue westbound approach consists of a shared left-turn/through/right-turn lane, a bicycle lane, and a parking lane. The Columbus Garage driveway southbound approach operates under stop control and consists of one multi-purpose lane. Parking along Columbus Avenue is resident parking or two-hour parking from 8:00 a.m. until 6:00 p.m. Monday through Friday. The Columbus Avenue eastbound and westbound travel lanes are separated by a seven-foot cobblestone median in the vicinity of the intersection.

The Southwest Corridor multi-use path runs along the north side of Columbus Avenue and sidewalks are provided along the south side. Crosswalks and ramps are provided across the east and south legs of the intersection approaches. Pavement markings at the intersection are in poor condition. The curb ramps are in fair condition, but are not provided with tactile warning panels. There is unrestricted parking along the west side of Burke Street.

Tremont Street/Coventry Street is an unsignalized intersection with three approaches. The Tremont Street eastbound and westbound approaches each consist of two travel lanes. The Burke Street southbound approach operates under stop control and consists of one multi-purpose lane. Crosswalks and ramps are provided across the north and east legs of the intersection. Pavement markings and curb ramps are in good condition; however, tactile warning panels are not provided.

Tremont Street/Burke Street is an unsignalized intersection with three approaches. The Tremont Street eastbound and westbound approaches each consist of two travel lanes. The Burke Street southbound approach operates under stop control and consists of one multi-purpose lane. Crosswalks and ramps are provided across the north and east legs of the intersection. Pavement markings and curb ramps are in good condition; however, tactile warning panels are not provided.

Public Transportation

Northeastern has excellent transit access and is conveniently located adjacent to 15 MBTA bus routes, three MASCO shuttle bus routes, MBTA Green Line Heath/Lechmere E Branch on Huntington Avenue to the north, the Orange Line and commuter rail service at Ruggles Station to the northwest of the site and Orange Line service at Massachusetts Avenue Station to the northeast. Ruggles is a major transportation center housing rapid transit, bus and commuter rail service. Public transportation is also an important mode of access for students, faculty/staff, and visitors and provides important connections to the surrounding commercial and cultural attractions, particularly for students living on the campus. According to the University's 2012 Rideshare Survey, approximately 32% of students, and 54% of faculty/staff, commute via public transit. The public transportation system serving the area around Northeastern University is shown in Figure 3-2 and described below.

MBTA Orange Line

The MBTA's Orange Line subway provides service from Forest Hills Station in Jamaica Plain, Boston through downtown Boston to Oak Grove Station in Malden, Massachusetts. The Orange Line provides inbound and outbound service approximately every six minutes Monday through Friday and every nine to 13 minutes on Saturday and Sunday. Within the campus there are two stations used by the Northeastern community: Ruggles Station, in the south campus at the corner of Ruggles and Tremont Streets and Massachusetts Avenue Station east of the campus on Massachusetts Avenue between Columbus Avenue and St. Botolph Street; both are within walking distance to the Project site. A secondary egress from Massachusetts Avenue station is provided on the Camden footbridge that is convenient for those coming to the campus, but riders cannot enter the station from this location.

MBTA Green Line

The MBTA Green Line E Branch provides trolley service between Heath and Lechmere stations. The E Branch operates on six-minute headways during the weekday morning and afternoon peak periods and on seven to nine minute headways during off-peak periods. Weekend service runs approximately every nine to 12 minutes. The Northeastern and Symphony Stations are located, along Huntington Avenue, less than one-third of a mile from the Project site.

MBTA Bus Service

The Northeastern Campus is located within convenient walking distance to 15 MBTA bus routes:

- #1 Harvard Holyoke Gate to Dudley Station via Massachusetts Avenue
- #8 Harbor Point/UMASS Kenmore Sta. via B.U. Medical Center & Dudley Station

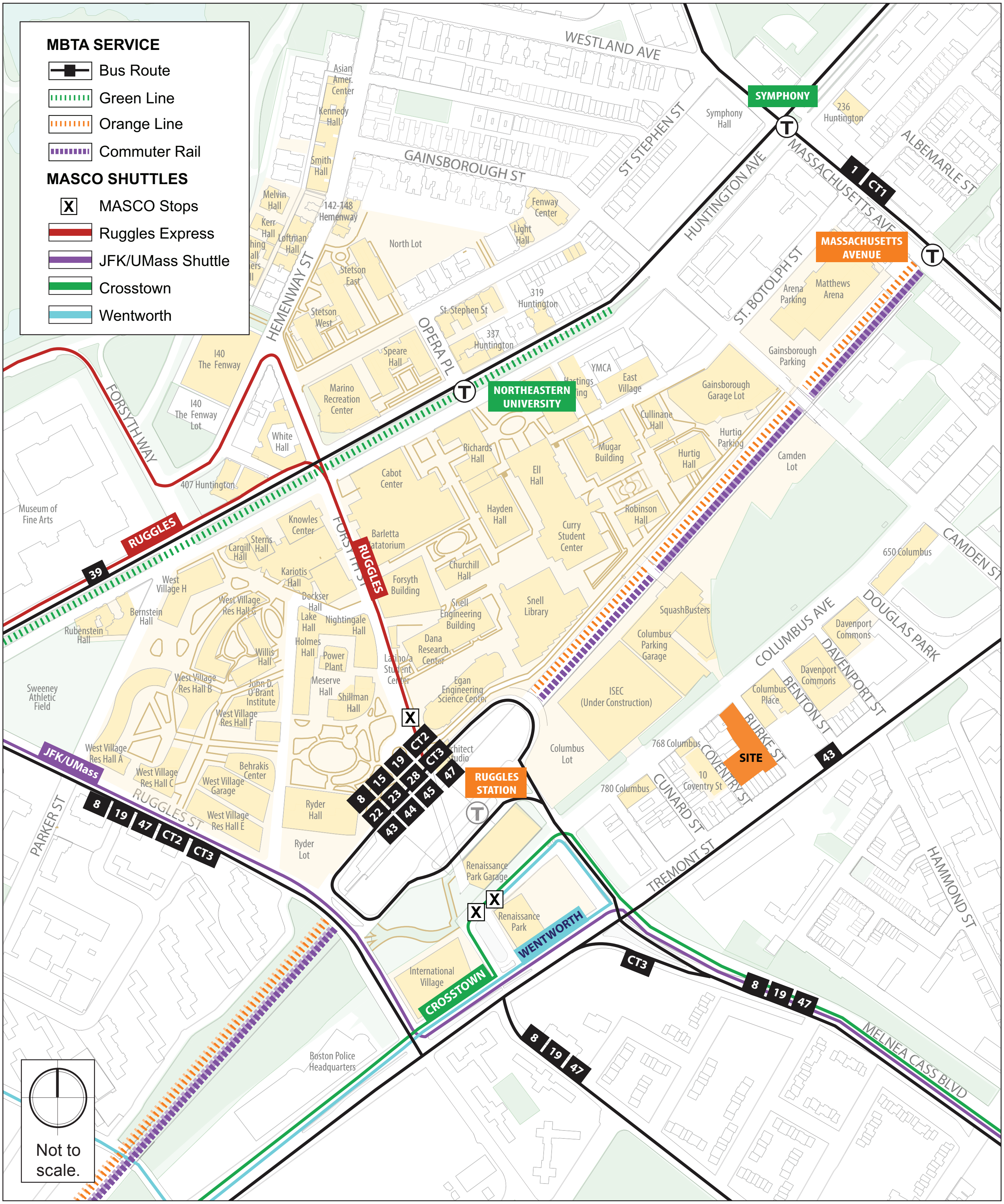

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Figure 3-2
Public Transportation

- #15 Kane Sq. or Fields Corner Sta. Ruggles Sta. via Uphams Corner
- #19 Fields Corner Sta. Kenmore or Ruggles Sta. via Grove Hall & Dudley Station
- #22 Ashmont Sta. Ruggles Sta. via Talbot Ave. & Jackson Sq.
- #23 Ashmont Sta. Ruggles Sta. via Washington St.
- #28 Mattapan Sta. Ruggles Sta. via Dudley Station.
- #39 Forest Hills Sta. Back Bay Sta. via Huntington Ave.
- #43 Ruggles Sta. Park & Tremont Streets via Tremont St.
- #44 Jackson Sq. Sta. Ruggles Sta. via Seaver St. & Humboldt Ave.
- #45 Franklin Park Zoo Ruggles Sta. via Blue Hills Ave.
- #47 Central Sq. Cambridge Broadway Sta. via B.U. Medical Center, Dudley Station. & Longwood Medical Area
- CT1 Central Square, Cambridge Boston University Medical Center/Boston Medical Center via MIT
- CT2 Sullivan Sta. Ruggles Sta. via Kendall/MIT
- CT3 Beth Israel Deaconess Medical Center Andrew Sta. via B.U. Medical Center

The primary MBTA bus route serving the Northeastern campus is the #39 Bus, which provides service between Forest Hills Station and Back Bay Station via Huntington Avenue. The buses operate on six- to 10-minute headways during the weekday morning and afternoon peak periods.

The Project site is located less than a quarter-mile from Ruggles Station, where passengers can access 12 MBTA bus routes, three MASCO shuttle bus routes, Orange Line rapid transit, and the commuter rail. The project site is also located adjacent to the MBTA #43 bus on Tremont Street that provides connection between Ruggles Station and Park Street Station.

MASCO Shuttle Buses

Medical Academic and Scientific Community Organization, Inc. (MASCO) is a non-profit organization dedicated to enhancing Boston's Longwood Medical and Academic area (LMA) with nearly 12,500 riders each day over ten different routes by using a fleet of 37 vehicles. MASCO, along with Paul Revere transportation, help transport people to and around the LMA area via shuttle services from public transit stops and off-site parking facilities. MASCO operates four shuttles that stop at, or near, Ruggles Station, including the

Ruggles Express, JKF/UMass, Mission Hill, and Crosstown Shuttles. MASCO shuttle services are available to members of the University who also have an affiliation with MASCO institutions.

MBTA Commuter Rail

Three MBTA commuter rail lines run through Ruggles Station: the Providence/Stoughton line, the Franklin line, and the Needham line. These trains provide access from Boston to the southern and southwestern regions of Massachusetts and Rhode Island.

The Needham Line has twelve inbound trains and twelve outbound trains that stop at Ruggles Station. Inbound trains run between 6:41 a.m. and 10:39 p.m. Outbound trains run between 12:09 p.m. to 10:39 p.m. Peak hour headways are approximately 30 minutes.

The Franklin Line has seven inbound trains and twelve outbound trains that stop at Ruggles Station. Inbound trains run between 7:00 AM and 12:57 p.m. approximately every 16 to 54 minutes during the peak periods. Outbound trains run between 12:53 p.m. to 11:58 p.m. approximately every 25 to 30 minutes during the peak periods.

The Providence/Stoughton Line has ten inbound trains and 25 outbound trains that stop at Ruggles Station. Inbound trains run between 6:11 a.m. and 2:42 p.m. approximately every 20 to 40 minutes during the peak periods. Outbound trains run between 6:28 a.m. to 12:07 a.m. approximately every 8 to 27 minutes during the peak periods and less frequently during the morning hours.

During some train services, passengers riding the MBTA commuter train on Track 2 have to get off at Back Bay Station and use the Orange Line to access Ruggles Station. For this reason, the Ruggles Station Platform Project will construct a new 800-foot long platform on Track 2, which will allow passengers to access Ruggles Station without having to bypass it.

Parking

Northeastern University currently owns and operates four parking garages and 12 surface parking lots on campus with a combined capacity of 3,230 spaces. Parking is available for a combination of faculty, staff, students, visitors, and the general public. Northeastern's parking supply is summarized in Table 3-1 and illustrated in Figure 3-3.

Table 3-1 Northeastern University Campus Parking Supply

Map Label	Parking Facility	User	Supply (spaces)*
Garages			
A	Columbus Garage[1]	Faculty/Staff decal, Student decal	995
B	Gainsborough Garage[2]	General Public, Faculty/Staff decal, Event, Snow Emergency	309
C	Renaissance Garage[3]	General Public, Faculty/Staff decal, Overnight Student decal, Snow Emergency	930
D	West Village Garage[4]	Faculty/Staff, Day/Evening Student, Admissions	264
	Subtotal Garages		2,498
Lots			
E	140 The Fenway	Faculty/Staff decal	36
F	Arena Parking Lot	Faculty/Staff decal	46
G	Burke Street Lot (Project Site)	Faculty/Staff decal	58
H	Camden Parking Lot[5]	Faculty/Staff decal, Student Decal	205
I	Churchill Lot	Restricted	11
J	Gainsborough Lot	General Public, Event	33
K	Hurtig/YMCA[6]	Faculty/Staff decal, Restricted	72
L	Latino/a Student Center	Restricted	8
M	North Lot[7]	Faculty/Staff decal, Student decal	145
N	Renaissance Park Lot[8]	Monthly Card Holders	75
O	Ryder Lot[9]	Faculty/Staff decal, Vendor decals	36
P	Shillman Hall	Restricted	7
	Subtotal Lots		732
	Total		**3,230**

1. 24 hours, 7 days a week. Faculty/Staff/Student with Overnight Parking decals only allowed 2:00 a.m. – 5:30 a.m. Monday – Sunday.
2. 24 hours, 7 days a week for hourly rate. Faculty/staff permits allowed between 4:00 a.m. – 1:00 a.m. Parking available during snow emergencies.
3. 24 hours, 7 days a week for hourly rate. Closed to NU day permits holders from 5:00 a.m. – 5:00 p.m. Monday–Friday. Weekend rate from 6:00 p.m. Friday until 12:00 a.m.-Monday. Accommodates parking for Children's Hospital (500 permits), Beth Israel (117 permits), and NU Vans (65 nested spaces).
4. 5:30 a.m. – 11:00 p.m., Monday – Friday and 8:00 a.m. – 5 p.m. on some Saturdays. No overnight parking.
5. 5:30 a.m. – 11:00 p.m., Monday – Sunday. This lot is estimated to close in March 2016.
6. 48 spaces dedicated to YMCA during the day with remaining 26 spaces available to YMCA after 5:00 p.m. No overnight parking.
7. 5:30 a.m. – 2:00 a.m. Monday – Sunday and with Overnight Parking Decal 2:00 a.m. – 5:30 a.m. Monday – Sunday.
8. Lot is used exclusively by Beth Israel monthly card holders (about 75 permits).
9. 5:30 a.m. – 11:00 p.m. Monday – Sunday.

Map Label	Parking Facility	Supply (spaces)
A	Columbus Parking Garage	995
B	Gainsborough Garage	309
C	Renaissance Garage	930
D	West Village Garage	264
E	140 The Fenway	36
F	Arena Parking Lot	46
G	Burke Street Lot	58
H	Camden Parking Area	205
I	Churchill Hall	11
J	Gainsborough Lot	33
K	Hurtig/YMCA	72
L	Latino/a Student Center	8
M	North Lot	145
N	Renaissance Park Lot	75
O	Ryder Lot	36
P	Shillman Hall	7
Total Spaces		3,230

Figure 3-3
Northeastern Parking Supply

The Project site sits on the Burke Street Lot that currently has a total of 58 surface parking spaces that are designated for use by faculty, staff, and public safety.

Unrestricted on-street parking is provided along the west sides of Burke Street and Coventry Street. Within the vicinity of the Project site, on-street parking is provided along both sides of Columbus Avenue and Tremont Street and is a mix of South End and Roxbury permit parking.

Traffic Data Collection

Vehicle, pedestrian, and bicycle turning movement counts were collected at the following intersections adjacent to the Project site during the weekday morning (7:00 a.m. – 9:00 a.m.), midday (11:00 a.m. – 1:00 p.m.), and evening (4:00 p.m. – 6:00 p.m.) peak periods on Tuesday, December 8, 2015, when classes were in session at Northeastern University:

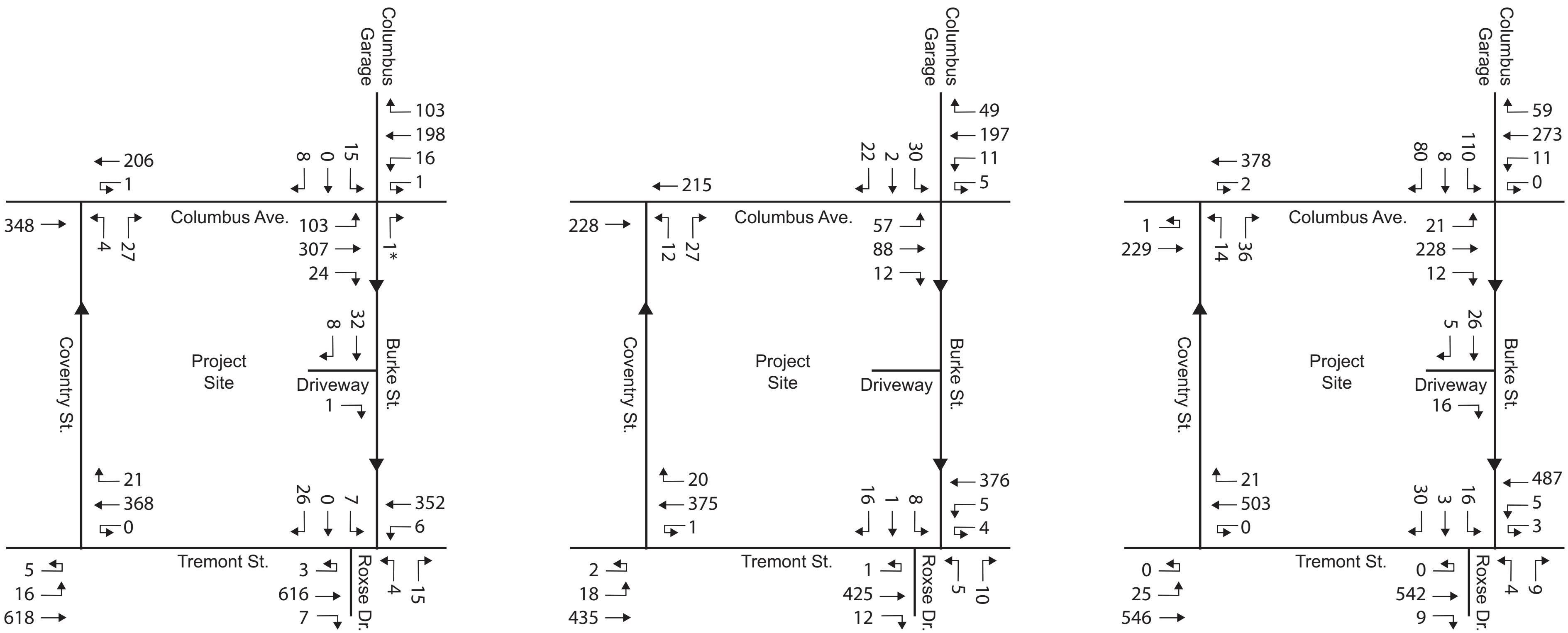
- Columbus Avenue/Burke Street/Columbus Garage;
- Columbus Avenue/Coventry Street;
- Tremont Street/Burke Street/Roxse Drive; and
- Tremont/Coventry Street.

Based on these counts, the weekday peak hours were identified as 7:45-8:45 a.m., 11:15 a.m. – 12:15 p.m., and 4:30-5:30 p.m. Figure 3-4 shows the resulting peak-hour vehicle turning movement volumes.

An intersection capacity analysis was completed for each of the study area intersections during the weekday morning and evening peak periods. The results of the capacity analysis for the Existing, No Build, and Build Conditions are summarized in Section 3.7.

Pedestrian Conditions

The Project site is located within Northeastern's South Campus and is within close walking distance to public transit. Crosswalks are positioned across Columbus Avenue at Burke Street and Coventry Street providing a pedestrian connection between the site and the remainder of the campus. These crosswalks are well utilized throughout the day. Figure 3-5 summarizes the morning, midday, and evening peak hour pedestrian volumes.



a.m. Peak Hour,
(7:45-8:45 a.m.)

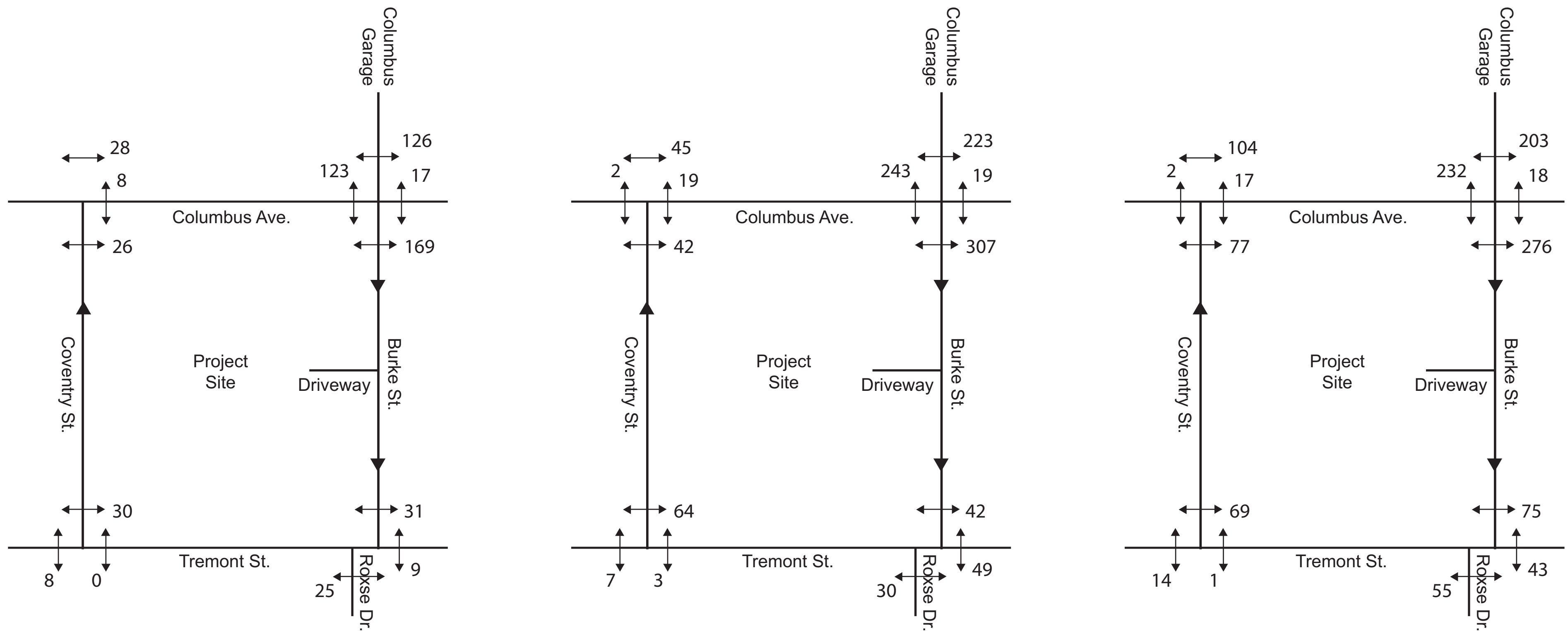
** Prohibited Movement.*

Midday Peak Hour,
(11:15 a.m.-12:15 p.m.)

p.m. Peak Hour,
(4:30-5:30 p.m.)

Figure 3-4

Existing Conditions (2015) Traffic Volumes



a.m. Peak Hour,
(7:45-8:45 a.m.)

Midday Peak Hour,
(11:15 a.m.-12:15 p.m.)

p.m. Peak Hour,
(4:30-5:30 p.m.)

Figure 3-5

Existing Conditions (2015) Pedestrian Volumes

During field observations, Howard Stein Hudson (HSH) noted numerous pedestrians crossing through the Burke Street Lot. It was also noted that sidewalks along Burke Street and Coventry Street are in poor condition. The Project will improve sidewalk conditions along these roadways adjacent to the site, where necessary. The ISEC Project, which is currently under construction, will also improve sidewalk and bicycle conditions along the north side of Columbus Avenue.

Bicycle Conditions

Bicycling has become an increasingly popular mode of transportation for the Northeastern Community, particularly for students. According to Northeastern's 2012 Massachusetts Department of Environmental Protection (DEP) Rideshare Survey, approximately ten percent of all students, and four percent of faculty/staff commute by bicycle on a typical day. Given Northeastern's urban location and compact campus, most students living off-campus tend to reside within walking distance to the campus or have relatively easy access via transit and bicycle. Bicycle mode share for students living off-campus is typically higher than those living on-campus, as on-campus students are within easy walking distance to various academic buildings, residence halls, dining facilities, and other amenities on campus. Cyclists also use the campus and the surrounding roadways to access the Southwest Corridor bicycle trail connecting to Back Bay and Downtown Boston; the Fenway Bicycle Path that runs along the Emerald Necklace; and the South Bay Harbor Trail via Melnea Cass Boulevard. Existing bicycle volumes adjacent to the Project site are illustrated in Figure 3-6.

Bicycle Routes

In the immediate vicinity of the campus, the City has recently added bicycle lanes along portions of Columbus Avenue, Massachusetts Avenue, and Forsyth Street and "share the road" symbols along Huntington Avenue, Ruggles Street, and Museum Road. The City has also recently added bicycle boxes at the intersection of Huntington Avenue and Forsyth Street.

Figure 3-7 shows major bicycle routes to and through the campus and potential future connections from the City of Boston's 2013 *Interactive Bicycle Network Map.*

Bicycle Storage and Demand

Figure 3-8 shows bicycle racks on campus and locations where bikes are parked without formal bike racks. Approximately one-half of the bicycle racks are covered. The designated bicycle parking is well used during peak periods; bicycles were also observed chained to poles, etc. in the most heavily used areas.

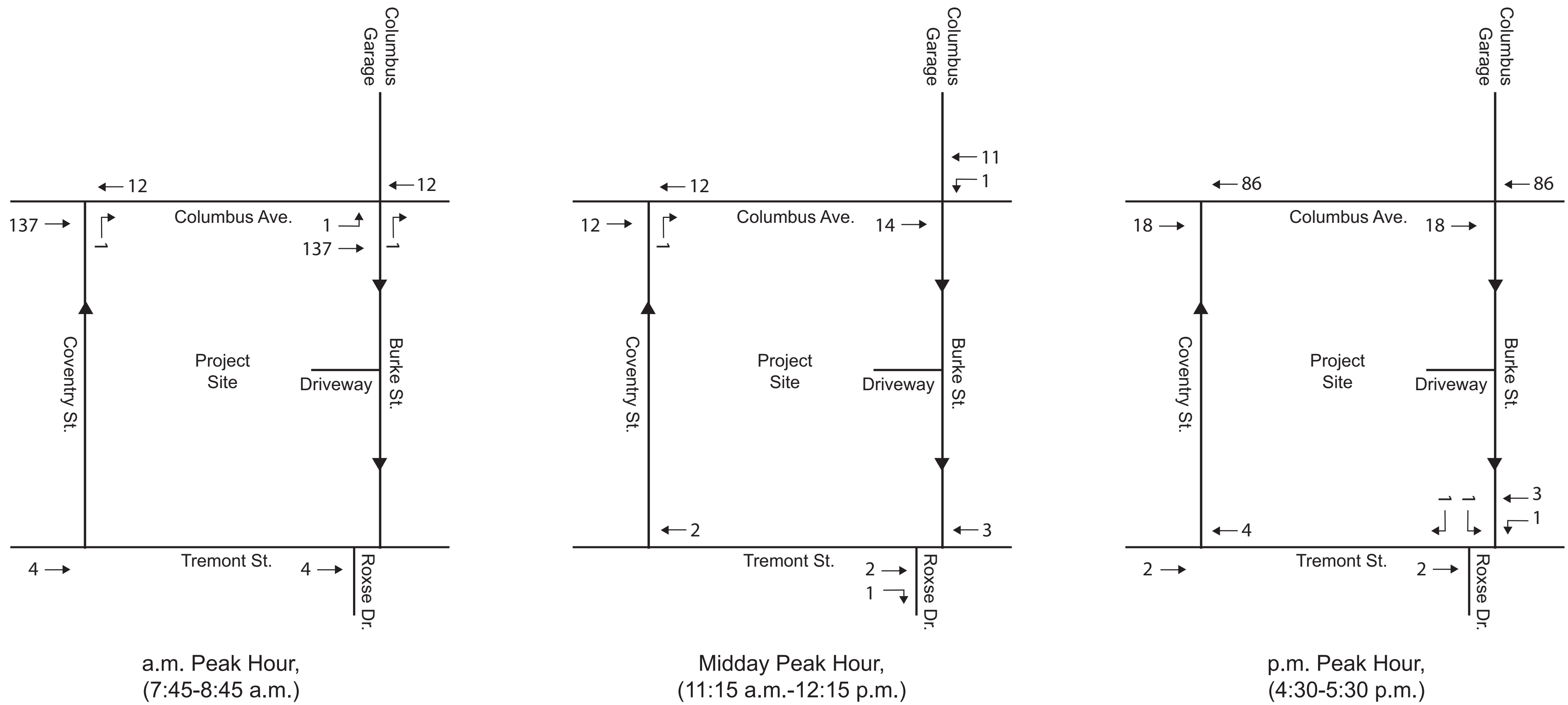


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Figure 3-6

Existing Conditions (2015) Bicycle Volumes

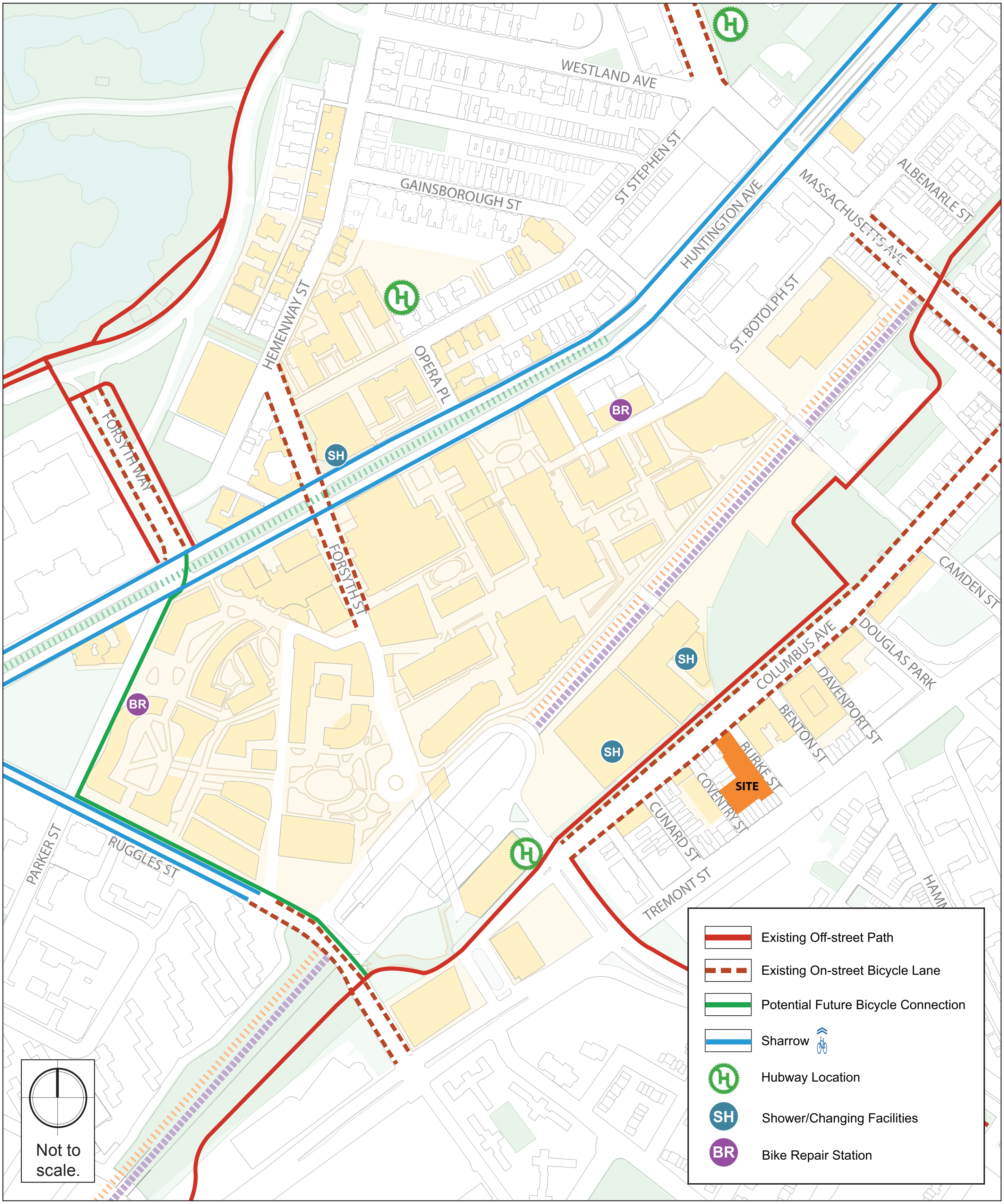

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Figure 3-7
Existing Bicycle Facilities

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Figure 3-8
Existing Bicycle Storage

While bike usage on campus has increased, bike storage options have not kept pace even though the University has significantly increased on-campus bike storage from just 141 bicycles at eight locations in 2000 to approximately 870 bicycles at nearly 40 locations throughout the campus today. Upon completion, the ISEC, which is currently under construction, will add storage for an additional 165 bicycles, including a dedicated bicycle room and shower facilities, exterior racks, and a bicycle cage within the Columbus Garage. These new bicycle accommodations will bring the campus wide total up to 1,035 bicycles. The University is currently studying options to increase the number of exterior bike racks in strategic locations across campus as well as looking for opportunities to increase indoor bike storage. Within the next three years, the University plans to significantly increase bike storage on campus.

Hubway Bicycle Sharing Program

In 2011, the University partnered with the City of Boston on the New Balance Hubway Bikeshare program. Hubway is a bicycle sharing system providing more than 1,300 bikes at 140 locations throughout Boston, Brookline, Cambridge, and Somerville. As shown in Figure 3-7 and summarized in Table 3-2, Hubway currently has three locations with a combined total of 48 bicycle docks within about one-third of a mile of the Project site.

Table 3-2 Hubway Bike Share Locations

Location	*Bicycle Docks*
Northeastern University/North Parking Lot[1]	15
Ruggles Station/Columbus Avenue	15
Massachusetts Avenue (Christian Science Plaza)	18
Total	***48***

1. Hubway bike station at North Lot is sponsored by Northeastern University.
Source: www.thehubway.com, accessed March 2016.

Recent and On-going Safety Improvements

In October 2015, Northeastern staff and the Boston Transportation Department (BTD) conducted a site walk along Columbus Avenue, between Melnea Cass Boulevard and Camden Street, to assess pedestrian and bicycle safety along the corridor. As a result of this coordination, several safety improvements were identified and implemented. Through new signage, on-street parking was shifted away from crosswalks and intersections to enhance sight lines and reduce conflicts. Design plans were also developed for improvements to the bicycle lanes along the corridor, including the addition of enhanced green painted bicycle lanes at all roadway and driveway crossings. These updated pavement markings are currently in place along the roadway.

The University continues to evaluate the pedestrian and bicycle safety conditions along the Columbus Avenue corridor.

Car Sharing

Increasingly popular car-sharing services provide easy access to vehicular transportation for urban residents who do not own cars (see Table 3-3 and Figure 3-9). The local car sharing providers, Zipcar and Enterprise, offer short-term rental service for members. Vehicles are rented on an hourly and per-mile basis, and all vehicle costs (gas, maintenance, insurance, and parking) are included in the rental fee. Vehicles are checked out for a specific time period and returned to their designated location.

Enterprise is currently the provider of shared cars on Campus and has 12 on-demand vehicles in five different locations. Enterprise allows students ages 18 years or older with a valid .edu email address to participate. Zipcar has one location adjacent to the campus with 6 vehicles at 76 Gainsborough Street.

Table 3-3 Car Sharing Locations

Location	*Number of Vehicles*
Zipcar	
76 Gainsborough Street	6
Enterprise	
Westland Garage (35 Westland Avenue)	2
North Lot (97 St. Stephen Street)	2
Columbus Garage (795 Columbus Avenue)	4
Ryder Lot (66 Leon Street)	2
Matthew's Arena (262 St. Botolph Street)	2

Source: zipcar.com and enterprisecarshare.com, accessed March 2016.

3.5 Area Development Projects

The following development projects, located within a quarter-mile of the Project site, were identified on the Boston Redevelopment Authority's (BRA) website:

1. ***1065 Tremont Street -*** New 6-story building with 16 rental units, one 1,000 sf ground floor commercial space, and 17 surface parking spaces. The project is currently under construction.

2. ***New England Conservatory (NEC) Student Life and Performance Center -*** New, 135,000 sf Residence Hall & Student Life Center on the existing parking lot on St. Botolph and the construction of a 65,000 sf Academic & Administration building on NEC's Gainsborogh Street site. The Project is currently under construction.

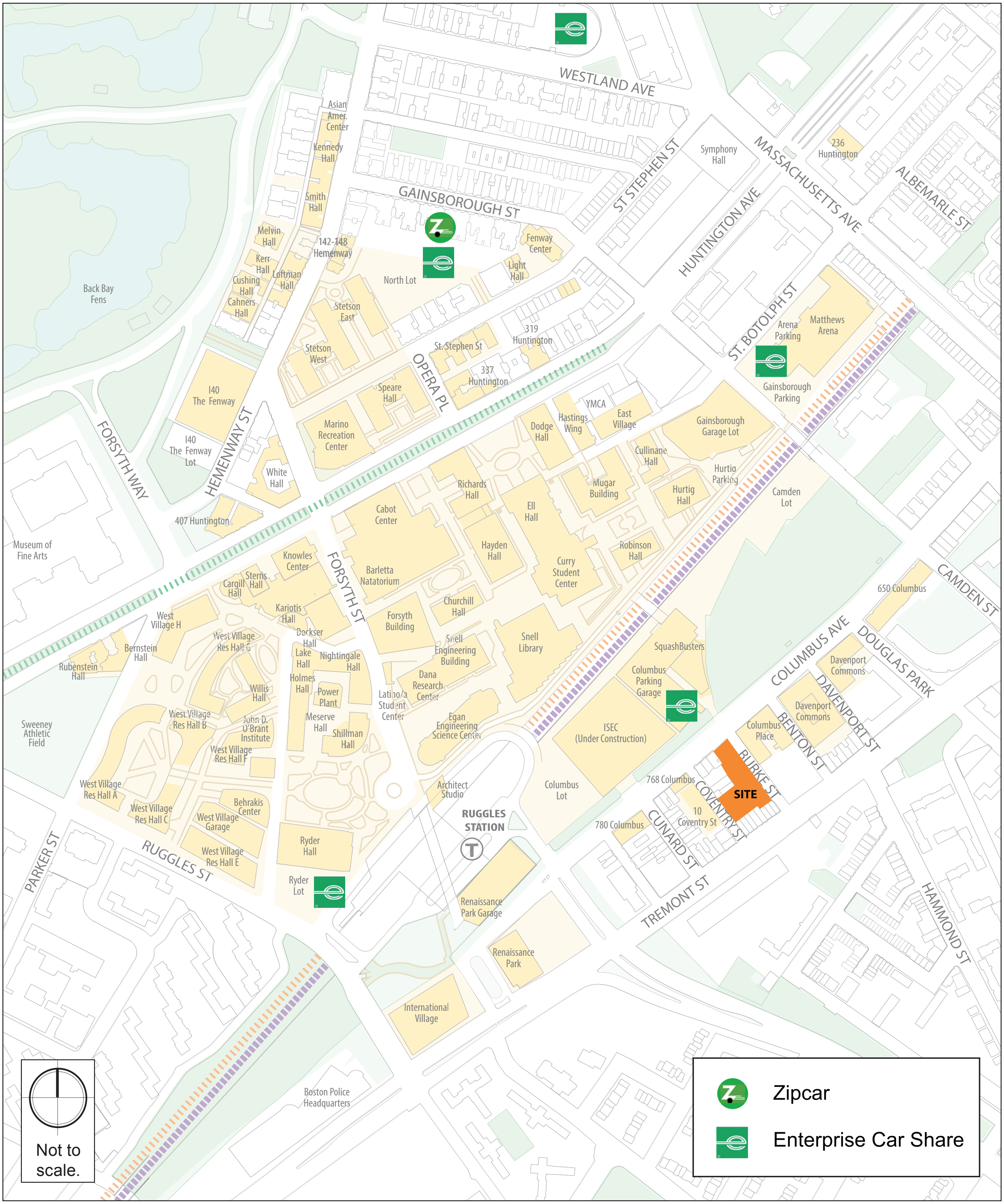

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Figure 3-9
Car Sharing Locations

3. *Tremont Crossing (P-3) -* Proposal calls for a revision to the original project, totaling approximately 1,928,400 sf of mixed-use space, including retail, art, educational, office, hotel, residential, and an above ground parking structure of 548,700 sf. The project is currently under review.

4. *Whittier Choice Neighborhood-* The project includes the demolition of the existing 200-unit Whittier Street Apartments and the construction of 387 residential units in three new buildings, 135 parking spaces, and 7,680 sf of ground floor commercial/retail space. The project is BRA Board approved.

5. *Madison Park Infill –* The project includes the demolition of an existing one-story building at 40 Raynor Circle and creation of a new residential development consisting of 76 residential units along Melnea Cass Boulevard. The project is BRA Board approved.

6. *20 Sussex Street –* The project includes the construction of 4 residential units and is BRA Board approved.

7. *1004-1012 Tremont Street –* The project includes the construction of a new 14,882 sf mixed-use building with 2,224 square feet of ground floor retail, 7 rental units, and 6 surface parking spaces. The project is BRA Board approved.

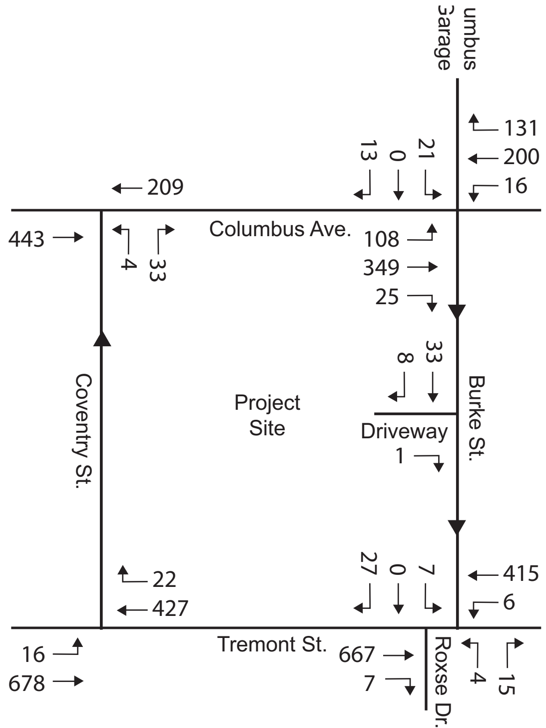
8. *Melnea Hotel and Residences –* The project includes the construction of a new 126,400 sf mixed use building with 50 rental units, 108 hotel rooms, 8,000 sf of commercial/retail space, and 70 parking spaces. The project is BRA board approved.

9. *Northeastern University Interdisciplinary Science and Engineering Complex (ISEC) –* 228,000 sf of research and office space and no parking. The project is currently under construction and expected to be completed at the end of 2016.

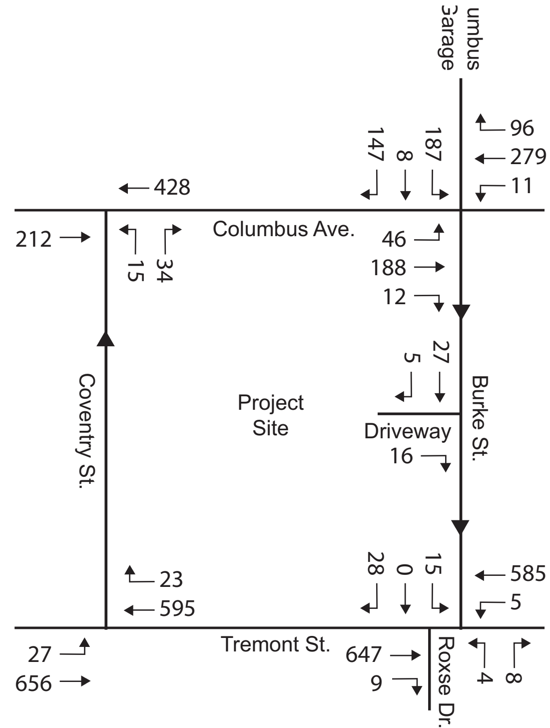
The traffic volumes associated with these projects were specifically assigned to study area intersections. In addition, the existing conditions traffic volumes were increased by a 0.5% annual growth rate for general traffic increases. The resulting 2020 No Build Conditions traffic volumes for the weekday morning and evening peak hours are summarized in Figure 3-10. The LOS analysis was conducted for the Future No-Build Condition and is summarized in Section 3.7.

3.6 Trip Generation

The following sections detail for trip generation for the proposed 207 residential units with 800 beds and approximately 3,000 sf of ground floor commercial space.



a.m. Peak Hour,
(7:45-8:45 a.m.)



p.m. Peak Hour,
(4:30-5:30 p.m.)

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Figure 3-10
No-Build Conditions (2020) Traffic Volumes

Residential Trip Generation

Northeastern's student enrollment is not anticipated to increase. Therefore, with the development of the proposed Project future external commuter trips to and from campus will be reduced while resident internal pedestrian trips will increase.

Typically, trip generation estimates for a Project are derived from Institute of Transportation Engineers' (ITE) Trip Generation (9th edition, 2012) fitted curve equations and average trip rates for comparable land use codes. However, Trip Generation does not provide comparable data for estimating person trips generated by a university residential building. Consistent with industry practice, the number of trips was based on survey data collected by Howard Stein Hudson at Suffolk University's Nathan R. Miller Residence Hall (345 beds) located at 10 Somerset Street in downtown Boston on Tuesday, March 7, 2006 and keycard access data and sign-in data from the University's West Village A North residence hall (412 beds) on Sunday, September 26, 2010 through Saturday October 2, 2010. These residential buildings have no associated parking on-site, similar to that of the proposed Project.

Based on the survey data, each bed is estimated to generate 6.32 daily person trips (3.16 person trips entering and 3.16 person trips exiting). The total peak-hour trip generation per bed is estimated to be 0.31 person trips per bed in the a.m. peak hour, 0.50 person trips per bed during the mid-day peak hour, and 0.54 person trips in the p.m. peak. The data show that the fewest trips are generated during the a.m. peak hour, more during the mid-day peak hour, and the most during the p.m. peak hour.

As with trip generation rates, no standard mode share rates could be applied to the student residents. As part of the Suffolk University survey at the Nathan R. Miller Residence Hall, all vehicular pick-up/drop-off and loading/service activity were observed in detail for use in estimating daily and peak-hour walk/bike/transit and vehicle mode shares. Based on these observations, 98% of daily trips are walk trips, transit trips, or bicycle trips. The remaining 2 percent of daily trips are made by vehicle.

The resulting trip generation for the 800 new beds is summarized in Table 3-4.

Table 3-4 Residence Hall Trip Generation

Period	*Direction*	*Vehicle Trips*	*Walk/Bike/Transit Trips*[1]
Daily	In	42	2,477
	Out	42	2,477
	Total	84	4,954
a.m. Peak Hour	In	2	57
	Out	8	175
	Total	10	232
midday Peak Hour	In	2	202
	Out	2	190
	Total	4	392
p.m. Peak Hour	In	2	218
	Out	2	206
	Total	4	424

Trip generation based on 800 beds.

1. Non-auto trips are predominantly internal campus trips.

Commercial Space Trip Generation

The trip generation for the approximately 3,000 sf ground-floor commercial space was estimated using data contained in the ITE's *Trip Generation* (9th edition, 2012) using Land Use Code (LUC) 820 Shopping Center. The resulting vehicle trips were then converted into person trips based on national average vehicle occupancy rates. Using BTD's mode split data for Area 4 (West Core) and vehicle occupancy rates, the person trips were then reallocated into walk/bike, transit, and vehicle trips. The resulting trip generation for the commercial use is summarized in Table 3-5.

Table 3-5 Ground-floor Commercial Trip Generation

Period	*Direction*	*Walk/Bike Trips*	*Transit Trips*	*Vehicle Trips*
Daily	In	48	14	14
	Out	48	14	14
	Total	96	28	28
a.m. Peak Hour	In	1	1	1
	Out	1	0	1
	Total	2	1	2
p.m. Peak Hour	In	4	1	1
	Out	4	1	1
	Total	8	2	2

Trip generation based on 3,000 sf.

Mode share based on BTD Area 4 data: 16% transit, 55% walk/bike, 29% auto.

Combined Project Vehicle Trip Generation

Table 3-6 summarizes the Project vehicle trip generation for the residential and commercial use combined.

Table 3-6 Project Vehicle Trip Generation

Period	*Direction*	*Residential Trips (800 beds)*	*Commercial Trips (3,000 sf)*	*Total*
Daily	In	42	14	56
	Out	42	14	56
	Total	84	28	112
a.m. Peak Hour	In	2	1	3
	Out	8	1	9
	Total	10	2	12
p.m. Peak Hour	In	2	1	3
	Out	2	1	3
	Total	4	2	6

As shown in Table 3-6, the Project will only generate 112 vehicle trips (56 in and 56 out) on a daily basis with just 12 vehicle trips (3 in and 9 out) during the weekday morning peak hour and only 6 vehicle trips (3 in and 3 out) during the afternoon peak hour. This increase corresponds to just one new vehicle trip every 5 to 10 minutes, which will have an imperceptible impact on the adjacent roadway network.

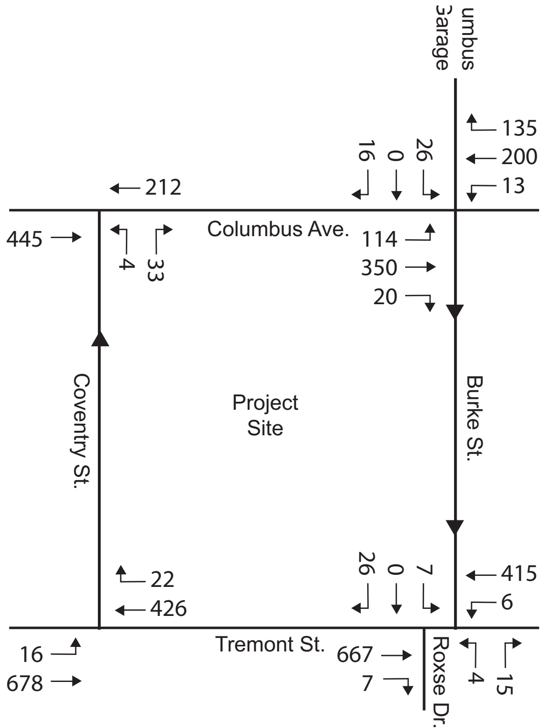
The Project-generated vehicle trips were added to the 2020 No Build Conditions traffic volumes to create the Build Conditions, which are summarized in Figure 3-11.

Traffic Shifts due to Parking Consolidation

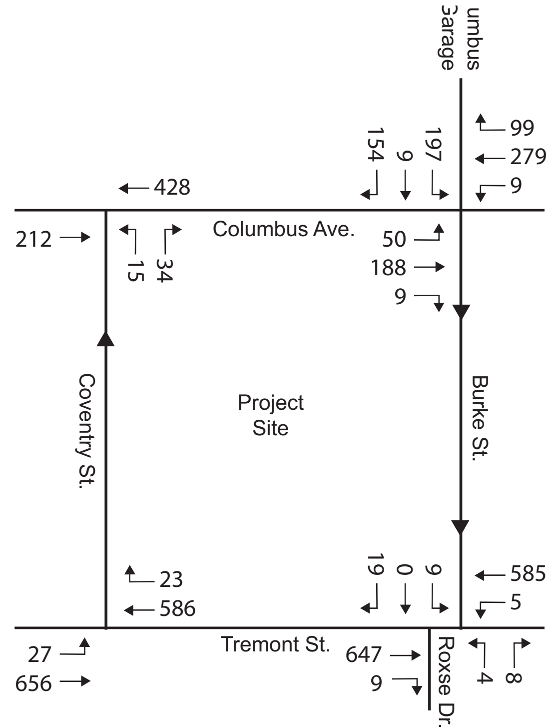
As part of the Project, 58 surface parking spaces at the Burke Street lot will be eliminated. Those that currently park at the Burke Street lot will in the future park at the nearby Columbus Garage or one of Northeastern's several other parking facilities. The vehicle trips associated with the existing lot will be redistributed on the roadway network as part of the Build Conditions analysis for the DPIR; however, the relocated trips are expected to have a negligible effect on area traffic operations.

Pedestrian Trip Generation

The Project is expected to generate approximately 200 to 425 pedestrian trips per hour throughout the day. It is anticipated that a majority of these trips would cross Columbus Avenue to access the Northeastern Campus, public transit at Ruggles and Massachusetts



a.m. Peak Hour,
(7:45-8:45 a.m.)



p.m. Peak Hour,
(4:30-5:30 p.m.)

Figure 3-11

Build Conditions (2020) Traffic Volumes

Avenue Stations, and other destinations. The University continues to evaluate pedestrian and bicycle safety conditions along the Columbus Avenue corridor as new building projects come online.

3.7 Intersection Operations Analysis

Traffic operations under existing conditions were analyzed at all study area intersections. Trafficware's Synchro 7 software was used to analyze delay and the existing Level of Service (LOS) at study area intersections. This tool is based on the methodology specified in the Transportation Research Board's *2000 Highway Capacity Manual* (HCM). HCM methods analyze the capacity of an intersection by determining the LOS, delay (in seconds), volume-to-capacity (v/c) ratio, and 95th percentile queue length (in feet), based on the intersection geometry, traffic control, and available traffic data for each intersection.

The v/c ratio is a measure of congestion at an intersection approach. A v/c ratio of one or greater indicates that the traffic volume on the intersection approach exceeds capacity.

The 95th percentile queue length, measured in feet, represents the farthest extent of the vehicle queue (to the last stopped vehicle) upstream from the stop line during 5% of all signal cycles. The 95th percentile queue will not be seen during each cycle. The queue would be this long only 5% of the time and would typically not occur during off-peak hours.

Field observations were performed by Howard Stein Hudson (HSH) to establish intersection geometry (i.e., number of turning lanes, lane length, and lane width).

LOS designations, derived from the HCM, are based on average delay per vehicle for all vehicles entering an intersection. Table 3-7 displays the intersection level of service criteria. LOS A indicates the most favorable condition, with minimum traffic delay, while LOS F represents the worst condition. LOS D or better is typically considered acceptable in an urban area. However, LOS E or F is often typical for a stop controlled minor street that intersects a major roadway.

Table 3-7 Intersection Level of Service Criteria

Level of Service	*Average Stopped Delay (seconds/vehicle)*
	Unsignalized Intersection
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Source: 2010 Highway Capacity Manual, Transportation Research Board.

Table 3-8 and Table 3-9 present the operational analysis summary for the Existing (2015), No-Build (2020), and Build (2020) conditions during the weekday a.m. and p.m. peaks, respectively. The complete intersection capacity analysis worksheets are provided in the Appendix.

As shown in the following LOS Summary Tables, the Build Condition constitutes a negligible effect on traffic operations when compared to expected operations under the No-Build Condition. The Synchro outputs for all conditions show the study intersections operating at reasonable levels of service, with the exception of the southbound approach at Columbus Avenue/Burke Street/Columbus Parking Garage during the evening peak hour, which Synchro shows operating at LOS F with significant vehicle queuing. This level of operation is typical for a stop controlled approach intersecting a primary urban roadway. In addition, HSH field observations at this intersection during the PM Peak Hour indicate that vehicle queues at the Columbus Parking Garage southbound approach generally do not exceed two to three vehicles and therefore traffic operations along that approach are significantly exaggerated by the Synchro analysis.

Table 3-8 LOS Summary Table, Weekday AM Peak Hour

Intersection Location	*Movement*	*Existing (2015)*				*No-Build (2020)*				*Build (2020)*			
		LOS[1]	*v/c*[2]	*Demand*[3]	*Queue*[4]	*LOS*	*v/c*	*Demand*	*Queue*	*LOS*	*v/c*	*Demand*	*Queue*
Columbus Avenue/Coventry Street	EB Columbus Ave. thru	-	0.25	389	0	-	0.28	443	0	-	0.28	445	0
	WB Columbus Ave. thru	-	0.15	206	0	-	0.15	209	0	-	0.15	212	0
	NB Coventry Street left/right	B	0.09	36	7	-	0.09	41	7	B	0.09	37	8
Columbus Avenue/Burke Street/Columbus Garage	EB Columbus Ave.	A	0.11	422	9	A	0.12	482	10	A	0.12	484	11
	WB Columbus Ave.	A	0.02	317	1	A	0.02	347	1	A	0.01	348	1
	SB Columbus Garage	D	0.17	23	15	D	0.28	34	27	D	0.34	42	36
Tremont Street/Coventry Street	EB Tremont Street left/thru	A	0.02	218	1	A	0.02	242	1	A	0.02	242	1
	EB Tremont Street thru	-	0.25	404	0	-	0.28	452	0	-	0.28	452	0
	WB Tremont Street thru	-	0.15	245	0	-	0.18	284	0	-	0.18	284	0
	WB Tremont Street thru/right	-	0.09	142	0	-	0.10	165	0	-	0.10	165	0
Tremont Street/Roxse Drive/Burke Street	EB Tremont Street thru	-	0.25	408	0	-	0.27	445	0	-	0.27	445	0
	EB Tremont Street thru/right	-	0.13	211	0	-	0.14	229	0	-	0.14	229	0
	WB Tremont Street left/thru	A	0.01	124	1	A	0.01	145	1	A	0.01	145	1
	WB Tremont Street thru	-	0.15	236	0	-	0.17	276	0	-	0.17	276	0
	NB Roxse Drive left/right	B	0.07	19	6	B	0.08	19	7	B	0.08	19	7
	SB Burke Street left/thru/right	B	0.09	33	7	B	0.10	34	8	B	0.10	34	8

1 Level of Service
2 Volume-to-capacity ratio
3 Demand in number of vehicles per hour
4 95th percentile queue length (feet)

Table 3-9 LOS Summary Table, Weekday PM Peak Hour

Intersection Location	*Movement*	*Existing (2015)*				*No-Build (2020)*				*Build (2020)*			
		LOS[1]	*v/c*[2]	*Demand*[3]	*Queue*[4]	*LOS*	*v/c*	*Demand*	*Queue*	*LOS*	*v/c*	*Demand*	*Queue*
Columbus Avenue/Coventry Street	EB Columbus Ave. thru	-	0.16	230	0	-	0.15	212	0	-	0.15	213	0
	WB Columbus Ave. thru	-	0.27	368	0	-	0.31	428	0	-	0.32	435	0
	NB Coventry Street left/right	B	0.12	48	10	B	0.12	49	11	B	0.12	49	10
Columbus Avenue/Burke Street/Columbus Garage	EB Columbus Ave.	A	0.03	263	2	A	0.07	246	5	A	0.07	247	6
	WB Columbus Ave.	A	0.01	358	1	A	0.01	386	1	A	0.01	387	1
	SB Columbus Garage	F	>1	198	267	F	>1	342	730	F	>1	360	796
Tremont Street/Coventry Street	EB Tremont Street left/thru	A	0.03	199	2	A	0.04	246	3	A	0.04	246	3
	EB Tremont Street thru	-	0.23	349	0	-	0.28	437	0	-	0.28	437	0
	WB Tremont Street thru	-	0.23	319	0	-	0.28	397	0	-	0.28	397	0
	WB Tremont Street thru/right	-	.13	180	0	-	0.15	221	0	-	0.15	221	0
Tremont Street/Roxse Drive/Burke Street	EB Tremont Street thru	-	0.22	359	0	-	0.27	431	0	-	0.27	431	0
	EB Tremont Street thru/right	-	0.12	189	0	-	0.14	225	0	-	0.14	225	0
	WB Tremont Street left/thru	A	0.01	168	1	A	0.01	200	1	A	0.01	200	1
	WB Tremont Street thru	-	0.23	327	0	-	0.27	390	0	-	0.27	390	0
	NB Roxse Drive left/right	C	0.05	4	12	C	0.06	12	5	C	0.06	12	5
	SB Burke Street left/thru/right	C	0.21	42	19	D	0.26	43	26	D	0.26	43	26

1 Level of Service
2 Volume-to-capacity ratio
3 Demand in number of vehicles per hour
4 95th percentile queue length (feet)

3.8 Parking

The Project will result in the elimination of the existing 58 surface parking spaces at the Burke Street Lot. Staff, faculty, and visitors that currently park at the Burke street lot will in the future park either at Columbus Garage or at one of several other lots and garages on the campus. The University currently has adequate parking supply throughout its campus to accommodate the shift in demand.

No designated on-site parking will be provided for residents of the Project. Resident students living within the proposed building would **not qualify** for the city of Boston residential parking-permit program. Full-time undergraduate and graduate students are eligible to purchase a parking pass for Northeastern parking facilities on a semester basis. Part-time student have the option to purchase a semester permit or an annual permit. There is sufficient capacity to meet student parking demand. As detailed in the IMP, parking demand for students is very low at only approximately 0.07 parking passes per student.

Together, the pedestrian-oriented nature of students, the proximity to campus, the close availability of transit, and the high cost of overnight parking, will discourage vehicle ownership by Project residents.

3.9 Bicycle Storage

Secure bicycle parking will be provided for residents, employees, and visitors, consistent with the *City of Boston Bicycle Parking Guidelines*, including:

- Each of the residential apartment units will be provided wall-mounted bike storage with a combined capacity totaling 590 biked (or 74 percent of building residents). The Project team has given careful attention to the design of the interiors to ensure that there is convenient access through the building, via elevator, and the hallways are wide enough to accommodate passage of bicycles and other residents. The in-room storage racks will eliminate the need for resident to lock up their bicycles and reduce the possibility of theft;

- Secure covered bicycle storage room at the ground level for approximately 44 bike parking spaces, serving residents, visitors, and guests;

- Outdoor storage for up to 48 bicycles around the Project site for building visitors and customers of the commercial space; and

- A self-service bicycle repair station will be provided within the ground-floor bicycle storage room.

The exact quantities, locations, and details of the bicycle storage amenities will be finalized as part of the Transportation Access Plan Agreement (TAPA) between the Proponent and BTD.

3.10 Loading and Building Servicing

As the Project site is occupied by a parking lot, there is no loading or service activity on the site today. During field observations, the study team observed that commercial vehicles servicing Columbus Place often park on the sidewalk along the eastern side of Burke Street.

The Project includes an at grade loading and service area off of Coventry Street. Loading will also occur within the existing Columbus Place surface parking lot, located across the street from the Project site on Burke Street.

The Project team will work with BTD to explore the appropriateness of adding an on-street commercial loading zone along the west side of Burke Street that could serve the Project's proposed commercial space as well as loading and service needs of the adjacent Columbus Place. Changes to on-street curb use would be determined as part of the TAPA process.

The types of services expected at the Project include package delivery, building servicing, trash removal, food deliveries, and deliveries to the ground floor commercial space. Deliveries are typically made by passenger vehicles, vans, pick-up trucks, and small box trucks. The loading area will be designed to accommodate a vehicle as large as SU-36 (approximately 36 feet in length).

To evaluate loading and service activity for a residence hall use, the study team used existing loading survey data from similar-type residential facilities at Suffolk University (Nathan R. Miller Residence Hall) and Northeastern University (Stetson Hall). Loading and service at the Project is expected to be similar to these existing residence halls in terms of the number and times of delivery on a typical weekday. Using a proportional estimate based on number of beds, the Project is expected to generate approximately 8 to 10 deliveries spread out over a typical weekday. Assuming deliveries generally occur between 7:00 a.m. and 3:00 p.m., about 1 delivery per hour can be expected at the Project.

3.11 Student Move-in Move out

Since 2000, the University has prepared Move-In/Move-Out Plans each academic year for the Boston Transportation Department (BTD). The Move-Out Plan is usually a less formalized document since that process is more gradual, taking place over a longer time-frame.

For the past several years, Northeastern has provided state of the art move-in support and service to students moving on to campus during move-in week in the Fall, including those residence halls on Columbus Ave. The service and support is structured to handle high volume University move-ins with quality, efficiency and professionalism. The plan includes over 500 “move in team” members, 25 staff providing supervision and over 2000 pieces of equipment. As cars pull up to the curb, cars are unloaded and a team of movers places their items into bins that are then taken directly to their rooms. The move-in plan focuses on traffic management and minimum disruption to city streets and includes:

- Attending community meetings to create support for the move-in plan.
- Notifying neighbors about the move-in process and arranging parking for neighbors in the Camden Lot and Gainsborough garages for the weekend.
- Avoiding moving students into the Fenway area on September 1st due to expected congestion.
- Working with the neighborhoods on August 31 and September 1.
- Assisting coordination of trash removal and police presence.
- Reaching out to neighboring businesses and institutions (i.e., the Symphony, Wentworth) in early May and early June to notify them of the University’s move in plans.
- Coordinating with the Mayors' Office and various city agencies with regard to move-in schedule, plan and coordination.
- Spreading move-in over five days to ease congestion and improve service.
- Easing the move-in process for parents and students by providing moving support (professional movers and moving carts) at targeted locations and increasing campus volunteers.
- Expanding curb-side check-in at White Hall, Willis Hall, and West Village H.
- Confirming parking plans with the City and nearby neighborhoods to assist with smooth curbside check-ins.

Northeastern also monitors major events and construction activities in the area that might impact moving procedures.

Peak move-in periods for Northeastern typically occur on the Friday, Saturday, Sunday, and Monday of Labor Day weekend. During those days, the University has about 1,000 – 2,000 students move in per day across the campus (Fenway area, East Village/Hastings, Columbus Ave and International Village). Move-in activities associated with the Project are expected to have only a small impact on area roadways, as it will account for less than 10 percent of the total number of students housed by Northeastern. Move-out periods vary greatly as students all manage their own schedules of being in classes and/or on co-op, and so there is no real peak for move-outs except for freshman move-out during the end of April, and this occurs over the course of one week during final exams.

The move-in for the Proposed Project will be included in the overall Northeastern University move-in strategy. The Northeastern move-in team will work with American Campus Communities on a plan where students are assigned a specific move-in day and time by Floor. The move in team will consult on traffic patterns, queue lines, elevator management and staging. The plan will also include a place for each vehicle to park in a Northeastern parking garage for move-in day. Northeastern University Facilities Services will participate in the removal of trash on Columbus Ave for the Burke Street Residence Hall in the same way they do today on Mission Hill during the September 1st move-in day.

3.12 Transportation Demand Management

The University has made a strong commitment and continues to make improvements to transportation demand management (TDM) initiatives to help reduce single-occupant auto commuting to and from its campus and to promote non-auto alternatives. Notably, since the 2000 IMP, drive alone commuter trips to/from the campus have declined substantially – from 27% to only 6% for students and from 49% to only 29% for employees. In 2012, Northeastern received the Massachusetts Excellence in Commuter Options (ECO) Pinnacle Award for the on-going efforts in incorporating sustainable transportation on campus.

Northeastern University provides a number of transportation demand management programs to reduce single-occupant automobile use and parking by students, faculty and staff, and to help improve the environment of the campus, as described below:

- On-Site sale of MBTA passes – The University currently provides MBTA pass sales on-campus through the Husky Card office. In addition, MBTA maps and schedules are posted at a number of different locations around campus.

- MBTA Semester Pass Program – The University participates in the MBTA's Semester Pass Program. This program allows students to receive a discount on transit passes for the semester when purchased in advance.

- Providing Pre-tax purchase of MBTA passes for employees – The University allows MBTA passes to be purchased by employees by means of a pre-tax payroll deduction for up to $125 per month. This effectively reduces the employee cost of purchasing passes.

- Negotiation with Bus Providers – The University is actively involved with the MBTA, BTD and the BRA, as well as adjacent institutions of higher learning and other government agencies to enhance access, as well as the aesthetics of the public transit facilities located adjacent to campus.

- Ruggles Station – Northeastern University continues to discuss with the MBTA to adopt the Ruggles Station on the Orange Line. This negotiation seeks opportunities for partnership between the University and the MBTA to enhance the overall commuting experience at the Ruggles Station.

- Posting of Bus Schedules – Information on the MBTA including maps, fares, schedules, updates and recommended routes to campus are available at various websites and information centers on campus.

- Bicycling Incentives – Northeastern supports bicycling to campus with sponsorship of the Hubway bike sharing system, discussed elsewhere in this document. The Northeastern University Police Department's new voluntary bicycle registration program is available to any faculty, staff, or student for $5. NUPD records the information and provides a sticker. Two bicycle repair stations have been installed on campus for use by the entire Northeastern community. The NU bookstore offers an automatic 20% discount on the U-type locks that it sells, and NU secured a 15% discount on bike safety and security gear at a nearby bicycle shop. Bicycle racks are available throughout campus, and secure bicycle storage space is provided on the ground level of the Renaissance Park Garage. Showers and lockers for cyclists are available at two athletic centers on the campus.

- Off-Campus Student Services Office – The University operates a Commuter Referral Office providing commuting students with information on commuting (bus and train schedules and carpooling information).

- Sponsorship of the Fenway Alliance – Northeastern University has been instrumental in supporting the Fenway Alliance as a consortium for planning in the area. The Alliance serves as a forum for the institutions centered in the Fenway Cultural District to coordinate on transportation and parking issues in addition to other concerns of a district-wide nature.

  Roxbury to Fenway Bicycle Connector – Over a period of years, Northeastern has worked to promote the proposed bicycle and pedestrian connection between the Back Bay Fens and the Southwest Corridor Park. The University continues to work collaboratively with the Boston Transportation Department as they seek to design and construct the Roxbury to Fenway Bicycle Connector as part of the Boston Green Links Initiative.

  Ride-matching Program – Northeastern participates in the MassRides program. Faculty, staff and students who are interested in carpooling or vanpooling are matched through a Northeastern University website to MassRides. Posters and literature promoting MassRides have been distributed campus-wide. The Office of

Environmental Health and Safety maintains information and links to MassRides on their website. Information is also available at the Off Campus Student Services office located at the Curry Student Center and the Human Resources Management Office at 250 Columbus Place.

- Guaranteed Ride Home – Northeastern continues to promote the Guaranteed Ride Home program offered through MassRides.
- Preferential Parking for Carpools and Vanpools – Up to four preferred parking spaces have been provided in the Gainsborough Garage first floor for faculty and staff with daytime decals who travel with at least three total occupants.
- Carpooling Incentives – The University provides other periodic incentives to encourage carpooling by students, faculty and staff.
- Car Sharing – As noted elsewhere, Northeastern has two car sharing services available on or near the Boston Campus – 6 assigned ZipCar spaces and 12 Enterprise CarShare spaces. Several University departments have Zipcar accounts.
- Electric Vehicles and Charging – The University has acquired several small electric vehicles for use on campus by facilities personnel. As part of the ISEC project, the University will be installing electric vehicle charging stations within the first floor of the Columbus Garage.
- Walking. Northeastern provides many facilities that encourage people to walk before, during and after work hours, including restaurants and other dining facilities, recreation centers, banking services, counseling services, a notary public, a library and the bookstore. Walking Works at Northeastern, a physical activity group, encourages walking, including the "walking and talking" program that connects faculty and staff with University leaders.

Additional TDM program elements specific to the new Project will be developed as part of the TAPA process.

3.13 Construction Period Impacts

Most construction activities will be accommodated within current site boundaries. Details of the overall construction schedule, working hours, number of construction workers, worker transportation and parking, number of construction vehicles, and routes will be addressed in detail in a Construction Management Plan (CMP) to be filed with BTD in accordance with the City's transportation maintenance plan requirements. The Project's contractor will be required to coordinate all construction activities with other on-going construction work to minimize impacts to area roadways.

To minimize transportation impacts during the construction period, the following measures will be incorporated into the CMP:

- On-site construction worker parking will be limited, and worker carpooling will be encouraged;
- A subsidy for MBTA passes will be considered for full-time employees;
- A truck routing plan will be developed to minimize impacts on adjacent roadways; and
- Secure spaces will be provided on-site for workers' supplies and tools so they do not have to be brought to the site each day.

Section 4.0

Environmental Review Component

4.0 ENVIRONMENTAL REVIEW COMPONENT

4.1 Wind

4.1.1 Introduction

A pedestrian wind study was conducted by Rowan Williams Davies and Irwin Inc. (RWDI) on the proposed Columbus Avenue Student Housing Project located on the Northeastern University campus in Boston, Massachusetts. The objective of the study was to assess the effect of the proposed development on local conditions in pedestrian areas around the study site and to provide recommendations for minimizing adverse effects.

The study involved wind simulations on a 1:300 scale model of the proposed building and surroundings. These simulations were conducted in RWDI's boundary-layer wind tunnel at Guelph, Ontario, for the purpose of quantifying local wind speed conditions and comparing to appropriate criteria for gauging wind comfort in pedestrian areas. The criteria recommended by the BRA were used in this study. The present report describes the methods and presents the results of the wind tunnel simulations.

Wind conditions at a majority of the locations studied are predicted to remain comfortable for walking or better. However, new uncomfortable mean wind speed conditions are predicted as a result of the Project. As the design progresses, potential mitigation measures, such as planting marcescent trees that maintain their foliage on an annual basis, will be studied with additional wind tunnel testing to determine the most effective solution to improve wind conditions.

4.1.2 Overview

Major buildings, especially those that protrude above their surroundings, often cause increased local wind speeds at the pedestrian level. Typically, wind speeds increase with elevation above the ground surface, and taller buildings intercept these faster winds and deflect them down to the pedestrian level. The funneling of wind through gaps between buildings and the acceleration of wind around corners of buildings may also cause increases in wind speed. Conversely, if a building is surrounded by others of equivalent height, it may be protected from the prevailing upper level winds, resulting in no significant changes to the local pedestrian level wind environment. The most effective way to assess potential pedestrian level wind impacts around a proposed new building is to conduct scale model tests in a wind tunnel.

The consideration of wind in planning outdoor activity areas is important since high winds in an area tend to deter pedestrian use. For example, winds should be light or relatively light in areas where people would be sitting, such as outdoor cafes or playgrounds. For bus stops and other locations where people would be standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable. For infrequently used areas, the wind comfort criteria can be relaxed even further. The actual effects of wind can range from pedestrian inconvenience, due to the blowing of dust and other loose material in a moderate breeze, to severe difficulty with walking due to the wind forces on the pedestrian.

4.1.3 Methodology

Information concerning the site and surroundings was derived from: information on surrounding buildings and terrain and, site plans and elevations of the proposed development provided by the design team. The following configurations were simulated:

- No Build Configuration: includes all existing and BRA approved surrounding buildings; and,

- Build Configuration: includes the proposed Project and all existing and BRA approved surroundings;

As shown in Figures 4.1-1 and 4.1-2, the wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1200 ft radius of the study site. The mean speed profile and turbulence of the natural wind approaching the modelled area were also simulated in RWDI's boundary layer wind tunnel. The scale model was equipped with 104 specially designed wind speed sensors that were connected to the wind tunnel's data acquisition system to record the mean and fluctuating components of wind speed at a full scale height of 5 feet above grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 wind directions, in 10 degree increments, starting from true north. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the reference wind speed in the free stream above the model. The results were then combined with long term meteorological data, recorded during the years 1995 to 2015 at the Boston Logan International Airport, in order to predict full scale wind conditions. The analysis was performed separately for each of the four seasons and for the entire year.

Figures 4.1-3 through 4.1-5 present "wind roses", summarizing the seasonal and annual wind climates in the area respectively, based on the data from Boston Logan International Airport. The upper left wind roses in Figure 4.1-3, for example summarizes the spring (March, April, and May) wind data. In general, the prevailing winds at this time of year are from the south-southwest through northwest directions and northeast to east-southeast. In the case of strong winds, however, the most common wind directions are from the west-northwest, northwest, south-southwest and west.

On an annual basis (Figure 4.1-5) the most common wind directions are those between south-southwest and north-northwest. Winds from the east-northeast to the east-southeast are also relatively common. In the case of strong winds, west-northwest, northwest and west are the dominant wind directions.

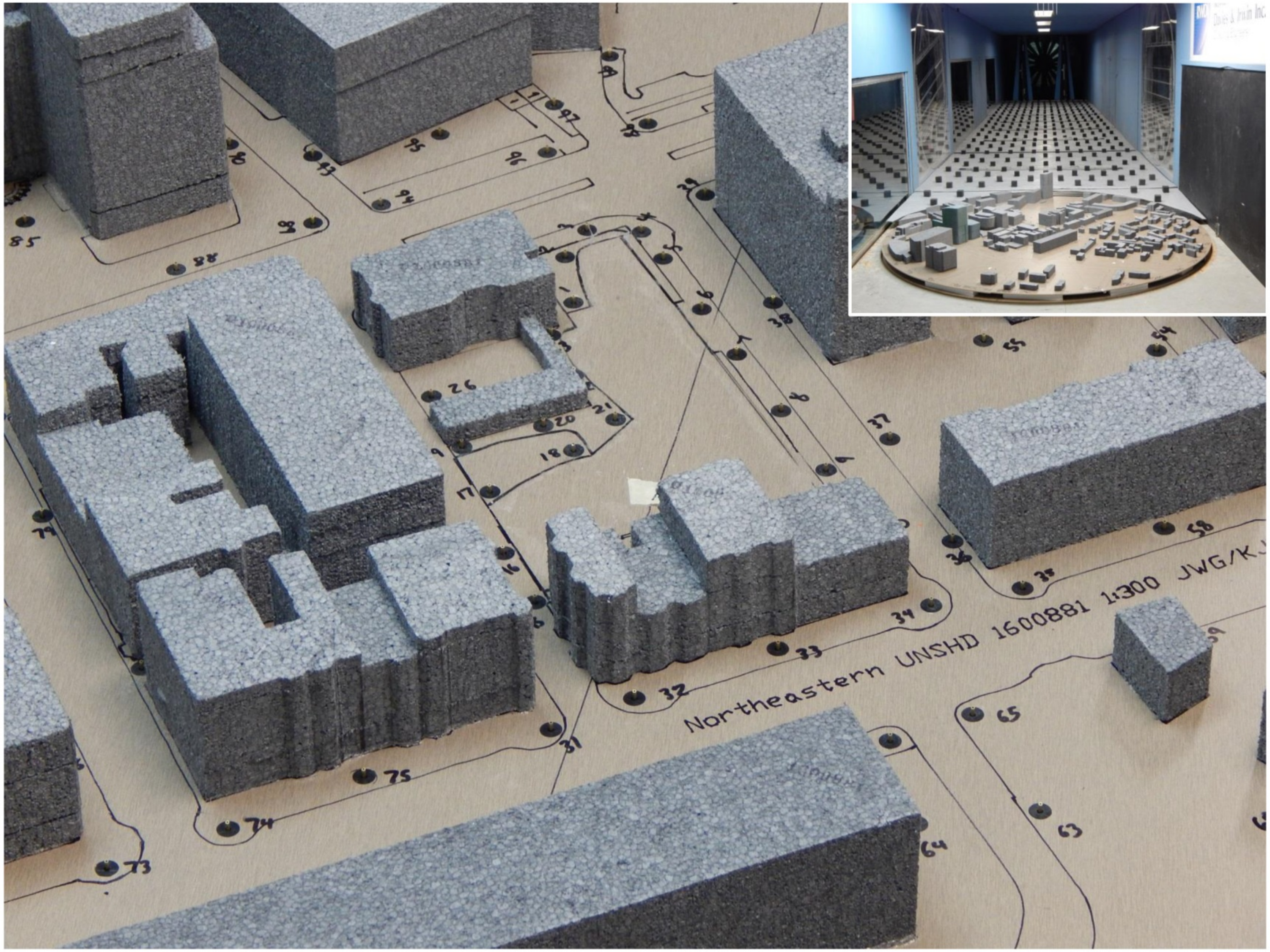


Figure 4.1-1

Wind Tunnel Study Model – No Build

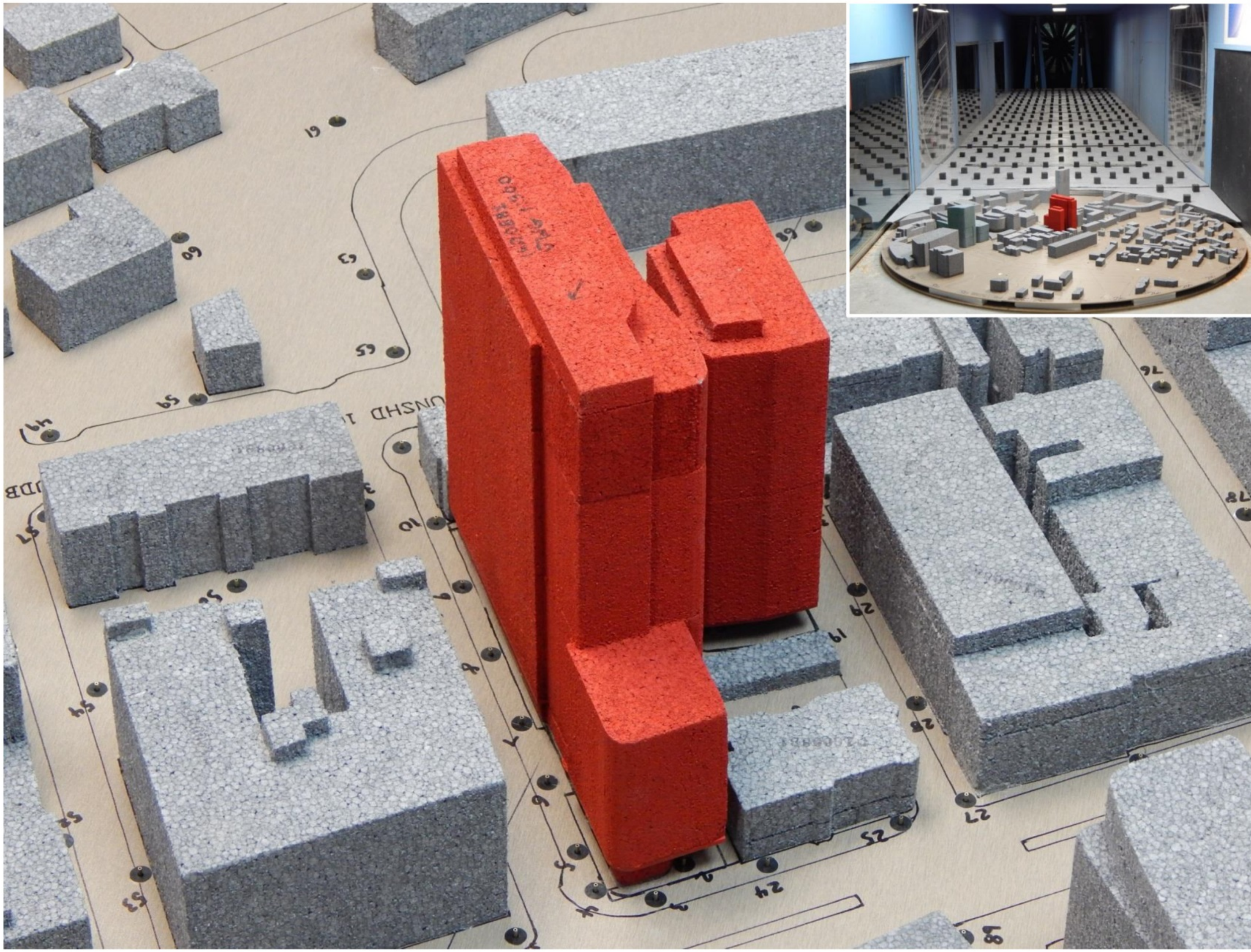


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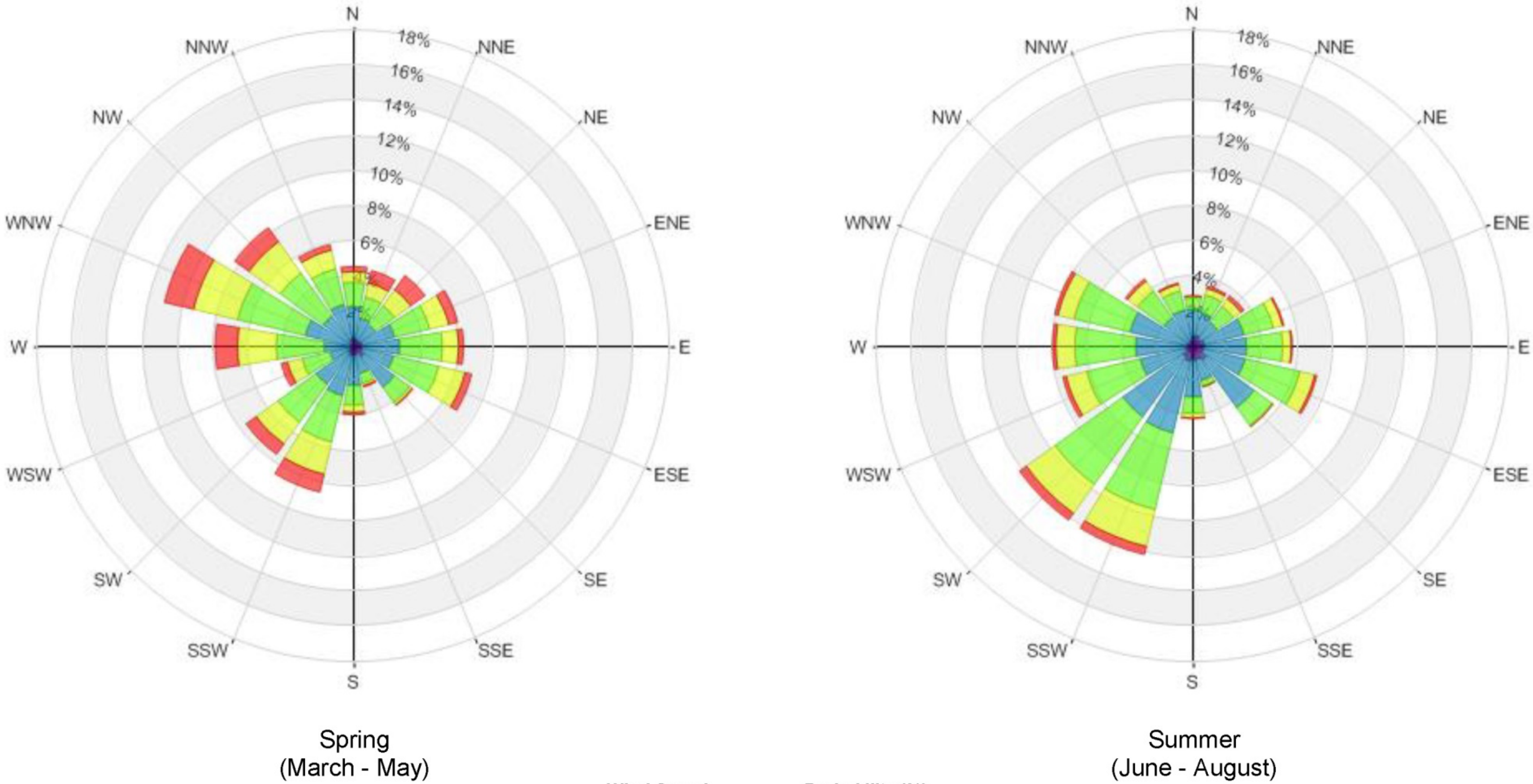
Figure 4.1-2

Wind Tunnel Study Model – Build



Wind Speed (mph)	Probability (%) Spring	Summer
Calm	2.8	3.1
1-5	6.7	9.5
6-10	28.8	38.8
11-15	32.7	34.4
16-20	19.1	11.7
>20	9.9	2.5

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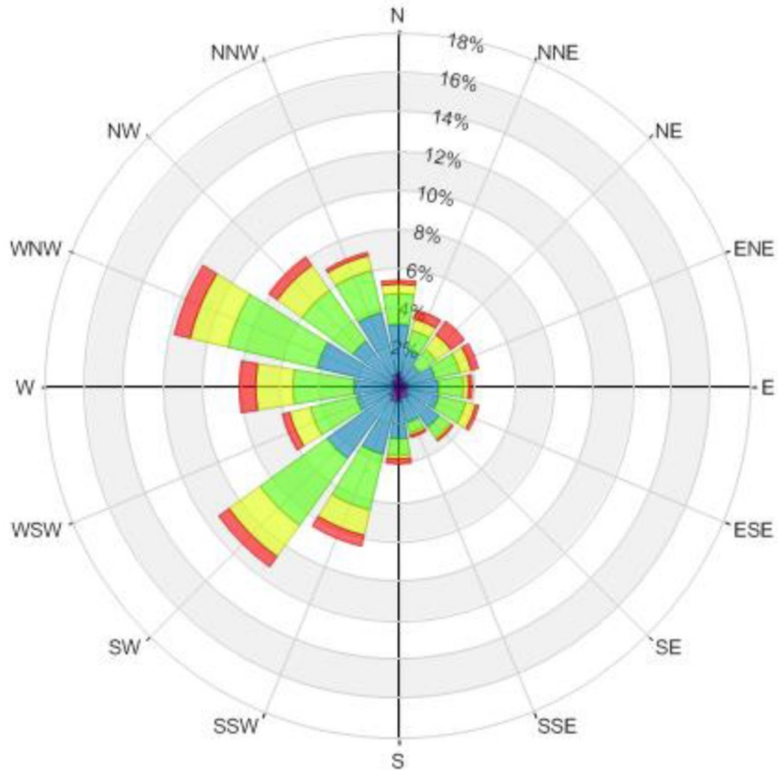
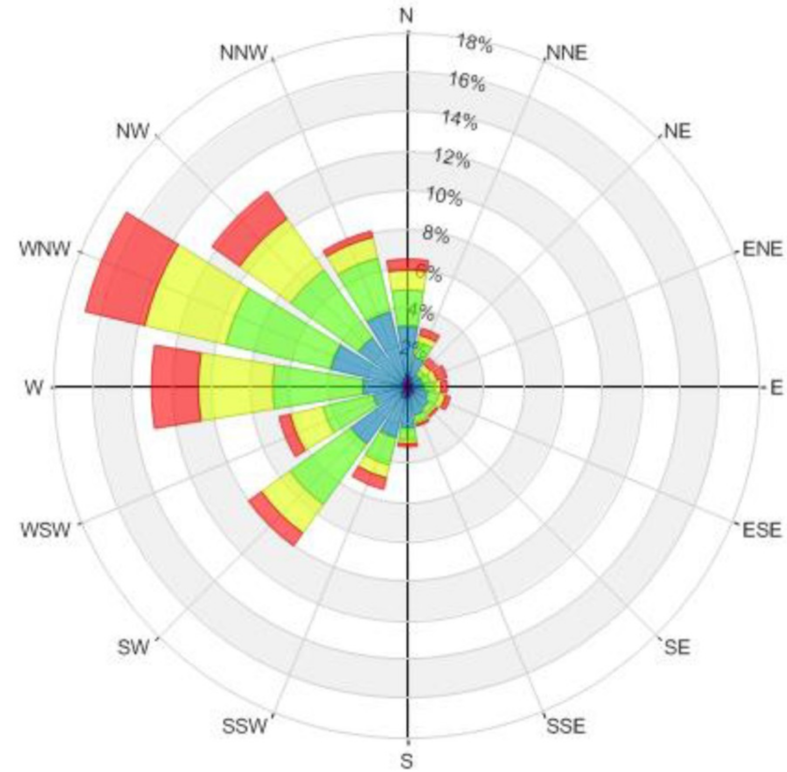
RWDI

Figure 4.1-3

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1995-2015)



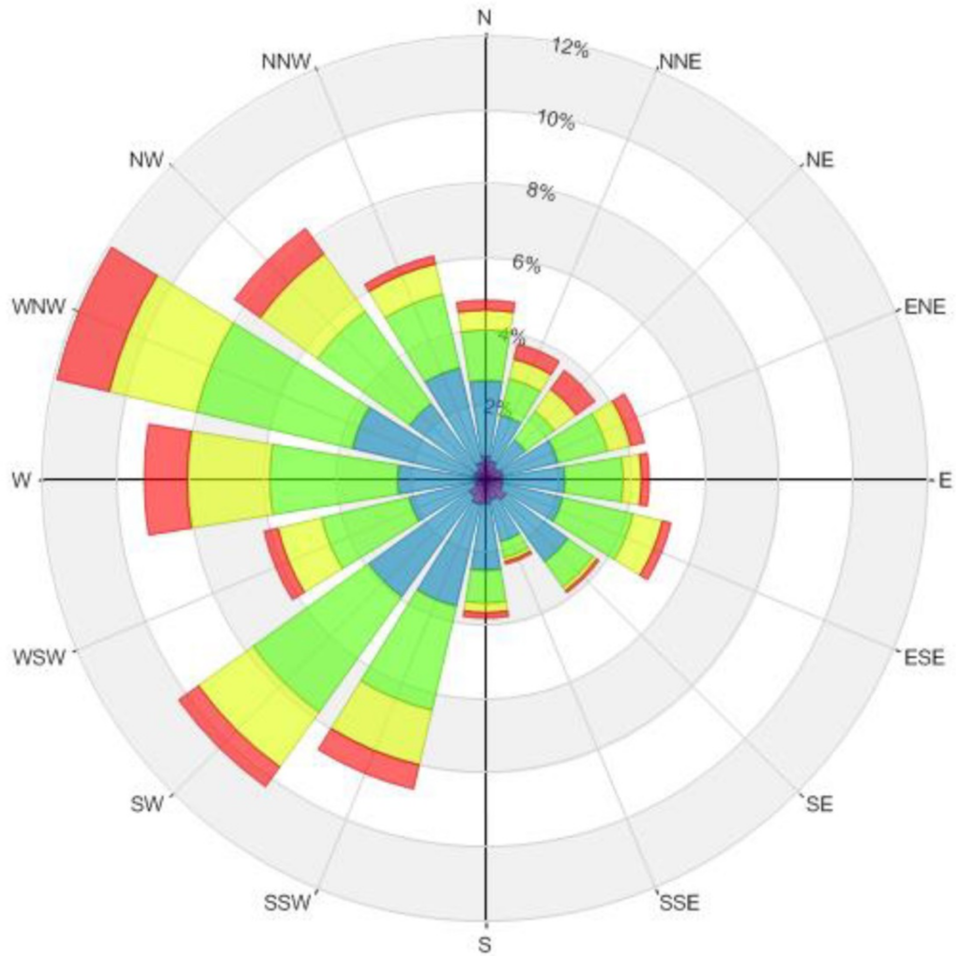
Fall
(September - November)



Winter
(December - February)

Wind Speed (mph)	Probability (%) Fall	Winter
Calm	3.4	2.6
1-5	8.5	6.5
6-10	34.7	28.0
11-15	32.3	30.8
16-20	14.4	19.7
>20	6.6	12.3

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1995-2015)



Annual Winds

Wind Speed (mph)	Probability (%)
Calm	3.0
1-5	7.8
6-10	32.6
11-15	32.6
16-20	16.2
>20	7.8

Figure 4.1-5

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1995-2015)

This study involved state of the art measurement and analysis techniques to predict wind conditions at the study site. It is worth noting that the sensation of comfort among individuals can be quite variable. Variations in age, individual health, clothing, and other human factors can change a particular response of an individual. The comfort limits used in this report represent an average for the total population. Also, unforeseen changes in the Project area, such as the construction or removal of buildings, can affect the conditions experienced at the site. Finally, the prediction of wind speeds is necessarily a statistical procedure. The wind speeds reported are for the frequency of occurrence stated (one percent of the time). Higher wind speeds will occur but on a less frequent basis.

4.1.4 Pedestrian Wind Comfort Criteria

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA 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. The second standard used by the BRA is based on the work of Melbourne[1] and is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking, as shown in Table 4.1-1.

The criteria are shown in terms of benchmarks for the one-hour mean speed exceeded one percent of the time (*i.e.*, the 99-percentile mean wind speed).

Table 4.1-1 Boston Redevelopment Authority Mean Wind 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.

The wind climate found in a typical downtown Boston location is generally comfortable for pedestrian use of sidewalks and thoroughfares and meets the BRA effective gust velocity criterion of 31 mph. However, the general wind climate in Boston is likely to be frequently uncomfortable for more passive activities such as sitting.

1 Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions," Journal of Industrial Aerodynamics, 3 (1978) 241 – 249.

4.1.5 Results

Table 1 in Appendix C presents the mean and effective gust wind speeds for each season as well as annually. Figures 4.1-6 through 4.1-9 graphically depict the mean speed winds at each wind measurement location based on the annual winds. 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. The following summary of pedestrian wind comfort is based on the annual winds for each configuration tested, except where noted below in the text.

4.1.5.1 No Build Configuration

A wind comfort categorization of walking is considered appropriate for sidewalks. Lower wind speeds conducive to standing are preferred at building entrances. During the winter and spring seasons, walking conditions are also considered acceptable in courtyard areas.

Comfort conditions at grade level on the site are generally expected to be suitable for sitting, with minimal standing and walking conditions at the northeast corner of the Project site (Locations 3 to 7). The conditions surrounding the site are anticipated to be mostly comfortable for standing and sitting with a few exceptions of walking. Uncomfortable conditions are expected to the west and southwest of the Project site along Tremont Street and Columbus Avenue (Locations 70 and 83 respectively).

There are no unacceptable effective gust conditions in the No Build Configuration.

4.1.5.2 Build Configuration

Entrances and Building Perimeter (Locations 1 through 26)

The entrances to the proposed new student housing development are situated at Locations 1 and 16. The north entrance of the building (Location 1) is expected to experience standing conditions which is considered appropriate. The entrance at the western façade of the building (Location 16) is expected to have conditions comfortable for walking.

The conditions around the building perimeter are expected to be comfortable for walking or better with the exception of uncomfortable conditions anticipated at Locations 2, 4 and 17. Locations 2 and 4 are at the chamfered building corner on the north facade of the building. Uncomfortable conditions at Location 17 are caused by the south-westerly winds downwashing from the tower and flowing beneath the undercut in the vicinity of Location 17. To help improve wind comfort conditions at these locations, the Proponent is exploring mitigation measures such as coniferous landscaping, tall planters or wind screens.

There will be no unacceptable effective gust conditions at the building entrances.

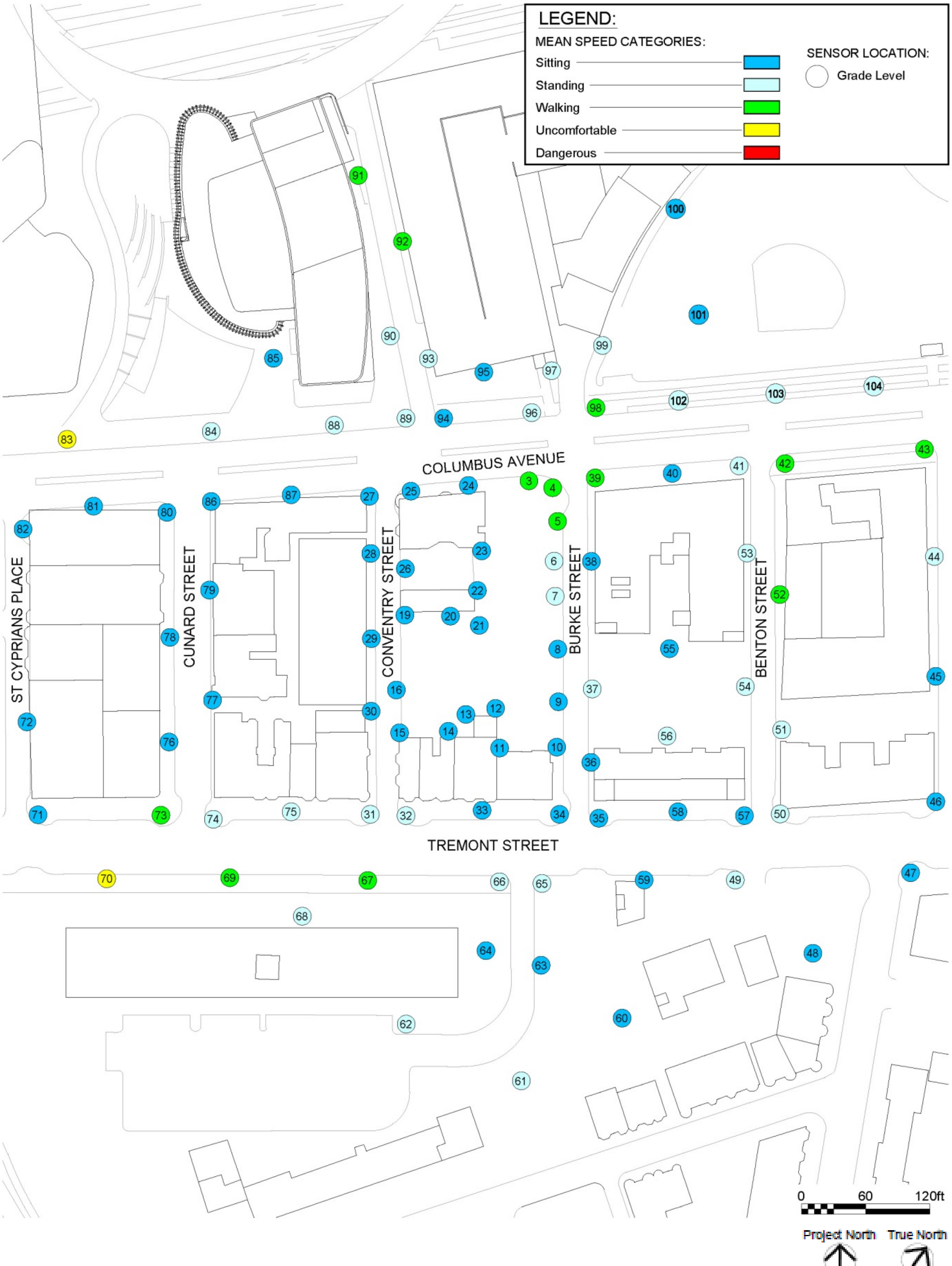


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Figure 4.1-6

Pedestrian Wind Conditions – Mean Speed – No Build

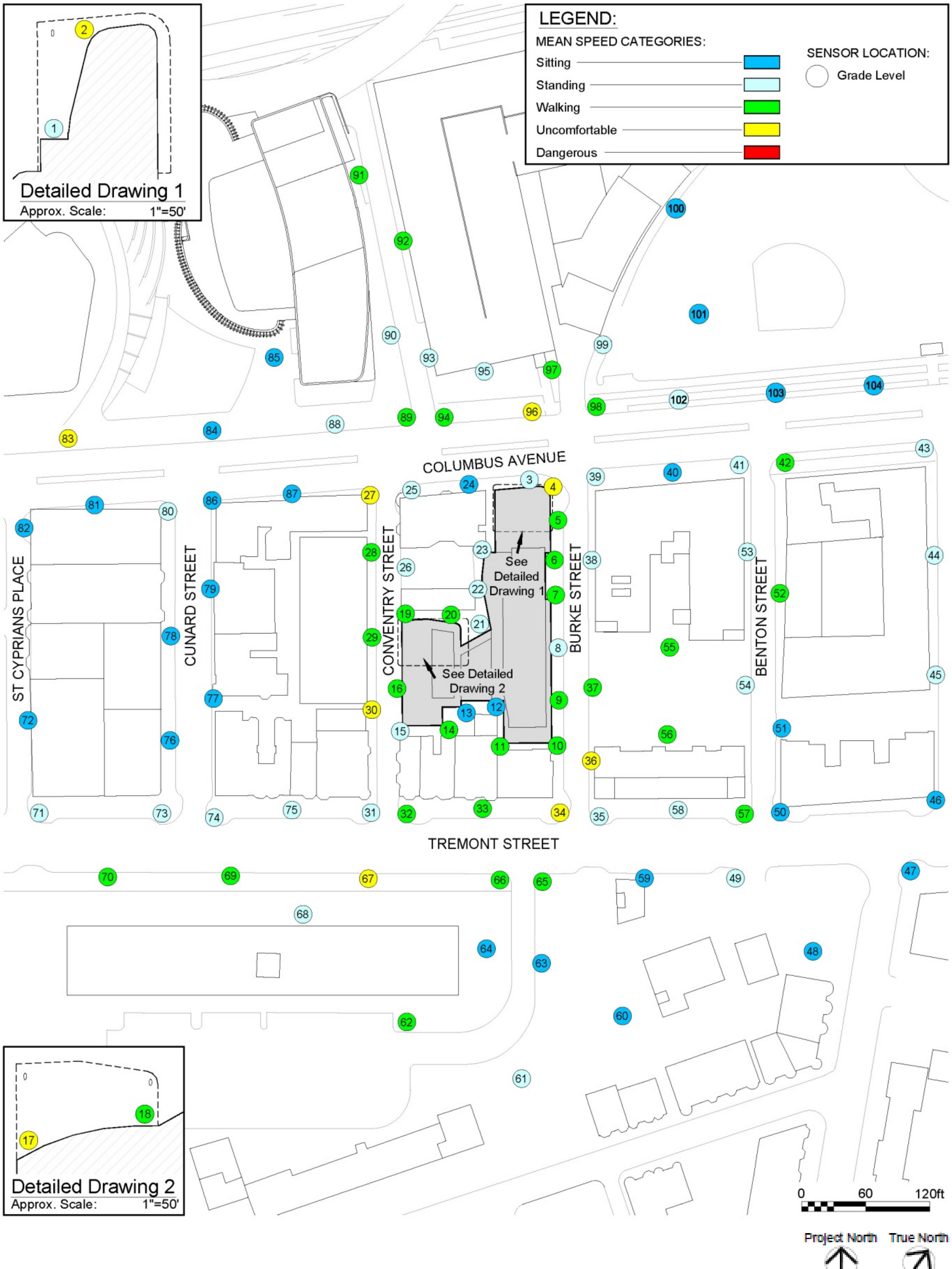

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Figure 4.1-7

Pedestrian Wind Conditions – Mean Speed – Build

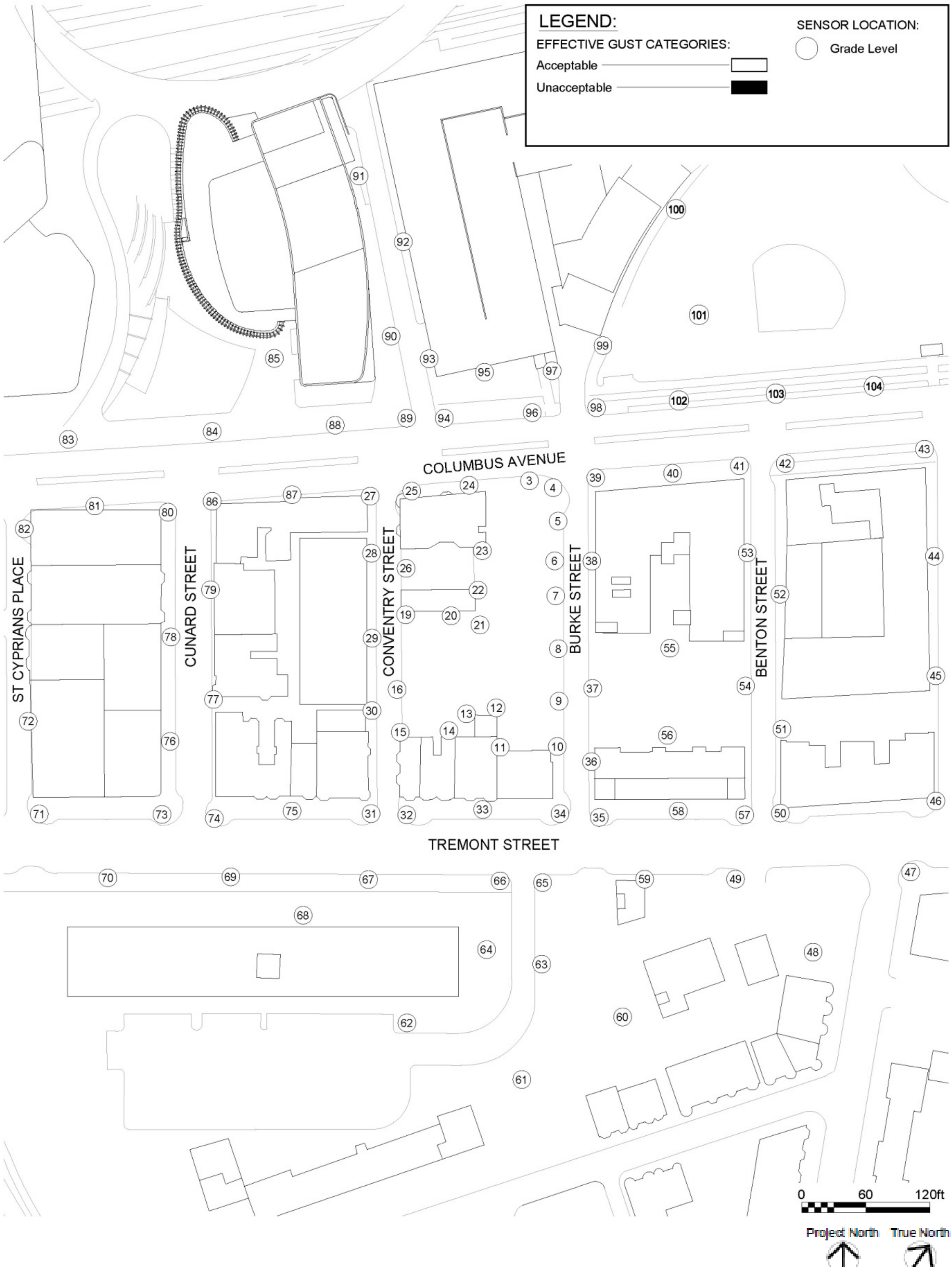

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Figure 4.1-8

Pedestrian Wind Conditions – Effective Gust Speed – No Build

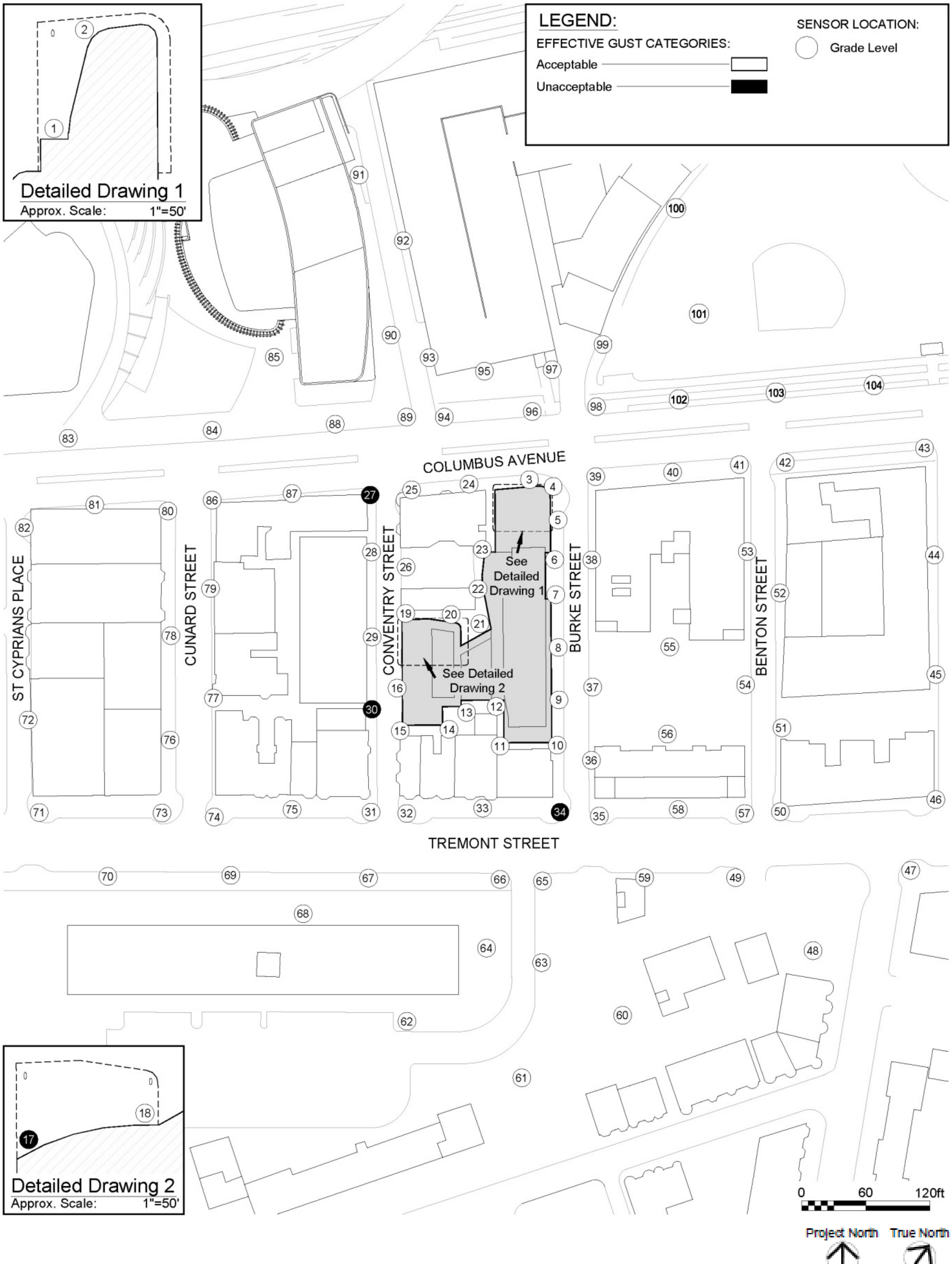

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Figure 4.1-9

Pedestrian Wind Conditions – Effective Gust Speed – Build

Off-site Sidewalks and Surroundings (Locations 27 through 104)

The surrounding area of the Project site is expected to have conditions of walking or better similar to the No Build configuration presented previously. Under the No Build configuration there is a total of 2 uncomfortable conditions (Locations 70 and 83 in figure 4.1-6). However under the Build configuration, a total of 7 uncomfortable conditions are anticipated (Locations 27, 30, 34, 36, 67, 83, and 96 in Figure 4.1-7). As the design of the building progresses, the Project will be refined to incorporate design solutions that will improve wind conditions. A landscaping plan that includes marcescent trees that maintain their foliage on an annual basis will be studied with additional wind tunnel testing to determine the most effective solution to improve wind conditions.

The Project is predicted to result in four effective gust exceedances (Locations 17, 27, 30, and 34 in Figure 4.1-9). The previously discussed mitigation techniques will assist in minimizing these exceedances as most gust exceedances surpassed the effective gust criteria by a minimal 1 or 2 mph (see Appendix C).

4.2 Shadow

4.2.1 Introduction and Methodology

As typically required by the BRA, 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).

The shadow analysis presents the new shadow that would be created by the Project. The analysis focuses on nearby open spaces and sidewalks 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 4.2-1 to 4.2-14 at the end of this section.

The results of the analysis show that new shadow from the Project is generally limited to nearby streets and sidewalk. Of the 14 time periods studied, new shadow will be cast onto the nearby bus stops on Tremont Street during only one time period (September 21 at 6 p.m.). New shadow will be cast onto Carter Field during only three of the time periods studied (March 21 at 3 p.m., September 21 at 3 p.m., and December 21 at 12:00 p.m.), however, shadow during the March and September time periods will be limited to a small portion of the southwestern corner of the field. During the March and December time periods the shadow on the field will be cast primarily on the portion of the field that will be covered by the temporary seasonal structure that will be in place approximately November through March.

4.2.2 Vernal Equinox (March 21)

At 9:00 a.m. during the vernal equinox, new shadow from the Project will be cast to the northwest onto Coventry Street and its sidewalks, and onto Columbus Avenue and its sidewalks. New shadow will be cast onto a portion of the future landscaped space adjacent to the Interdisciplinary Science and Engineering Complex (ISEC), which is currently under construction. No new shadow will be cast onto nearby bus stops or other open spaces.

At 12:00 p.m., new shadow from the Project will be cast to the northeast onto Burke Street and its sidewalks and onto a portion of Columbus Avenue and its sidewalks. Minimal new shadow will be cast onto the southwestern corner of Carter Field. No new shadow will be cast onto nearby bus stops or other open spaces.

At 3:00 p.m., new shadow from the Project will be cast to the northeast onto Burke Street and its sidewalks, and onto a portion of Benton Street and its sidewalks. No new shadow will be cast onto nearby bus stops or open spaces.

4.2.3 Summer Solstice (June 21)

At 9:00 a.m. during the summer solstice, new shadow from the Project will be cast to the northeast onto Coventry Street and its sidewalks and onto Columbus Avenue and its sidewalks. New shadow will be cast onto a small portion of the future landscaped space adjacent to the ISEC. No new shadow will be cast onto nearby bus stops or other open spaces.

At 12:00 p.m., new shadow from the Project will be minimal. New shadow will be cast to the north onto a small portion of Columbus Avenue and its southern sidewalk. No new shadow will be cast onto nearby bus stops or open spaces.

At 3:00 p.m., new shadow from the Project will be cast to the east Burke Street and its sidewalks. No new shadow will be cast onto nearby bus stops or open spaces.

At 6:00 p.m., new shadow from the Project will be cast to the southeast onto Burke Street and its sidewalks, small portions of Tremont Street and its southern sidewalk, Cabot Street and its sidewalks, and Hammond Street and its sidewalks. New shadow will be cast onto the bus stop at the southeastern corner of the site, and onto the bus stop at the intersection of Tremont and Hammond Streets. No ne shadow will be cast onto nearby open spaces.

4.2.4 Autumnal Equinox (September 21)

At 9:00 a.m., during the autumnal equinox, new shadow from the Project will be cast to the northwest onto Coventry Street and its sidewalks and onto Columbus Avenue and its sidewalks. New shadow will be cast onto a portion of the future landscaped space adjacent to the ISEC. No new shadow will be cast onto nearby bus stops or other open spaces.

At 12:00 p.m., new shadow from the Project will be cast to the north onto Burke Street and its sidewalks and onto a portion of Columbus Avenue and its sidewalks. Minimal new shadow will be cast onto the southwestern corner of Carter Field. No new shadow will be cast onto nearby bus stops or other open spaces.

At 3:00 p.m., new shadow from the Project will be cast to the northeast onto Burke Street and its sidewalks, and onto a portion of Benton Street and its sidewalks. No new shadow will be cast onto nearby bus stops or open spaces.

At 6:00 p.m., most of the area is under existing shadow. New shadow from the Project will be cast to the southeast onto the small portions of Burke, Benton, Kendall and Lenox Streets that are not already under shadow. No new shadow will be cast onto nearby bus stops or open space.

4.2.5 Winter Solstice (December 21)

The winter solstice creates the least favorable conditions for sunlight in New England. Because the sun angle during the winter is lower than in other seasons, shadows are made longer and reach further into the surrounding area.

At 9:00 a.m., new shadow from the Project will be cast to the northwest onto Columbus Avenue. No new shadow will be cast onto nearby bus stops or open space.

At 12:00 p.m., new shadow from the Project will be cast to the northeast onto Burke Street and its sidewalks and onto Columbus Avenue and its sidewalks, and onto a portion of Carter Field. No new shadow will be cast onto nearby bus stops or other open spaces.

At 3:00 p.m., most of the area is under existing shadow. New shadow from the Project will be cast to the northeast onto the small portions of Burke, Benton, Camden, and Northampton Streets that are not under existing shadow. No new shadow will be cast onto nearby bus stops or open spaces.

4.2.6 Conclusions

The shadow impact analysis looked at net new shadow created by the Project during fourteen time periods. The results of the analysis show that new shadow from the Project is generally limited to nearby streets and sidewalk. Of the 14 time periods studied, new shadow will be cast onto the nearby bus stops on Tremont Street during only one time period (September 21 at 6 p.m.). New shadow will be cast onto Carter Field during only three of the time periods studied (March 21 at 12 p.m., September 21 at 12 p.m., and December 21 at 12:00 p.m.), however, shadow during the March and September time periods will be limited to a small portion of the southwestern corner of the field. During the March and December time periods the shadow on the field will be cast primarily on the portion of the field that will be covered by the temporary seasonal structure that will be in place approximately November through March.

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Figure 4.2-1

Shadow Study: March 21, 9:00 a.m.

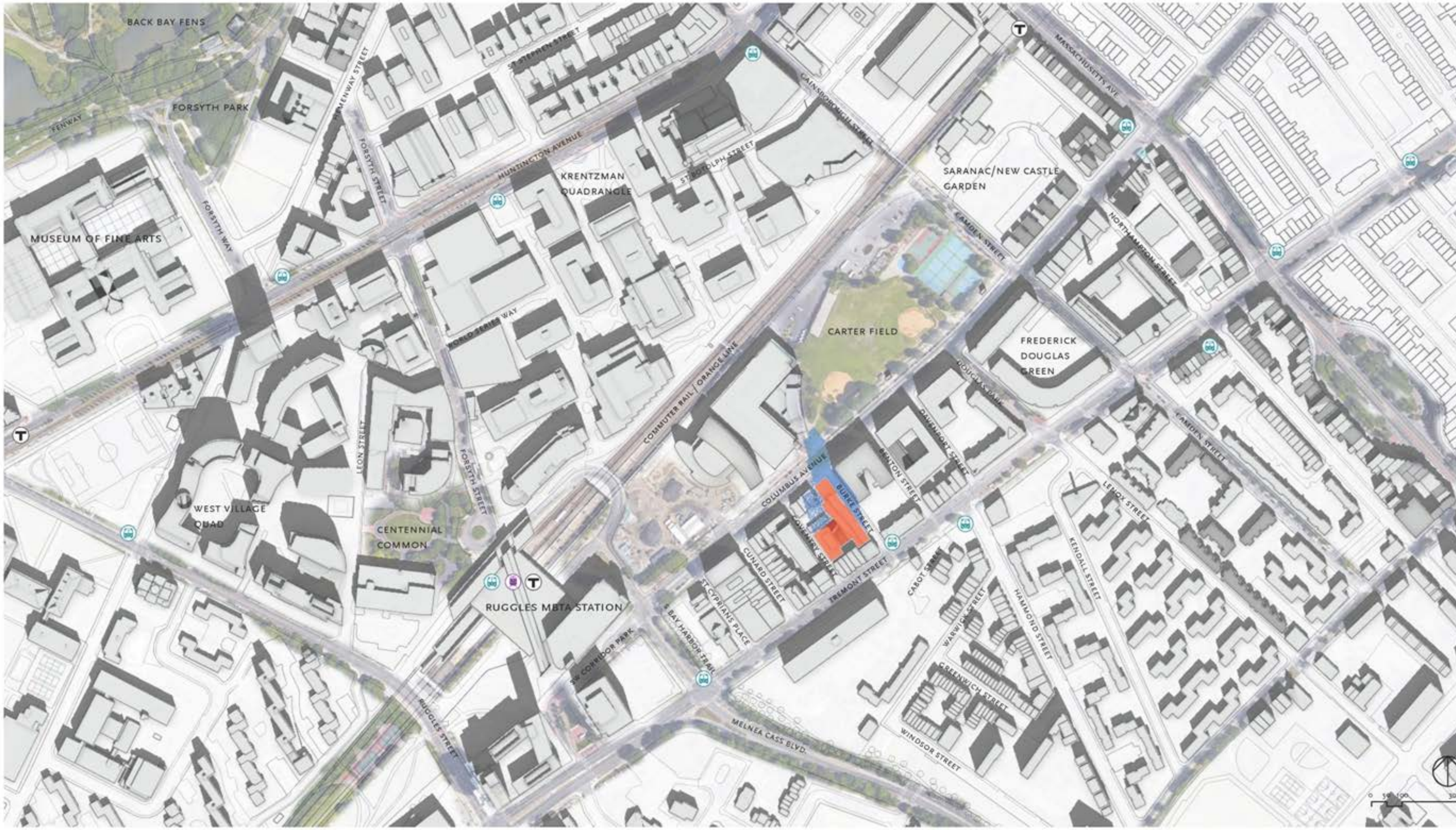

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Figure 4.2-2

Shadow Study: March 21, 12:00 p.m.

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Figure 4.2-3

Shadow Study: March 21, 3:00 p.m.

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Figure 4.2-4

Shadow Study: June 21, 9:00 a.m.

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Figure 4.2-5

Shadow Study: June 21, 12:00 p.m.

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Figure 4.2-6

Shadow Study: June 21, 3:00 p.m.

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Figure 4.2-7

Shadow Study: June 21, 6:00 p.m.

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Figure 4.2-8

Shadow Study: September 21, 9:00 a.m.

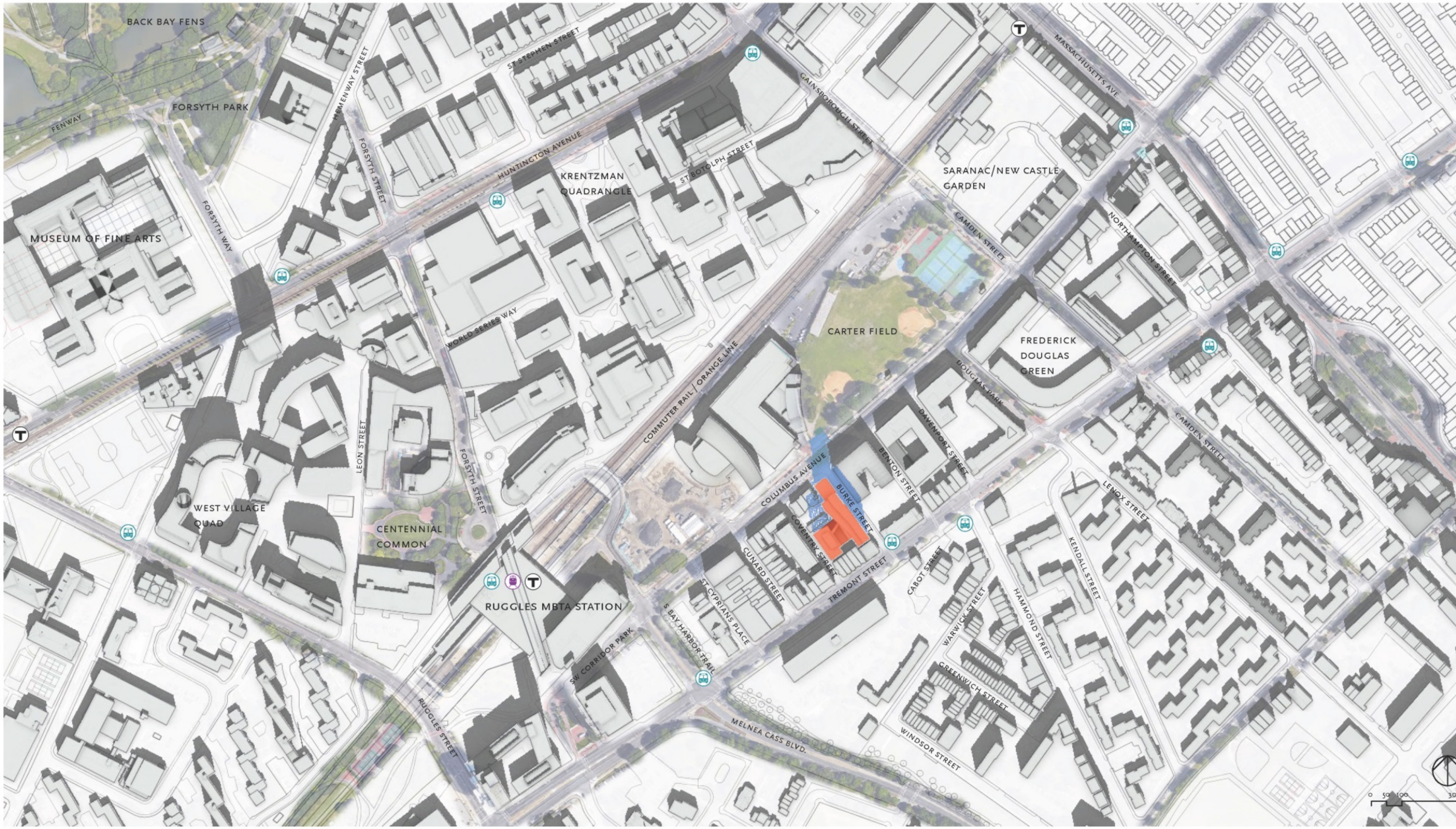

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Figure 4.2-9

Shadow Study: September 21, 12:00 p.m.

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Figure 4.2-10

Shadow Study: September 21, 3:00 p.m.

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Figure 4.2-11

Shadow Study: September 21, 6:00 p.m.

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Figure 4.2-12

Shadow Study: December 21, 9:00 a.m.

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Figure 4.2-13

Shadow Study: December 21, 12:00 p.m.

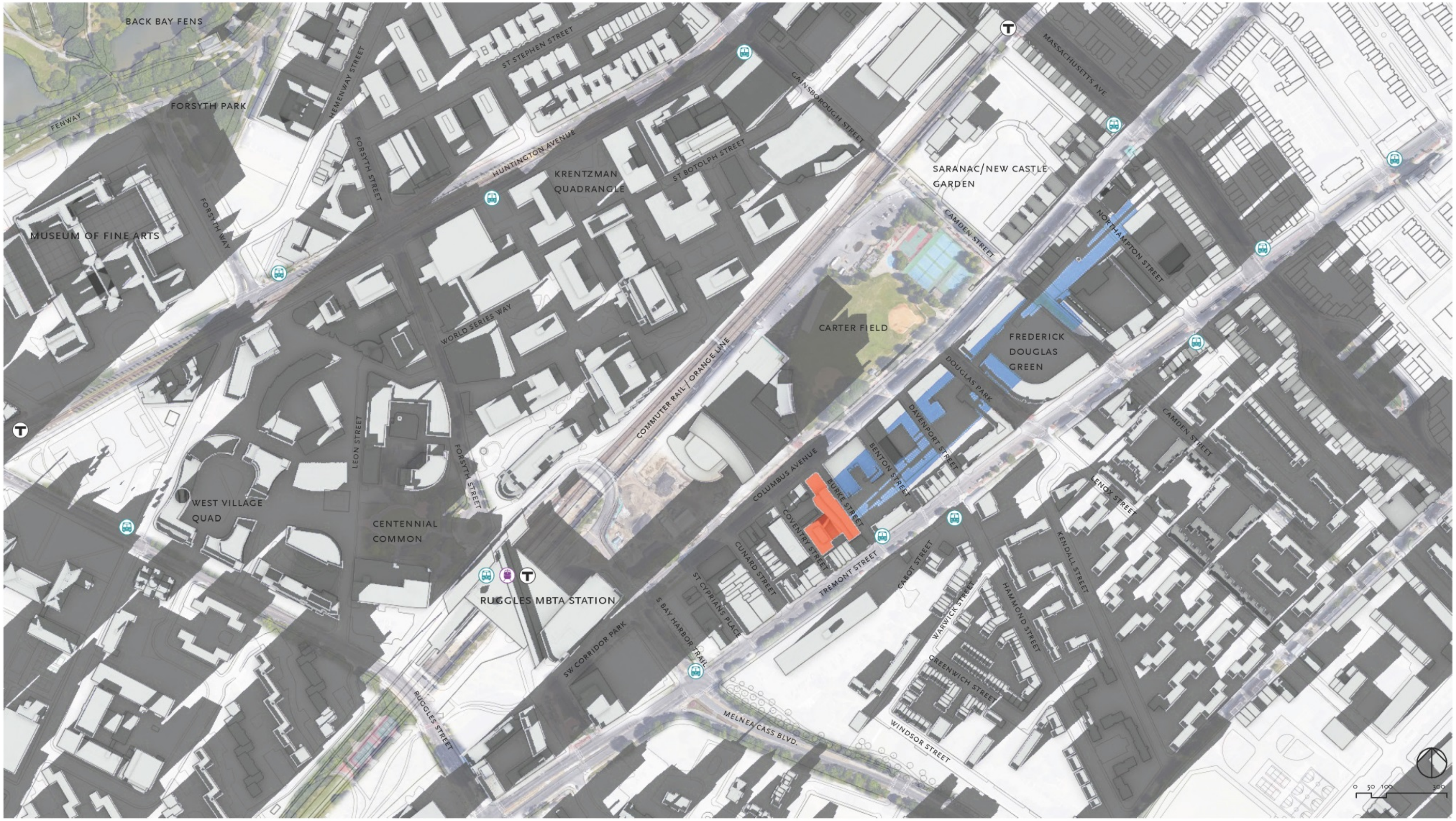

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Figure 4.2-14

Shadow Study: December 21, 3:00 p.m.

4.3 Daylight Analysis

4.3.1 Introduction

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

Because the Project site currently consists of a surface parking lot, the proposed Project will inherently increase daylight obstruction; however, because of the height variations, the resulting conditions are similar to or slightly lower than what is typical of the area and other urban areas.

4.3.2 Methodology

The daylight analysis was performed using the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program[2]. 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 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 0 to 100 percent based on 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.

The analysis compares three conditions: Existing Conditions; Proposed Conditions; and the context of the area.

Three viewpoints were chosen to evaluate the daylight obstruction for the Existing and Proposed Conditions. Four area context points were considered to provide a basis of comparison to existing conditions in the surrounding area. The viewpoint and area context viewpoints were taken in the following locations and are shown on Figure 4.3-1.

---

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

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

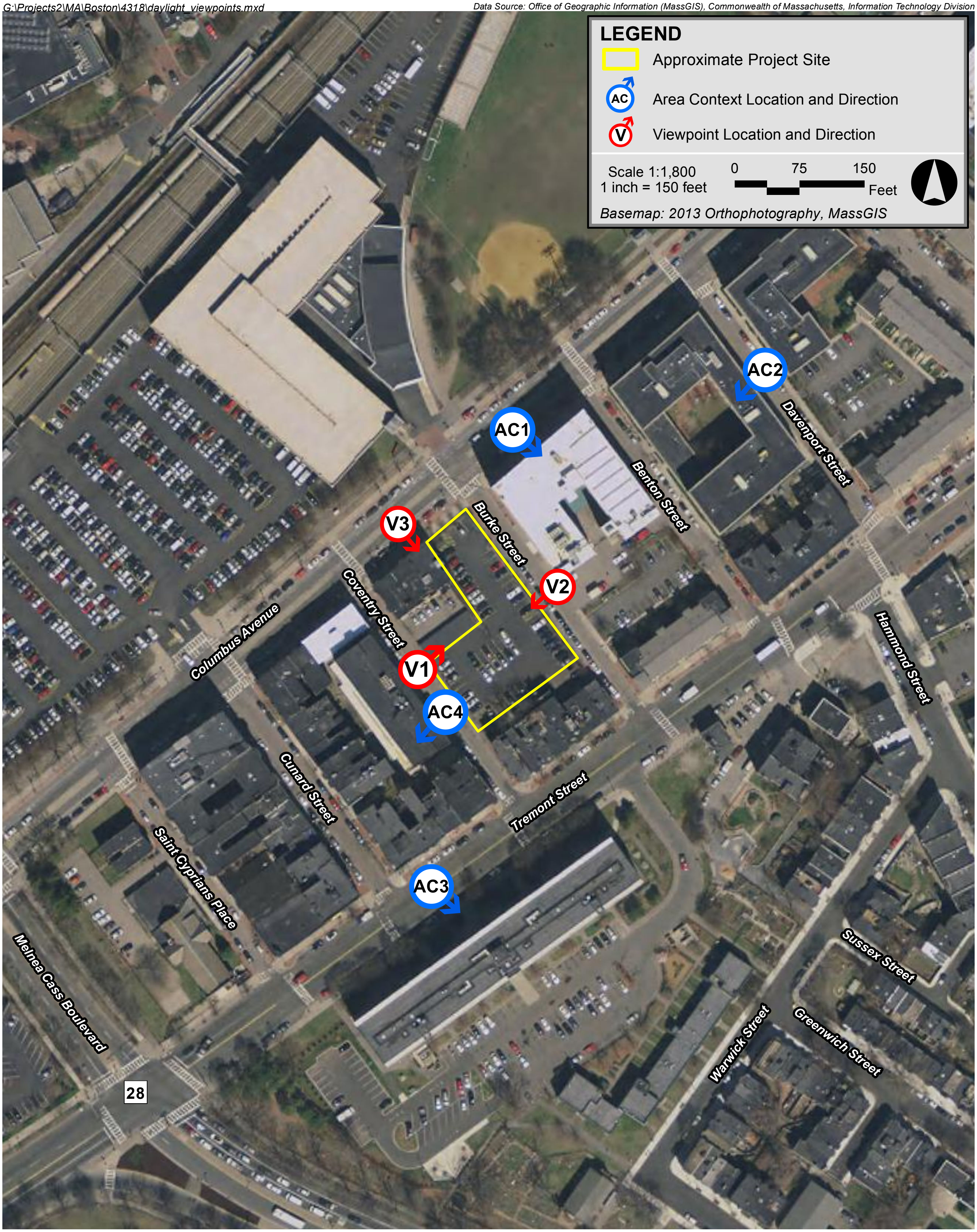

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Figure 4.3-1

Daylight Analysis Viewpoints

- **Viewpoint 1:** View from Coventry Street facing northeast toward the Project site
- **Viewpoint 2:** View from Burke Street facing southwest toward the Project site
- **Viewpoint 3:** View from Columbus Avenue facing southeast toward the Project site
- **Area Context Viewpoint AC1:** View from Columbus Avenue facing southeast toward 716 Columbus Avenue
- **Area Context Viewpoint AC2:** View from Davenport Street facing southwest toward 700 Columbus Avenue
- **Area Context Viewpoint AC3:** View from Tremont Street facing southeast toward 1044 Tremont Street
- **Area Context Viewpoint AC4:** View from Coventry Street facing southwest toward 10 Coventry Street

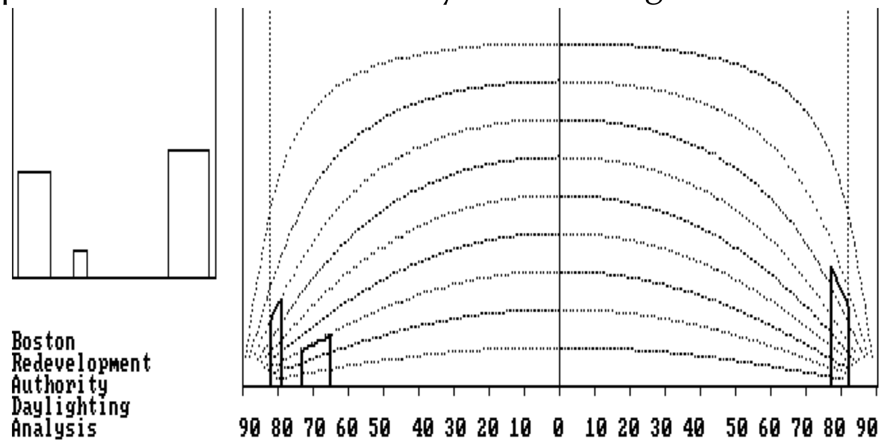
4.3.3 Results

The results for each viewpoint are described in Table 4.3-1. Figures 4.3-2 through 4.3-5 illustrate the BRADA results for each analysis.

Table 4.3-1 Daylight Analysis Results

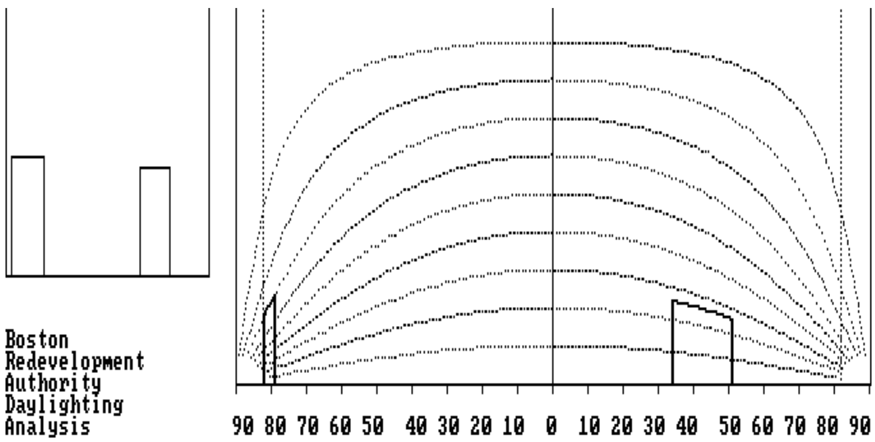
Viewpoint Locations		*Existing Conditions*	*Proposed Conditions*
Viewpoint 1	View from Coventry Street facing northeast toward the Project site	3.9%	75.1%
Viewpoint 2	View from Burke Street facing southwest toward the Project site	3.4%	88.4%
Viewpoint 3	View from Columbus Avenue facing southeast toward the Project site	30.1%	53.0%
Area Context Points			
AC1	View from Columbus Avenue facing southeast toward 716 Columbus Avenue	75.0%	N/A
AC2	View from Davenport Street facing southwest toward 700 Columbus Avenue	83.6%	N/A
AC3	View from Tremont Street facing southeast toward 1044 Tremont Street	67.7%	N/A
AC4	View from Coventry Street facing southwest toward 10 Coventry Street	83.2%	N/A

Viewpoint 1: View from Coventry Street facing northeast toward the Project site



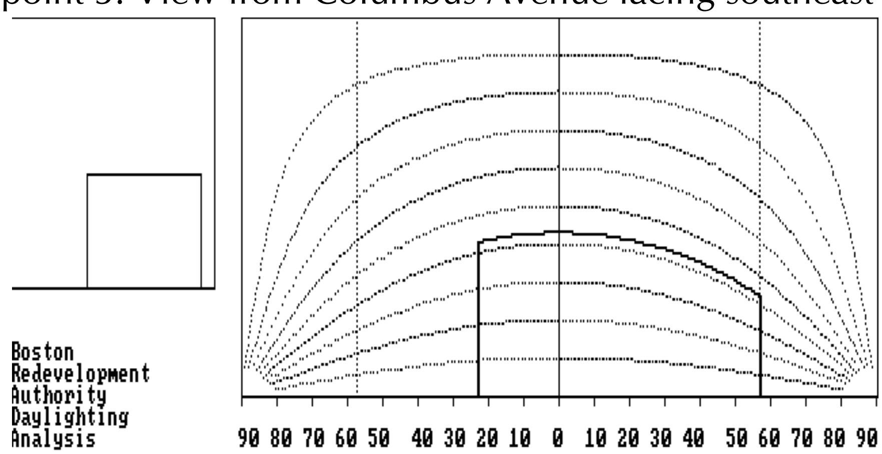
Obstruction of daylight by the building is 3.9 %

Viewpoint 2: View from Burke Street facing southwest toward the Project site



Obstruction of daylight by the building is 3.4 %

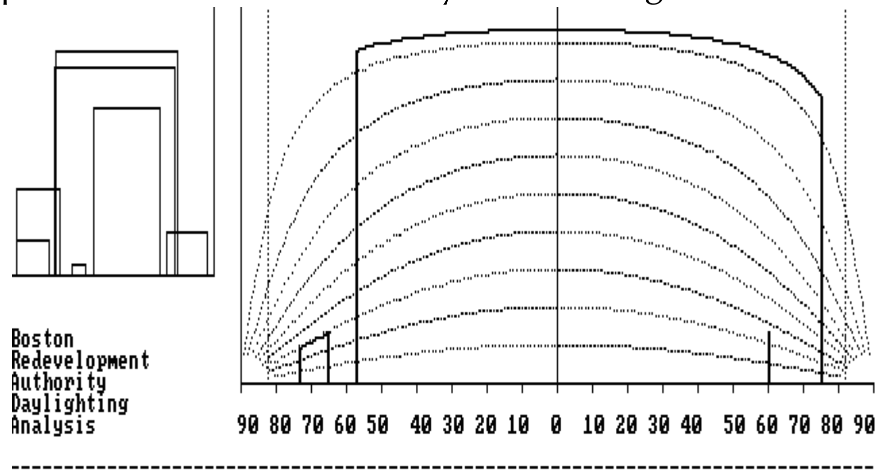
Viewpoint 3: View from Columbus Avenue facing southeast toward the Project site



Obstruction of daylight by the building is 30.1 %

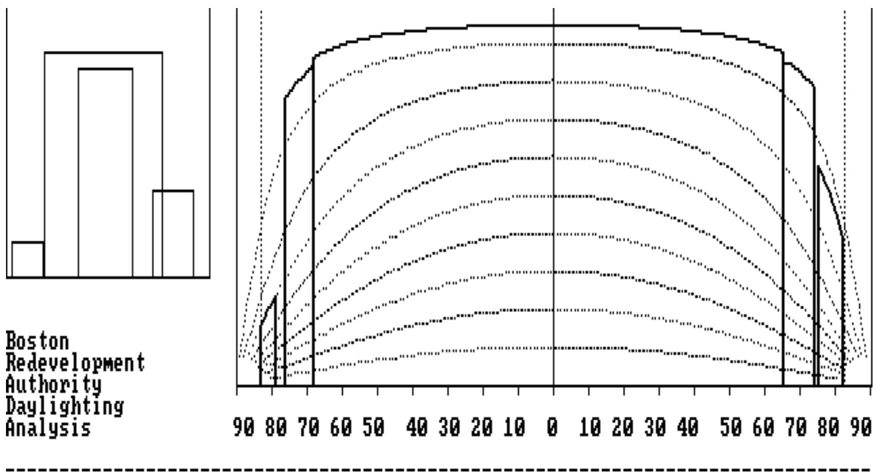
Figure 4.3-2
Existing Conditions

Viewpoint 1: View from Coventry Street facing northeast toward the Project site



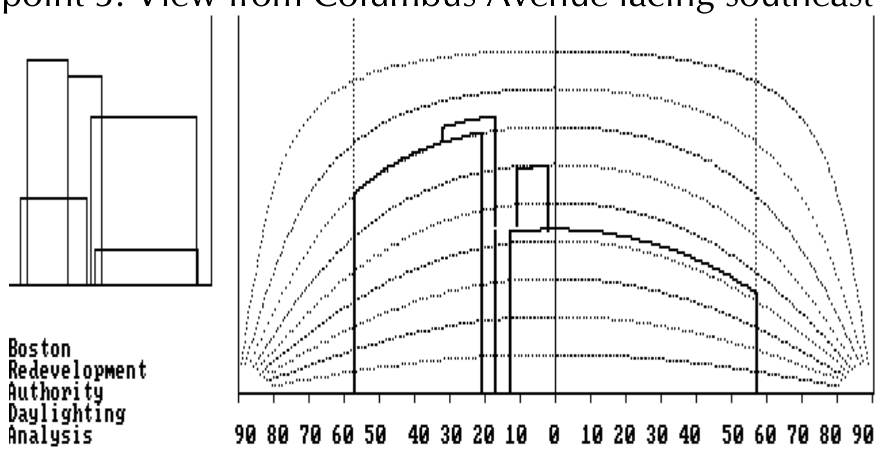
Obstruction of daylight by the building is 75.1 %

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



Obstruction of daylight by the building is 88.4 %

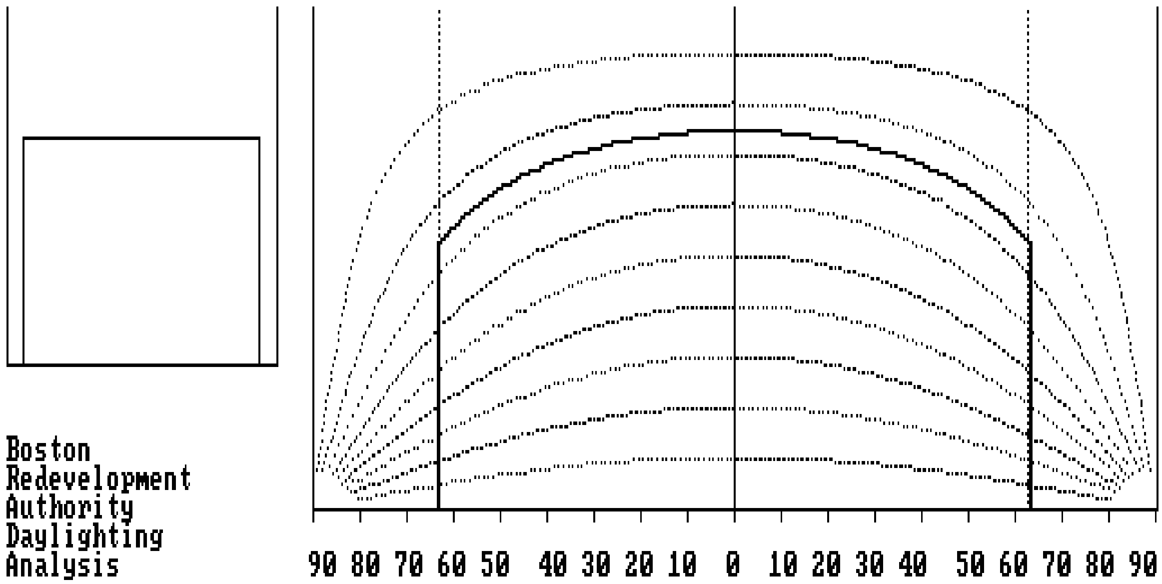
Viewpoint 3: View from Columbus Avenue facing southeast toward the Project site



Obstruction of daylight by the building is 53.0 %

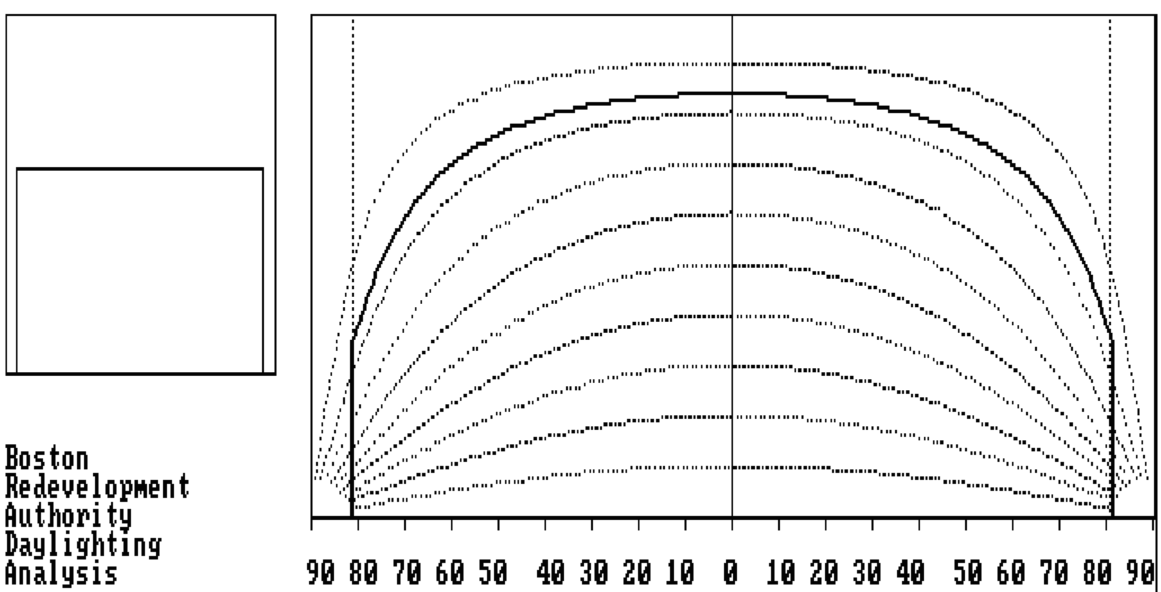
Figure 4.3-3
Proposed Conditions

AC 1: View from Columbus Avenue facing southeast toward 716 Columbus Avenue



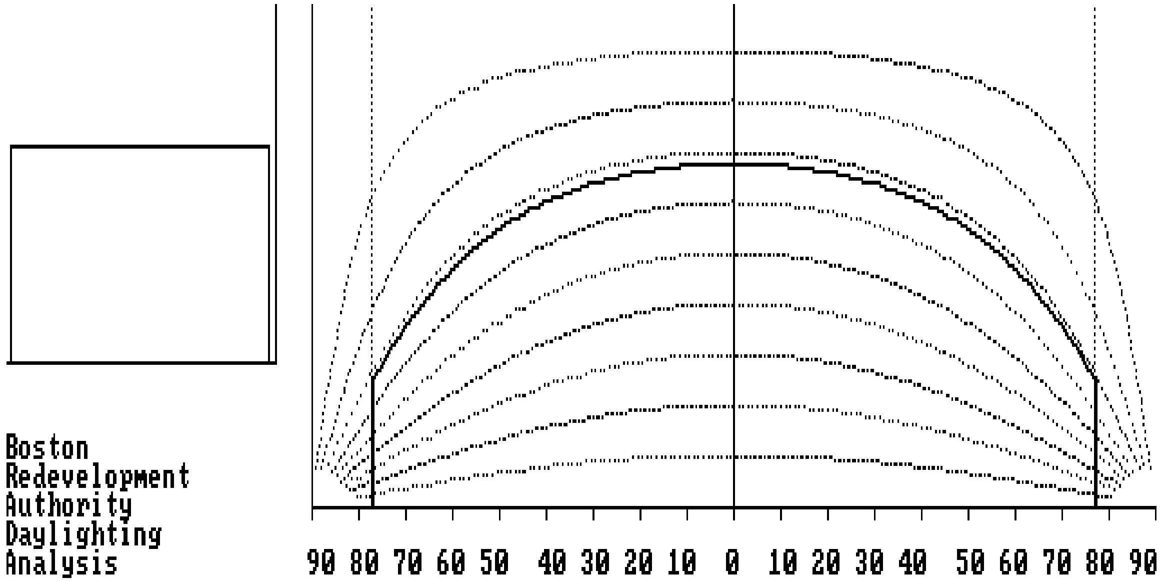
Obstruction of daylight by the building is 75.0 %

AC 2: View from Davenport Street facing southwest toward 700 Columbus Avenue



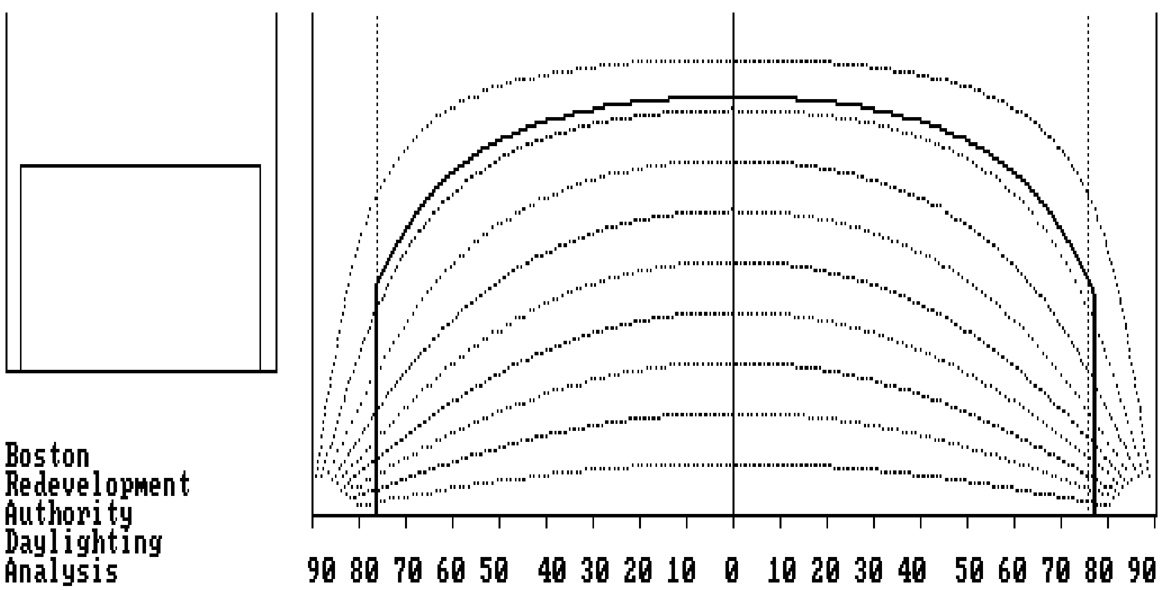
Obstruction of daylight by the building is 83.6 %

AC 3: View from Tremont Street facing southeast toward 1044 Tremont Street



Obstruction of daylight by the building is 67.7 %

AC 4: View from Coventry Street facing southwest toward 10 Coventry Street



Obstruction of daylight by the building is 83.2 %

Coventry Street – Viewpoint 1

Coventry Street runs along the western edge of the Project site. Viewpoint 1 was taken from the center of Coventry Street facing northeast toward the Project site. The development of the proposed Project would result in a daylight obstruction value of 75.1%. Since the Project site currently consists of a large surface parking lot, this is an increase of existing conditions. However, the daylight obstruction value is consistent with and less than other buildings in the area, including the Area Context buildings.

Burke Street – Viewpoint 2

Burke Street runs along the eastern edge of the Project site. Viewpoint 2 was taken from the center of Burke Street facing southwest toward the Project site. The development of the Project would result in a daylight obstruction value of 88.4%. This is the highest daylight obstruction value of the three viewpoints because the Projects largest frontage is along Burke Street, which is a narrow, one-lane street. While this is an increase over existing conditions, the daylight obstruction value is only slightly higher than other buildings in the area, including the Area Context buildings, and is typical of urban areas.

Columbus Avenue – Viewpoint 3

Columbus Avenue runs along the northern edge of the Project site. Viewpoint 3 was taken from the center of Columbus Avenue facing southeast toward the Project site. The development of the Project would result in a daylight obstruction value of 53.0%. While this is an increase over existing conditions, the daylight obstruction value is less than other buildings in the area, including the area context buildings.

Area Context Viewpoints

The Project site is located in downtown Boston in an area with a mix of relatively high density residential and institutional uses and surface parking lots. To provide a larger context for comparison of daylight conditions, obstruction values were calculated for the three Area Context Viewpoints described above and shown on Figure 4.3-1. The daylight obstruction values ranged from 67.7% for AC3 to 83.6% for AC2. Daylight obstruction values for the Project are consistent with and less than the Area Context values.

4.3.4 Conclusion

The daylight analysis conducted for the Project describes existing and proposed daylight obstruction conditions at the Project site and 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 will be similar to the daylight obstruction values within the surrounding area and typical of dense urban areas.

4.4 Solar Glare

The Project materials are still being studied and glazing of the windows will be determined as the design progresses. Due to the type of potential glass and glazing proposed, solar glare impacts are not currently anticipated.

4.5 Air Quality

4.5.1 Introduction

An air quality analysis was conducted to determine the impact of pollutant emissions from combustion source emissions generated by the Project. United States Environmental Protection Agency (EPA) approved air dispersion models were used to estimate Project-generated ambient concentrations of carbon monoxide (CO), nitrogen oxides (NOx), particulate matter (PM-10 and PM-2.5), and sulfur dioxide (SO_2). The air quality analysis shows that the Project will comply with the National Ambient Air Quality Standards for all criteria pollutants related to the operation of the Project's mechanical equipment.

4.5.2 National Ambient Air Quality Standards and Background Concentrations

Background air quality concentrations and federal air quality standards were utilized to conduct the air quality impact analyses. Federal National Ambient Air Quality Standards (NAAQS) were developed by US Environmental Protection Agency (EPA) to protect the human health against adverse health effects with a margin of safety. The following sections outline the NAAQS standards and detail the sources of background air quality data.

4.5.2.1 National Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by the US 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 National Ambient Air Quality Standards (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 4.5-1. Massachusetts Ambient Air Quality Standards (MAAQS) are typically identical to NAAQS.

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

Table 4.5-1 National (NAAQS) and Massachusetts (MAAQS) Ambient Air Quality Standards

Pollutant	*Averaging Period*	*NAAQS ($\mu g/m^3$)*		*MAAQS ($\mu g/m^3$)*	
		Primary	*Secondary*	*Primary*	*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	None	10,000	Same
	1-hour [3]	40,000	None	40,000	Same
Ozone	8-hour [8]	**137**	Same	**235**	Same
Pb	3-month [1]	1.5	Same	1.5	Same

[1] Not to be exceeded
[2] 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
[3] Not to be exceeded more than once per year.
[4] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
[5] 98th percentile, averaged over 3 years
[6] EPA revoked the annual PM_{10} NAAQS in 2006.
[7] Not to be exceeded more than once per year on average over 3 years
[8] Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years. Effective December 28, 2015
[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

A one-hour NO_2 standard was promulgated on January 22, 2010 to protect public health, including the health of sensitive populations (e.g., people with asthma, children, and the elderly). The final rule for the new hourly NO_2 NAAQS was published in the Federal Register on February 9, 2010 and became effective on April 12, 2010. The form of this standard is the three-year average of the 98th percentile of the daily maximum one-hour concentrations.

Similarly, a one-hour SO_2 standard was promulgated on June 2, 2010 to protect public health, including the health of sensitive populations (e.g., people with asthma, children, and the elderly). The final rule for the new hourly SO_2 NAAQS was published in the Federal Register on June 22, 2010 and became effective on August 23, 2010. The form of this standard is the three-year average of the 99th percentile of the daily maximum one-hour concentrations.

The inhalable particulate (PM10) NAAQS were promulgated on July 1, 1987 at the federal level with the intent of replacing the existing standards limiting ambient levels of Total Suspended Particulate (TSP). In 2006, the annual PM_{10} standard was revoked. However it remains codified in 310 CMR 6.00. EPA also promulgated a Fine Particulate ($PM_{2.5}$) NAAQS, effective December 2006, with an annual standard of 15 micrograms per cubic meter ($\mu g/m^3$) and the 24-hour standard of 35 $\mu g/m^3$. The annual standard has since been strengthened to 12 $\mu g/m^3$ (in 2012).

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.

The NAAQS consist of primary and secondary standards. Primary standards are intended to protect human health. Secondary standards are intended to protect public welfare from known or anticipated adverse effects associated with the presence of air pollutants, such as damage to property or vegetation. NAAQS have been developed for various durations of exposure. Massachusetts Ambient Air Quality Standards (MAAQS) are codified in 310 CMR 6.04, and generally follow the NAAQS but are not identical (differences are highlighted in bold in Table 4.5-1).

4.5.2.2 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 2012 to 2014. Data for these pollutant and averaging time combinations were obtained from the U.S. 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 1-hr NO_2 standard, the 3-year average of the 98th percentile of the maximum daily 1-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 Harrison Avenue in Boston, roughly 0.54 miles south of the project location. A summary of the background air quality concentrations are presented in Table 4.5-2.

Air quality in the vicinity of the Project site is generally good, with all (except ozone) local background concentrations found to be well below the NAAQS. Compliance with the 8-

hour ozone NAAQS continues to be a challenge throughout the Commonwealth, although it has been improving.

Table 4.5-2 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	*Avg Time*	*Form*	*2012*	*2013*	*2014*	*Background Concentration (µg/m³)*	*NAAQS*	*Percent of NAAQS*
SO_2 [1,6]	1-Hour [5]	99th %	31.702	28.558	32.226	30.8	196.0	16%
	3-Hour	H2H	30.916	25.414	56.33	56.3	1300.0	4%
	24-Hour	H2H	13.1	13.1	13.362	13.4	365.0	4%
	Annual	H	2.9	2.8	2.8	2.9	80.0	4%
PM-10	24-Hour	H2H	32	34.0	61	61.0	150.0	41%
	Annual	H	14.2	15.1	13.9	15.1	50.0	30%
PM-2.5	24-Hour [5]	98th %	20.6	15.9	12.7	16.4	35.0	47%
	Annual [5]	H	8.28	7.3	5.96	7.2	12.0	60%
NO_2 [2]	1-Hour [5]	98th %	82.72	94	95.88	90.9	188.0	48%
	Annual	H	29.7	32.8	29.6	32.8	100.0	33%
CO [2]	1-Hour	H2H	2474.2	2145.3	1963.1	2474.2	40000.0	6%
	8-Hour	H2H	2177.4	1375.2	1489.8	2177.4	10000.0	22%
Ozone [4]	8-Hour	H4H	121.706	115.817	106.002	121.7	147.0	83%
Lead	Rolling 3-Month	H	0.014	0.006	0.014	0.014	0.15	9%

Notes:
From 2012-2014 EPA's AirData Website
[1] SO_2 reported ppb. Converted to µg/m³ using factor of 1 ppm = 2.62 µg/m³.
[2] CO reported in ppm. Converted to µg/m³ using factor of 1 ppm = 1146 µg/m³.
[3] NO_2 reported in ppb. Converted to µg/m³ using factor of 1 ppm = 1.88 µg/m³.
[4] O_3 reported in ppm. Converted to µg/m³ using factor of 1 ppm = 1963 µg/m³.
[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.

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

4.5.2.3 Stationary Source Analysis Methodology

The most recent version of the U.S. EPA AERMOD refined dispersion model (Version 15181) was selected to predict concentrations from the stationary sources related to the Project. AERMOD is the U.S. EPA's preferred model for regulatory applications. The use of

AERMOD provides the benefits of using the most current algorithms available for steady state dispersion modeling.

The ISC-AERMOD View graphical user interface (GUI) Version 9.1.0, created by Lakes Environmental, was used to facilitate model setup and post-processing of data. The AERMOD model was selected for this analysis because it:

- is the required U.S. EPA model for all refined regulatory analyses for receptors within 50 km of a source;
- is a refined model for facilities with multiple sources, source types, and building-induced downwash;
- uses actual representative hourly meteorological data;
- incorporates direction-specific building parameters which can be used to predict impacts within the wake region of nearby structures;
- allows the modeling of multiple sources together to predict cumulative downwind impacts;
- provides for variable emission rates;
- provides options to select multiple averaging periods between one-hour and one year (scaling factors can be applied to adjust the one-hour impact to a peak impact less than one-hour); and,
- allows the use of large Cartesian and polar receptor grids, as well as discrete receptor locations.

Regulatory default options adopted for the model include the options described below.

- *Use stack-tip downwash (except for building downwash).* Stack-tip downwash is an adjustment of the actual stack release height for conditions when the gas exit velocity is less than 1.5 times the wind speed. For these conditions, the effective release height is reduced a bit, based on the diameter of the stack and the wind and gas exit velocity. This option applies to point sources only, such as emergency generators, cooling towers, boiler units and garage vents.
- *Use the missing data and calms processing routines.* The model treats missing meteorological data in the same way as the calms processing routine, i.e., it sets the concentration values to zero for that hour, and calculates the short term averages according to U.S. EPA's calms policy, as set forth in the Guideline. Since only 1-hour averages are being used, concentrations predicted with calm or missing data would not affect model results.

- Since a number of sources are to exhaust horizontally, the non-default option for horizontal point sources was used.

- The AERMOD model is able to assign sources to a rural or urban category to allow specified urban sources to use the effects of increased surface heating under stable atmospheric conditions. The urban dispersion classification was selected based on a visual inspection of the area within a three kilometer radius of the Project site. A population estimate of 1,118,961 was obtained from the U.S. Census website (www.census.gov), confirmed by MassDEP, and is used in the AERMOD model to estimate the urban boundary layer height.

4.5.2.4 Sources

Stationary sources of air pollution are typically units that combust fuel. In this case, these sources consist of heating units and electrical generating units in the Project. Cooling towers, although not a combustion source, are a source of particulate emissions and are included in the analysis. All modeled source data are presented in Appendix D.

Boilers

The current plans also include a number of small condensing boilers for heat and domestic hot water. All units will be natural gas-fired. Some are located in a penthouse mechanical area on the roof of the building while others are on the ground floor. The units are expected to be exhausted through individual stacks.

The boilers will be within the requirements of the MassDEP's Environmental Results Program (ERP) since individual estimated heat inputs are within or below the 10 to 40 MMBtu/hour ERP range. However, emissions were conservatively estimated for each boiler based on the MassDEP Boiler ERP program emission limits. Dispersion modeled impacts from the domestic water heating units were estimated from exhaust stacks 3 feet above the building roof heights above ground level. Two heating boilers and two additional domestic water heaters were assumed to exhaust horizontally at 15 feet above ground level. For all impacts, the heating and hot water equipment is assumed to be in operation 24 hours per day, seven days per week.

Emergency Generator

Current design plans include a 600-kilowatt emergency generator. The unit will provide life safety and standby emergency power to the building. The unit will be diesel-fired and located in a mechanical area on the roof of the building. The generator is assumed to be designed such that its exhaust stack extends at least 10 feet above the individual building roof height above ground level.

Typically, the generator will operate for approximately one hour each month for testing and general maintenance. The ERP regulation applies to new emergency generators greater than

37 kW. The regulation is similar to the boiler ERP in that new engines are subject to emission standards, recordkeeping, certification, and compliance with the MassDEP noise policy. Since the generator maximum rating capacity is greater than the ERP limit of 37 kW, it will be subject to the new ERP program. Per the ERP, the generator owner will limit operation of the generator to less than 300 hours per year and submit a certification form to MassDEP within 60 days of installation.

Emissions were estimated for the emergency generator based on vendor supplied data. Comparable equipment was assumed where not provided by the architects or design engineers. The generators are assumed to operate for 300 of 8,760 hours per year in the modeling for annual averaging times.

Cooling Towers

Current plans call for two 750 ton two-cell cooling towers to be installed on the proposed building. These units will remove the excess heat generated by the building's mechanical equipment. All units will be located on the roof of the building.

Only emissions of particulate matter are assumed to be produced by the cooling tower cells. The cooling towers are assumed to operate at 100% capacity for 8,760 hours per year. Emissions of all other pollutants from the cooling towers are expected to be negligible.

Emissions and exhaust parameters were based on vendor supplied data and/or engineering judgment.

4.5.2.5 Meteorology

The regional meteorology in Boston is best approximated with meteorological data collected by the nearby Boston Logan International Airport in East Boston, MA. The station is located approximately 4.6 miles (7.4 km) to the east-northeast of the Project site at an elevation of 15 feet (4.57 m) above mean sea level. This station is the closest site for which extensive meteorological data are available which are representative of similar topographic influences that affect the proposed sites. Five years (2010-2014) of hourly surface data collected at the station include wind speed and direction, temperature, cloud cover and ceiling height. Upper air data from Gray, Maine was processed along with the surface data. The processed meteorological files for use in AERMOD were provided by the MassDEP. These files have been used on other AERMOD applications in the area for review by MassDEP and are presumed to be of sufficient quality for regulatory applications.

A windrose of the 2010-2014 Boston data is presented in Figure 4.5-1.

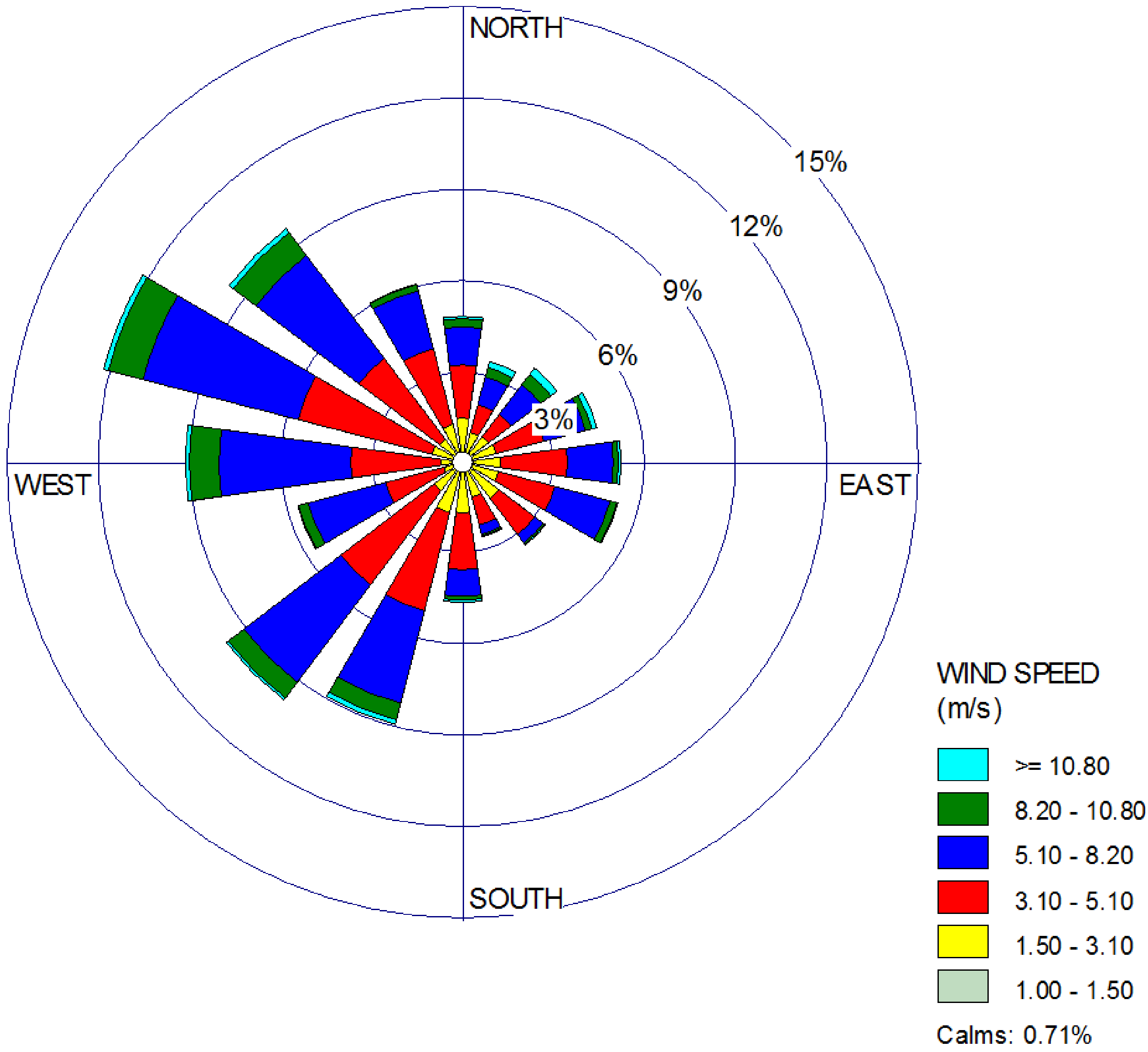


Figure 4.5-1

Boston Logan Airport 2010-2014 Wind Rose

4.5.2.6 Receptors

A nested Cartesian grid of receptors was used for the air quality dispersion modeling. A 500 m by 500 m bounding box (surrounding all Project sources) was established with 20 m receptor spacing; the nested grids extend in all cardinal directions out from the bounding box. They consist of 50 meter spacing out to 1 km, 100 meter spacing out to 1.5 km, 200 meter spacing out to 2.5 km, and 500 meter spacing out to 5.5 km beyond the bounding box.

Additionally, five flagpole receptors were placed at the nearest edge of the uppermost floor of the garage across Columbus Avenue, at a height of 14.9 meters above ground.

Over 2,700 receptors were included in the modeling analysis. Terrain around the immediate site is relatively flat. The terrain elevation for each receptor was obtained electronically from USGS digital terrain data. The National Elevation Dataset (NED), with a resolution of 1/3 arc-second (approximately 10 meters) was processed using the AERMAP program. Elevations and hill heights for each receptor as well as the base elevations of the existing sources modeled and buildings entered in BPIP-Prime were determined through the AERMAP processing.

Figure 4.5-2 presents the source and receptor locations, as well as the buildings used in the GEP stack height/downwash analysis described below.

GEP Stack Height Analysis

The Good Engineering Practice (GEP) stack height evaluation of the facility has been conducted in accordance with the EPA revised Guidelines for Determination of Good Engineering Practice Stack Height (EPA, 1985). A GEP stack is sufficiently high to avoid aerodynamic downwash effects from nearby buildings or structures. As defined by the EPA guidelines, the formula for computing GEP stack height is the greater of:

1. 65 meters, or
2. for stacks constructed after January 12, 1979,

$$H_{GEP} = H_b + 1.5L$$

where H_{GEP} = GEP stack height,

H_b = Height of adjacent or nearby structures,

L = Lesser of height or maximum projected width of adjacent or nearby building (*i.e.*, the critical dimension), and nearby is within 5L of the stack from downwind (trailing edge) of the building.

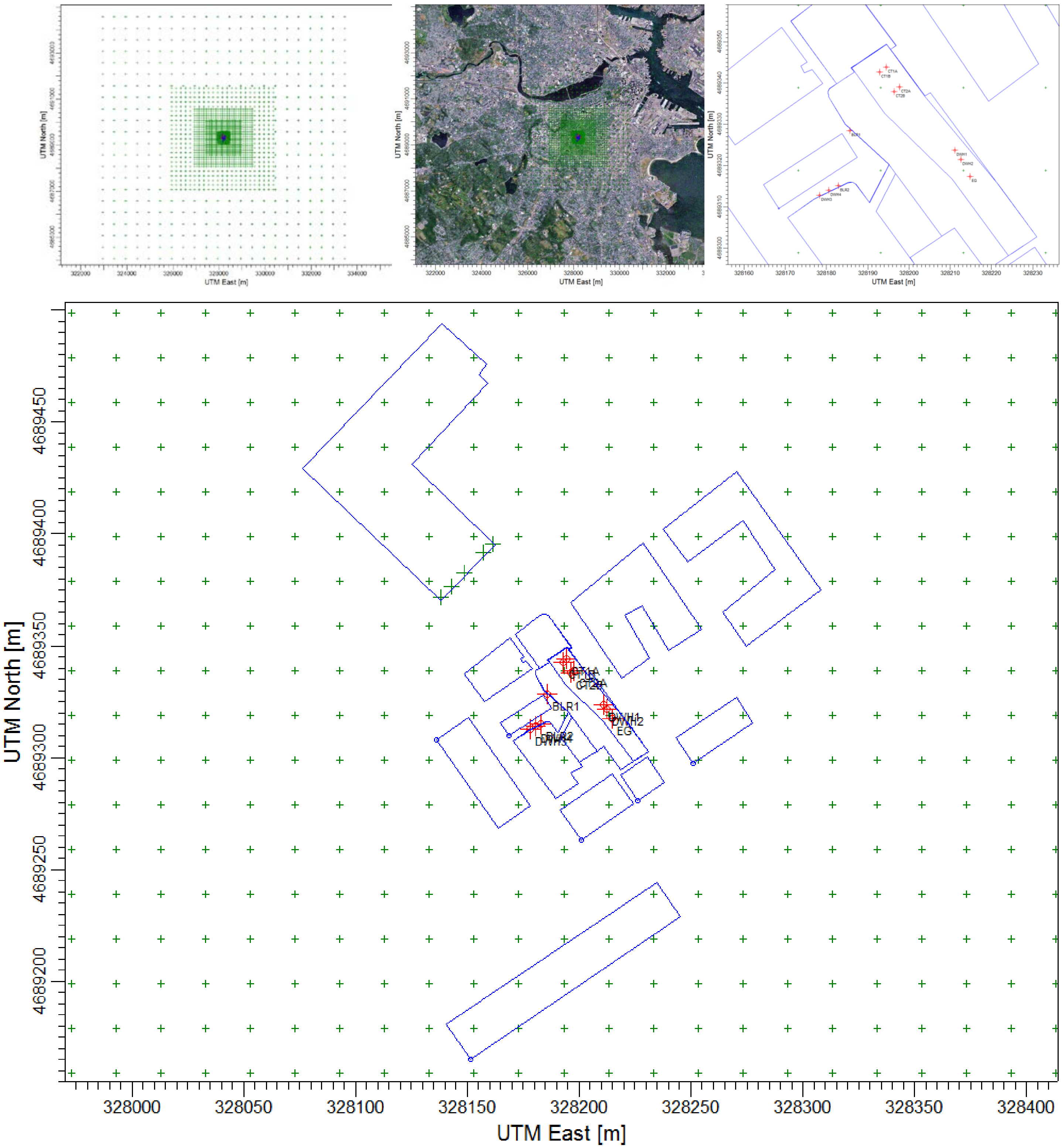


Figure 4.5-2

AERMOD stationary source, receptor, and building locations

The GEP formula was applied to the input building. The EPA's Building Profile Input Program Prime Version (BPIP-Prime) was run to confirm the GEP height and to calculate direction-specific building dimensions for use in AERMOD.

The point sources subject to building influences are the boiler stacks, the cooling towers, and the emergency generator stack.

The proposed boiler stacks, the cooling towers, and emergency generator stacks are all below GEP height; therefore, building downwash effects were considered in the air quality modeling. The AERMOD model determines when and if to include downwash in its calculations. In addition, because downwash applies, the AERMOD downwash algorithm was used to estimate concentrations in the building cavity areas.

4.5.3 Air Quality Results

A cumulative impact analysis was also conducted for comparison to the NAAQS for SO_2, NOx, PM-10, and PM-2.5. This analysis addresses emissions from the Project's heating boilers, emergency generators, and cooling towers.

Worst case maximum predicted impacts from these source groups were added to monitored background values obtained from MassDEP and compared to the NAAQS. Table 4.5-3 presents the results of the stationary sources. All concentrations are below the applicable NAAQS for the respective pollutants.

4.5.4 Conclusions

Using conservative estimates, the pollutant concentrations at the nearest receptors for impacts from the heating boilers, cooling towers, and emergency generator, plus monitored background values, are well under the NAAQS thresholds.

4.5.5 Microscale Analysis

The Boston Redevelopment Authority requires that project-induced impacts to ambient air quality be addressed. A microscale analysis is used to determine the effect on air quality of the increase in traffic generated by the Project. This microscale analysis may be required for a project at intersections where 1) project traffic would impact intersections or roadway links currently operating at Level of Service (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 (ADT) on roadways providing access to a single location.

The proposed Project does not generate 3,000 ADT, nor does it increase traffic volumes by 10 percent or 100 vehicles per hour. As discussed in Chapter 2, all intersections studied will continue to operate at the same LOS as under the No Build conditions during both the a.m. and p.m. peak hours. Therefore, no quantitative analysis is required. Given the generally well-operating intersections, and the small increases in volume at the worst intersections, it is expected that there would be no violations of the NAAQS for CO at any intersections associated with Project-related traffic.

Table 4.5-3 Summary of NAAQS Stationary Source Modeling Analysis

Pollutant	*Averaging Time*	*Max Modeled Conc. ($\mu g/m^3$)*	*Modeled Year*	*Background Concentration ($\mu g/m^3$)*	*Total Conc. ($\mu g/m^3$)*	*Standard ($\mu g/m^3$)*	*% Of Standard*
SO_2	1 HR (1)	1.04	2010-2014	30.8	31.9	195	16%
	3 HR (2)	0.76	2014	56.3	57.1	1300	4%
	24 HR (2)	0.25	2013	13.4	13.6	365	4%
	ANN. (3)	0.06	2013	2.9	3.0	80	4%
PM-10	24 HR (4)	4.25	2012	61.0	65.2	150	43%
	ANN. (3)	1.04	2013	15.1	16.1	50	32%
PM-2.5	24 HR (5)	4.47	2010-2014	16.4	20.9	35	60%
	ANN. (6)	1.01	2010-2014	7.2	8.2	15	55%
NO_2	1 HR (7)	48.99	2010-2014	90.9	139.9	188	74%
	ANN. (3)	3.93	2012	32.8	36.7	100	37%
CO	1 HR (2)	205.29	2011	2474.2	2679.5	40000	7%
	8 HR (2)	70.82	2012	2177.4	2248.2	10000	22%

Notes:
(1) Maximum 4th-Highest Maximum Daily 1-Hr Concentration Averaged Over 5 Years
(2) Highest 2nd-High Concentration Over 5 Years
(3) Highest Annual Concentration Over 5 Years
(4) Highest 6th-High Concentration Over 5 Years
(5) Maximum 1st-Highest 24-Hour Concentration Averaged Over 5 Years
(6) Maximum Annual Concentration Averaged Over 5 Years
(7) Maximum 8th Highest Maximum Daily 1-hour Concentrations Averaged Over 5 Years

4.6 Stormwater/Water Quality

Chapter 8 includes a discussion of stormwater and water quality.

4.7 Flood Hazard Zones/ Wetlands

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the site located in the City of Boston - Community Panel Number 25025C0079J indicates the FEMA Flood Zone Designations for the Project site. The map shows that the Project is located outside of the 500-year flood plain.

The Project site does not contain wetlands.

4.8 Geotechnical Impacts

4.8.1 Subsurface Soil Characteristics

A subsurface exploration program consisting of test borings was completed at the Project site to define existing geologic conditions. The test borings were drilled to depths ranging from 16 to 41 feet below existing ground surface. Existing site grades range from El. 18 to El. 20, Boston City Base Datum (BCB).

In general, the subsurface soil profile at the site consists of a surficial layer of fill and organic soils, underlain by a deep deposit of marine sand and clay, extending to bedrock at depth. The table below summarizes the subsurface conditions revealed in the test borings, in order of increasing depth below the ground surface.

Table 4.8-1 Generalized Subsurface Soil Profile

Description	*Depth to Top of Layer (Ft)*	*Thickness of Layer[1] (Ft)*
Miscellaneous Fill	-	7.5 – 9.5
Organic Soils	Not encountered and 7.5	0 to 2.7
Marine Sand	7 to 10.5	0 to 9
Marine Clay	9.5-15.5	90+[1]
Glacial Deposits and Bedrock	[1]	--

1 - Off-site explorations indicate that the marine clay is typically greater than 90 ft thick and bedrock may be 120 to 160 ft deep.

4.8.2 Groundwater Conditions

Groundwater monitoring wells have been installed and monitored at the Project site. Groundwater level measurements obtained in 2015 indicate the water level is at approximately El. 8 Boston City Base Datum ("BCB").

Site groundwater levels will fluctuate naturally due to seasonal variation in such factors as precipitation and temperature. Area groundwater levels may be influenced by local construction activity, pumping from foundation drains, and leakage into or out of sewers and storm drains. Seasonal fluctuations can also be expected.

The Project is not located within the Groundwater Conservation Overlay District (GCOD). Therefore requirements of Article 32 are not applicable.

4.8.3 Foundation Construction Methodology

It is anticipated that the building will be supported on piles bearing in glacial soils or bedrock. High capacity, low displacement, steel H-piles are planned to be installed. Piles will be vibrated to the top of the bedrock bearing stratum to mitigate noise and potential impacts to abutting structures. Following installation to the top of bedrock, piles will be driven to final end bearing resistance. Vibration monitoring will be conducted during pile installation and appropriate criteria will be developed for levels not to be exceeded during construction.

No permanent construction below site groundwater levels is planned. Shallow excavation will be required for pile cap construction. Any temporary dewatering required to control storm water runoff into excavations will be conducted in accordance with appropriate permits to be obtained from City, State and Federal agencies, as applicable, to discharge into adjacent storm drain systems. It is anticipated that temporary construction dewatering permits will be obtained from the MWRA and BWSC by the Proponent.

4.8.4 Seismic Design

As part of the geotechnical analyses for design, test boring data will be used to evaluate potential impacts of the design earthquake specified in the Building Code and determine the Seismic Site Class for use in structural design. Based on review of the available subsurface data, the soils at the site are not considered susceptible to liquefaction, and therefore measures to mitigate for liquefaction are not anticipated.

4.8.4 Considerations for Off-site Impacts and Mitigation Measures

Based on the design and construction methodology developed for the Project, potential impacts to abutters from foundation construction, such as ground movement, pile foundation installation, vibration, and groundwater lowering will be mitigated through development of specific design and performance criteria and implementation of a monitoring program during construction.

4.8.5 Soil Management

A Phase I Environmental Site Assessment was completed for the property. The Environmental Assessment did not reveal previous site use that would have potentially impacted site conditions other than the presence of urban fill. Soil sampling and chemical testing may be conducted of any soil or groundwater that may be generated as a result of construction activity. Any surplus excavated soil will be managed in accordance with applicable laws and environmental regulation.

4.9 Solid and Hazardous Waste

4.9.1 Hazardous Waste

If soil disposal is required, the Proponent will obtain site specific information regarding environmental conditions of excavated soils to evaluate for the presence of oil and hazardous materials. Foundation construction for the new building may generate soil requiring off-site transport. Chemical testing of the material will be required by receiving facilities to identify chemical constituents and any contaminants present. Chemical testing of the material will be conducted prior to construction in accordance with facility requirements.

Any material leaving the site will be required to be legally transported in accordance with local, state and federal requirements. In addition, any regulated soil conditions related to oil and hazardous materials will be managed in accordance with appropriate Massachusetts MassDEP regulatory requirements.

4.9.2 Operation Solid and Hazardous Waste Generation

The Project will generate solid waste typical of other residential/mixed-use projects. Solid waste generated by the Project will be approximately 599 tons per year, based on the number of beds proposed and amount of retail space proposed. Other than typical wastes generated by residential use (e.g., paint, detergents, etc.), no hazardous wastes are anticipated to be generated by the Project.

The University and ACC endeavor to reduce the level of solid waste generated in construction and daily operations through waste minimization, reuse of materials, and recycling wherever possible. A dedicated recyclables storage and collection program will facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfill.

The ACC recycling approach is a multi-pronged program that begins with having recycling centers conveniently located at the central core of each residential floor. These new lifestyle norms are then reinforced by educational programs and information about the community.

- **Educate**: Inform and engage our people on sustainable behaviors and community involvement.
- **Empower**: Enable our people to create lasting value through sustainable practices, opportunities and solutions.
- **Inspire**: Use sustainable community features and programs as residential teaching aids.

It is the commitment of ACC that residents create lifelong student behavioral habits and sustainability practices that they will maintain into the future.

4.10 Noise Impacts

4.10.1 Introduction

A sound level assessment was conducted by Epsilon Associates, Inc. that included a baseline sound monitoring program to measure existing sound levels in the vicinity of the Project site, computer modeling to predict operational sound levels from mechanical equipment associated with the Project, and a comparison of future Project sound levels to applicable City of Boston Zoning District Noise Standards.

This analysis, which is consistent with BRA requirements for noise studies, indicates that predicted noise levels from the Project, with appropriate noise controls such as a super low sound fan and water silencers for the proposed cooling tower as well as an emergency generator sound attenuating enclosure and hospital-grade exhaust silencer, will comply with applicable regulations.

4.10.2 Noise Terminology

There are several ways in which sound (noise) levels are measured and quantified, all of which use the logarithmic decibel (dB) scale. The following section defines the noise terminology used in this analysis.

The decibel scale is logarithmic to accommodate the wide range of sound intensities observed in the environment. A property of the decibel scale is that the sound pressure levels of two distinct sounds are not purely additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a three-decibel increase (53 dB), not a doubling (100 dB). Thus, every three-decibel change in sound level represents a doubling or halving of sound energy. Related to this is the fact that a change in sound level of less than three dB is generally imperceptible to the human ear.

Another property of the decibel scale is that if one source of noise is 10 dB (or more) louder than another source, then the total combined sound level is simply that of the louder source (i.e., the quieter source contributes negligibly to the overall sound level). For example, a source of sound at 60 dB plus another source at 47 dB is 60 dB.

The sound level meter used to measure noise is a standardized instrument.[3] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various conditions. One network is the A-weighting network (there are also B- and C-weighting networks), which most closely approximates how the human ear responds to sound as a function of frequency, and is the accepted scale used for community sound level measurements. Sounds are frequently reported as detected with the A-weighting network of the sound level meter in dBA. A-weighted sound levels emphasize the middle frequencies (i.e., middle pitched—around 1,000 Hertz sounds), and de-emphasize lower and higher frequencies.

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[3] *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983, published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

Because the sounds in our environment vary with time, they cannot simply be represented with a single number. In fact, there are several methods used for quantifying variable sounds which are commonly reported in community noise assessments, as defined below.

- L_{eq}, the equivalent level, in dBA, is the level of a hypothetical steady sound that would have the same energy (i.e., the same time-averaged mean square sound pressure) as the actual fluctuating sound observed.

- L_{90} is the sound level, in dBA, exceeded 90 percent of the time in a given measurement period. The L_{90}, or residual sound level, is close to the lowest sound level observed when there are no obvious nearby intermittent noise sources.

- L_{50} is the median sound level, in dBA, exceeded 50 percent of the time in a given measurement period.

- L_{10} is the sound level, in dBA, exceeded only 10 percent of the time in a given measurement period. The L_{10}, or intrusive sound level, is close to the maximum sound level observed due to occasional louder intermittent noises, like those from passing motor vehicles.

- L_{max} is the maximum instantaneous sound level observed in a given measurement period.

By employing various noise metrics, it is possible to separate prevailing, steady sounds (the L_{90}) from occasional louder sounds (L_{10}) in the noise environment. This analysis treats all noise sources from the Project as though the emissions will be steady and continuous, described most accurately by the L_{90} exceedance level.

In the design of noise controls, which do not function quite like the human ear, it is important to understand the frequency spectrum of the noise source of interest. The spectra of noises are usually stated in terms of octave-band sound pressure levels, in dB, with the octave frequency bands being those established by standard (American National Standards Institute (ANSI) S1.11, 1986). To facilitate the noise-control design process, the estimates of noise levels in this analysis are also presented in terms of octave-band sound pressure levels. Octave-band measurements and modeling are used in assessing compliance with the City of Boston noise regulations.

4.10.3 Noise Regulations and Criteria

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 proposed Project and is considered in this noise study.

Table 4.10-1 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. The "Residential Zoning District" limits apply to any lot located within a residential zoning district or to any residential use located in another zone except an Industrial Zoning District, according to Regulation 2.2. Similarly, per Regulation 2.3, business limits apply to any lot located within a business zoning district not in residential or institutional use.

Table 4.10-1 City Noise Standards, Maximum Allowable Sound Pressure Levels

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

Notes:
1. Noise standards from Regulation 2.5 "Zoning District Noise Standards", City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.
2. All standards apply at the property line of the receiving property.
3. dB and dBA based on a reference pressure of 20 micropascals.
4. Daytime refers to the period between 7:00 a.m. and 6:00 p.m. daily, except Sunday.

4.10.4 Existing Conditions

A background noise level survey was conducted to characterize the existing "baseline" acoustical environment in the vicinity of the Project, located on the southeastern edge of the Northeastern University campus in Boston. Existing noise sources in the vicinity of the Project site currently include: vehicle traffic along local roadways including: Columbus Avenue and Tremont Street, rooftop mechanical equipment, subway noise, daytime construction activity, aircraft flyovers, birds, and pedestrian foot traffic.

4.10.4.1 Noise Monitoring Methodology

Sound level measurements were made on Thursday, February 18, 2016 during the daytime (1:00 p.m. to 3:00 p.m.) and on Friday, February 19, 2016 during nighttime hours (12:00 a.m. to 2:00 a.m.). Since noise impacts from the Project on the community will be highest when background noise levels are the lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Daytime measurements were scheduled to avoid peak traffic conditions. All measurements were 20 minutes in duration.

Sound levels were measured at publicly accessible locations at a height of five feet (1.5 meters) above ground level, under low wind conditions, and with dry roadway surfaces. Wind speed measurements were made with a Davis Instruments TurboMeter electronic wind speed indicator, and temperature and humidity measurements were made using a General Tools digital psychrometer. Unofficial observations about meteorology or land use in the community were made solely to characterize the existing sound levels in the area and to estimate the noise sensitivity at properties near the Project site.

4.10.4.2 Noise Monitoring Locations

Three representative noise monitoring locations were selected based upon a review of zoning and land use in the Project area. These measurement locations are depicted on Figure 4.10-1 and described below.

- **Location ST-1** is located in front of 748 Columbus Avenue, representative of the closest residential and recreational receptors to the north of the Project along Columbus Avenue.
- **Location ST-2** is located in front of 10 Coventry Street, representative of the closest residential receptors to the east and west of the Project along Benton Street, Burke Street, Coventry Street, and Cunard Street.
- **Location ST-3** is located in front of 1042 Tremont Street, representative of the closest residential receptors to the south of the Project along Tremont Street.

4.10.4.3 Noise Monitoring Equipment

A Larson Davis Model 831 sound level meter equipped with a PRM831 Type I Preamplifier, a 377B20 half-inch microphone, and manufacturer-provided windscreen was used to collect background sound pressure level data. This instrumentation meets the "Type 1 - Precision" requirements set forth in ANSI S1.4 for acoustical measuring devices. The measurement equipment was calibrated in the field before and after the surveys with a Larson Davis CAL200 acoustical calibrator which meets the standards of IEC 942 Class 1L

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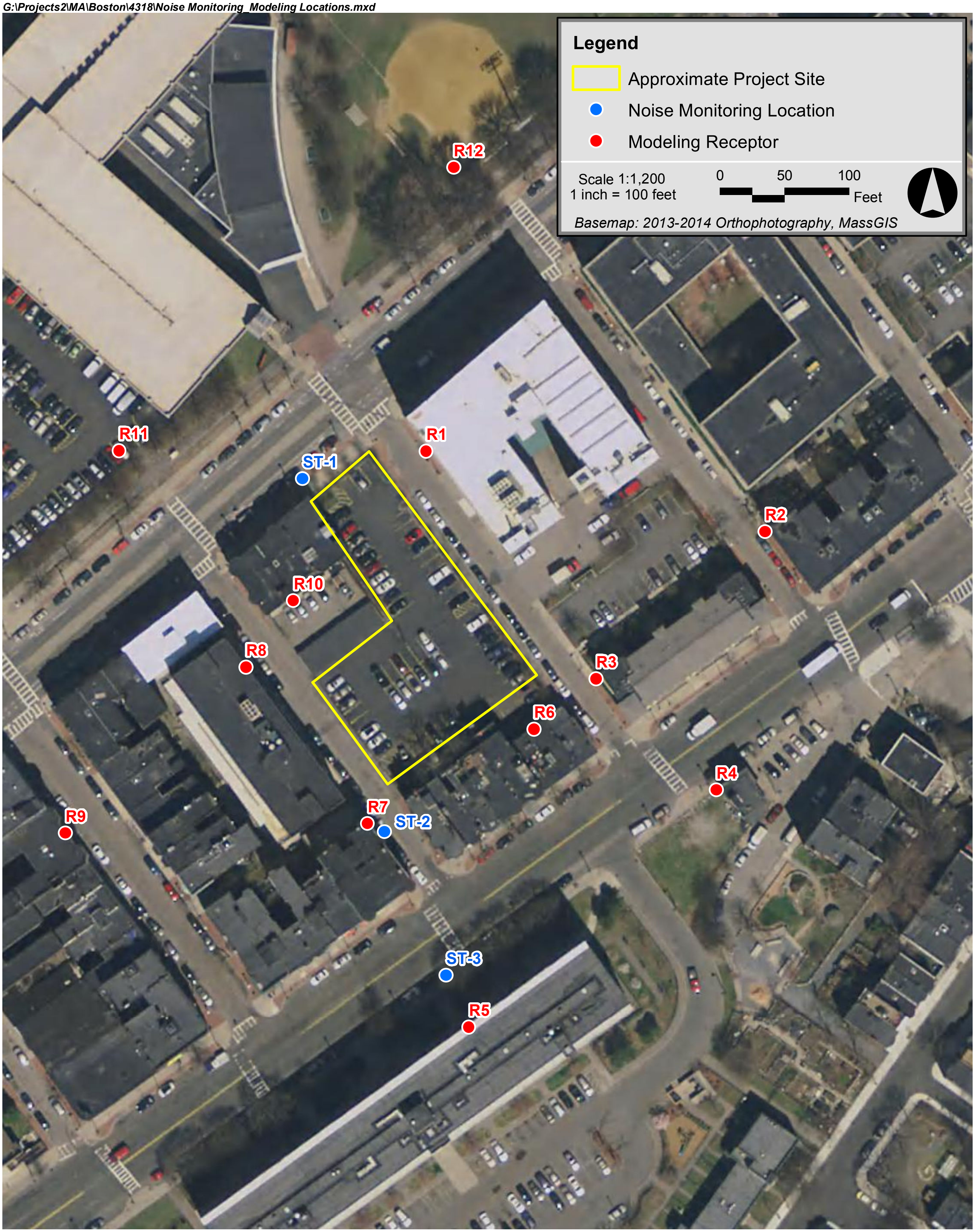

Columbus Avenue Student Housing Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 4.10-1

Noise Monitoring & Modeling Locations

and ANSI S1.40-1984. Statistical descriptors (L_{eq}, L_{90}, etc.) were calculated for each sampling period, with octave-band sound levels corresponding to the same data set processed for the broadband levels.

4.10.4.4 Measured Background Noise Levels

Baseline noise monitoring results are presented in Table 4.10-2, and summarized below:

- The daytime residual background (L_{90} dBA) measurements ranged from 52 to 58 dBA;
- The nighttime residual background (L_{90} dBA) measurements ranged from 49 to 55 dBA;
- The daytime equivalent level (L_{eq} dBA) measurements ranged from 62 to 66 dBA;
- The nighttime equivalent level (L_{eq} dBA) measurements ranged from 55 to 62 dBA.

4.10.5 Future Conditions

4.10.5.1 Overview of Potential Project Noise Sources

The primary sources of continuous sound exterior to the Project are expected to consist of a rooftop cooling tower, energy recovery ventilators (ERVs), and emergency power devices.

This equipment is anticipated to include one 750-ton two-cell cooling tower proposed for the 20th floor roof, along with one 600 kW emergency generator fitted with a sound attenuating enclosure and critical grade exhaust silencer. Additionally, four ERVs with a total capacity of 2,600 MBH are anticipated to be located on the roofs of the 8th floor (1 unit), 17th floor (1 unit) and 20th floor (2 units). Other secondary noise sources including pumps, heat exchangers, boilers, and domestic hot water heaters are anticipated to either be enclosed within the rooftop penthouse, within the building interior, or are assumed to have sound levels 10 dBA lower than the primary sources of noise, and were not considered in this analysis to contribute significantly to the overall sound level. Stair pressurization fans were assumed to be emergency-use only and were not included.

Mitigation will be applied to sources as needed to ensure compliance with the applicable noise regulations. The noise control features assumed in this analysis consist of a super low sound fan and water silencers for the proposed cooling tower as well as an emergency generator sound attenuating enclosure and hospital-grade exhaust silencer.

Table 4.10-2 Summary of Measured Background Noise Levels – February 18, 2016 (Daytime) & February 19, 2016 (Nighttime)

Location	*Period*	*Start Time*	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	*L_{90} Sound Pressure Levels by Octave-Band*								
								31.5 Hz	*63 Hz*	*125 Hz*	*250 Hz*	*500 Hz*	*1k Hz*	*2k Hz*	*4k Hz*	*8k Hz*
			dBA	*dBA*	*dBA*	*dBA*	*dBA*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*
ST-1	Day	1:15 PM	63	73	66	62	58	77	69	64	57	54	52	46	37	31
ST-2	Day	1:38 PM	62	84	63	56	52	63	62	57	52	51	47	39	29	22
ST-3	Day	2:01 PM	66	82	69	64	56	65	63	59	55	54	51	45	37	29
ST-1	Night	12:16 AM	59	74	63	56	55	65	64	64	56	51	48	42	34	27
ST-2	Night	12:42 AM	55	80	55	51	49	60	61	56	50	47	42	34	27	22
ST-3	Night	1:19 AM	62	78	66	55	51	58	58	57	50	49	45	39	31	25

Weather Conditions:

	Date	Temp	RH	Sky	Wind
Daytime	Thursday, February 18, 2016	31 °F	28%	Clear/sunny	N @ 1-4 mph
Nighttime	Friday, February 19, 2016	24 °F	35%	Clear	SW @ 4-6 mph

Monitoring Equipment Used:

	Manufacturer	Model	S/N
Sound Level Meter	Larson Davis	LD831	3752
Microphone	Larson Davis	377B20	142894
Preamp	Larson Davis	PRM831	029563
Calibrator	Larson Davis	Cal200	7147

A tabular summary of the modeled mechanical equipment anticipated for the Project is presented below in Table 4.10-3. Sound power level data for each unit, as provided by the manufacturer or calculated from provided sound pressure level data, is presented in Table 4.10-4. Sound power levels of those units for which data was not provided were assumed based on data for similar or representative equipment. Noise reduction levels assumed in the model are provided in Table 4.10-5. The approximate locations of the mechanical equipment were provided by the Project team through a preliminary roof plan.

Table 4.10-3 Modeled Noise Sources

Noise Source	*Quantity*	*Equipment Location*	*Size/Capacity per Unit*
Cooling Tower	1	East Roof x2 (218'AGL)	750 Ton
Energy Recovery Ventilator	4	North Roof x1(89' AGL), East Roof x2 (218' AGL), West Roof x1 (174' AGL)	2,600 MBH
Emergency Generator	1	East Roof x1 (218' AGL)	600 kWe

Table 4.10-4 Modeled Sound Power Levels per Unit

Noise Source	*Broad -band*	*32 Hz*	*63 Hz*	*125 Hz*	*250 Hz*	*500 Hz*	*1k Hz*	*2k Hz*	*4k Hz*	*8k Hz*
	dBA	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*
Cooling Tower[1]	94	104[8]	104	101	93	91	88	84	79	80
ERV-1[2]	96	89[8]	89	87	94	90	91	90	82	79
ERV-2[3]	103	96[8]	96	91	102	99	98	96	89	85
ERV-3[4]	103	96[8]	96	91	102	99	98	96	89	85
ERV-4[5]	102	97[8]	97	91	102	97	98	96	89	86
Emergency Generator – Mechanical (Enclosed)[6]	101	109[8]	109	108	104	99	93	89	83	81
Emergency Generator – Exhaust (Unsilenced)[7]	130	133[8]	133	131	127	122	122	123	122	124

Notes:

1. Evapco Model UT-29-628 750 Ton 2-Cell Cooling Tower w/Super Low Sound Fan and Water Silencers
2. Valent VPRE 210 ERV with 2x TE355 Supply Fans and 1x TE400 Exhaust Fan
3. Valent VPRE 310 ERV with 1x APH24 Supply Fans and 2x TE450 Exhaust Fans
4. Valent VPRE 310 ERV with 1x APH24 Supply Fans and 2x TE450 Exhaust Fans
5. Valent VPRE 310 ERV with 2x TE450 Supply Fans and 2x TE400 Exhaust Fans
6. Kohler Power Systems 600REOXVB 600 kW diesel generator set, 100% Load w/Sound Enclosure
7. Kohler Power Systems 600REOXVB 600 kW diesel generator set, 100% Load; Raw Exhaust (No Silencer)
8. No data available in 32 Hz band. Assumed equal to 63 Hz band.

Table 4.10-5 Modeled Noise Reduction Levels

Noise Source	*Broad-band*	*32 Hz*	*63 Hz*	*125 Hz*	*250 Hz*	*500 Hz*	*1k Hz*	*2k Hz*	*4k Hz*	*8k Hz*
	dBA	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*	*dB*
Emergency Generator Exhaust Silencer[1]	88	91[2]	91	87	85	82	80	78	75	86

Notes:

1. Silex JB-8 Critical Grade Silencer, or similar
2. No data available in 32 Hz band. Assumed equal to 63 Hz band.

4.10.5.2 Noise Modeling Methodology

Noise impacts from mechanical equipment associated with the Project were predicted using Cadna/A noise calculation software (DataKustik Corporation, 2015). This software, which uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation), offers a refined set of computations accounting for local topography, ground attenuation, drop-off with distance, barrier shielding, diffraction around building edges, reflection off building facades, and atmospheric absorption of sound from multiple noise sources.

An initial analysis considered all of the mechanical equipment without the emergency generator running to simulate typical nighttime operating conditions at nearby receptors. A second analysis combined the mechanical equipment and the emergency generator to reflect worst-case daytime conditions during brief, routine, testing of the generator when ambient levels are higher.

4.10.5.3 Noise Modeling Results

Twelve modeling locations with a height of 1.5 meters above-grade were included in the analysis representing the nearest noise-sensitive residential and recreational receptors. Figure 4.10-1 shows the locations of each modeled receptor as well as the monitoring locations selected for background measurements.

The predicted sound levels, presented in Table 4.10-6, from all mechanical equipment operating simultaneously (except the emergency generator) at rated load are expected to range from 38 to 42 dBA at nearby receptors including the closest residences. Table 4.10-7 presents predicted sound levels from all mechanical equipment including the emergency generator during routine daytime testing periods which are expected to range from 40 to 48 dBA at nearby receptors including the closest residences.

Results of this evaluation demonstrate that sound levels from Project operation are anticipated to fully comply with the most stringent City of Boston nighttime broadband and octave-band noise limits described in Table 4.10-1. Additionally, Project-only sound levels are predicted to remain well below the existing background sound levels as shown in Table 4.10-2, which already exceed many of the City of Boston limits without any contribution from the Project. As such, this analysis indicates that the proposed Project can operate without significant impact on the existing acoustical environment.

Table 4.10-6 Modeled Project-Only Sound Levels – Typical Nighttime Operation (No Emergency Generator)

Modeling Location ID	*Zoning / Land Use*	*Evaluation Period*	*Broadband (dBA)*	*Sound Pressure Level (dB) per Octave-band Center Frequency*								
				32 Hz	*63 Hz*	*125 Hz*	*250 Hz*	*500 Hz*	*1k Hz*	*2k Hz*	*4k Hz*	*8k Hz*
R1	Residential	Night	41	54	53	47	43	38	35	33	24	16
R2	Residential	Night	42	53	52	49	43	39	35	30	21	11
R3	Residential	Night	39	52	50	44	42	36	33	29	20	9
R4	Residential	Night	38	51	49	43	42	35	32	28	18	6
R5	Residential	Night	39	47	44	36	42	35	33	29	19	7
R6	Residential	Night	39	46	43	36	39	33	34	32	23	13
R7	Residential	Night	38	48	44	36	41	35	33	30	20	11
R8	Residential	Night	41	50	48	41	44	37	36	33	24	14
R9	Residential	Night	40	47	46	40	43	36	34	30	21	9
R10	Residential	Night	41	47	44	38	43	36	36	33	24	15
R11	Residential	Night	41	51	49	44	44	38	35	31	21	10
R12	Recreational	Night	42	52	52	48	44	39	35	30	20	8
City of Boston Limits	**Residential**	**Night**	**50**	**68**	**67**	**61**	**52**	**46**	**40**	**33**	**28**	**26**
	Business	**Night**	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**
	Industrial	**Night**	**70**	**83**	**82**	**77**	**73**	**67**	**61**	**57**	**53**	**50**

Table 4.10-7 Modeled Project-Only Sound Levels – Typical Daytime Operation + Routine Emergency Generator Testing

Modeling Location ID	*Zoning / Land Use*	*Evaluation Period*	*Broadband (dBA)*	*Sound Pressure Level (dB) per Octave-band Center Frequency*								
				32 Hz	*63 Hz*	*125 Hz*	*250 Hz*	*500 Hz*	*1k Hz*	*2k Hz*	*4k Hz*	*8k Hz*
R1	Residential	Day	44	72	64	51	45	39	36	33	24	17
R2	Residential	Day	48	76	69	53	46	41	38	38	32	24
R3	Residential	Day	44	74	66	51	46	38	34	30	21	11
R4	Residential	Day	43	73	65	50	45	37	32	29	19	8
R5	Residential	Day	41	68	59	46	44	36	33	30	20	8
R6	Residential	Day	41	69	59	46	41	35	35	32	23	14
R7	Residential	Day	40	64	54	41	42	36	34	30	21	11
R8	Residential	Day	42	65	56	44	44	38	36	33	24	15
R9	Residential	Day	40	65	56	43	43	37	34	30	21	9
R10	Residential	Day	41	63	54	42	43	37	36	33	24	16
R11	Residential	Day	42	66	57	46	44	38	35	31	21	10
R12	Recreational	Day	44	70	63	50	45	40	36	32	22	10
City of Boston Limits	**Residential**	**Day**	**60**	**76**	**75**	**69**	**62**	**56**	**50**	**45**	**40**	**38**
	Business	**Day**	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**
	Industrial	**Day**	**70**	**83**	**82**	**77**	**73**	**67**	**61**	**57**	**53**	**50**

4.10.6 Conclusions

Baseline noise levels were measured in the vicinity of the Project site and were compared to predicted noise levels based on information provided by the manufacturers of representative mechanical equipment or estimated from the equipment's capacity. With appropriate mitigation (as described in Section 4.10.5.1), the Project is not expected to introduce significant outdoor mechanical equipment noise into the surrounding community.

Results of the analysis indicate that typical nighttime noise levels from the Project as well as noise levels from routine daytime testing of the emergency generator are expected to remain well below the City of Boston Noise Zoning requirements. It should be noted that the existing background sound levels in the immediate Project area already exceed the City of Boston limits without any contribution from the Project. The results presented in Section 4.10.5.3 indicate that the Project is not anticipated to significantly impact the existing acoustical environment.

At this time, the mechanical equipment and noise controls are conceptual in nature and, during the final design phase of the Project, will be specified to meet the applicable City of Boston noise limits. Additional mitigation may include the selection of quieter units, screening walls, mufflers, or equipment enclosures as needed.

4.11 Construction Impacts

4.11.1 Introduction

A Construction Management Plan (CMP) in compliance with the City's Construction Management Program will be submitted to the Boston Transportation Department (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 Proponent intends to follow the guidelines of the City of Boston and the MassDEP, which direct the evaluation and mitigation of construction impacts.

4.11.2 Construction Methodology/Public Safety

Construction methodologies that ensure public safety and protect nearby tenants 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.

4.11.3 Construction Schedule

The Proponent anticipates that the Project will commence construction in the last quarter of 2016 and last for approximately 30 months.

Typical construction hours will be from 7:00 am to 6:00 pm, Monday through Friday, with most shifts ordinarily ending at 3:30 pm. No substantial sound-generating activity will occur before 7:00 am. 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. Notification should occur during normal business hours, Monday through Friday. It is noted that some activities such as finishing activities could run beyond 6:00 pm 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.

4.11.4 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 management consultant will work to ensure that staging areas will be located to minimize impacts to pedestrian and vehicular flow. Secure fencing and barricades will be used to isolate construction areas from pedestrian traffic adjacent to the site. Construction procedures will be designed to meet all Occupational Safety and Health Administration (OSHA) safety standards for specific site construction activities.

4.11.5 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 Boston Harbor" plaques will be installed at storm drains that are replaced or installed as part of the Project.

4.11.6 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 1,000 construction jobs will be created over the length of construction. The Proponent will make reasonable good-faith efforts to have at least 50% of the total employee work hours be for Boston residents, at least 25% of total employee work hours be for minorities and at least 10% of the total employee work hours be for women. The Proponent will enter into 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.

4.11.7 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.

4.11.8 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.

4.11.9 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.

4.11.10 Construction Waste

The Proponent will take an active role with regard to the reprocessing and recycling of construction waste. The disposal contract will include specific requirements that will ensure that construction procedures allow for the necessary segregation, reprocessing, reuse and recycling of materials when possible. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per 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.

4.11.11 Protection of Utilities

Existing public and private infrastructure located within the public right-of-way will be protected during construction. The installation of proposed utilities within the public way will be in accordance with the MWRA, BWSC, Boston Public Works, Dig Safe, and the governing utility company requirements. 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.

4.11.12 Rodent Control

A rodent extermination certificate will be filed with each 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.

4.12 Wildlife Habitat

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

Section 5.0

Sustainable Design and Climate Change Preparedness

5.0 SUSTAINABLE DESIGN AND CLIMATE CHANGE PREPAREDNESS

5.1 Sustainability

Northeastern University is deeply committed to becoming a greener institution. In 2007, the University became a founding member of the American College & University Presidents Climate Commitment (ACUPCC), a nationwide initiative to reduce greenhouse gas emissions among institutions of higher learning. In 2010, Northeastern officially adopted a climate action strategy called "Sustainable Action Plan: Roadmap Towards Carbon Neutrality." In 2015, Northeastern published "Update on Sustainability: 2005- 2025," which highlights progress made to date and outlines goals toward a more sustainable future. More details on Northeastern's sustainability initiatives can be found in Section 8.0 of the IMP Amendment.

Northeastern and American Campus Communities share the City of Boston's strong commitment to the principles of sustainable development and aims to incorporate a wide variety of sustainable initiatives in this Project.

5.2 Sustainable Design

The Project will be designed and built using construction industry best- practices for sustainability described within, and measured by, the LEED for Homes Mid-Rise rating system. An Integrated Project Team and process have been established to leverage all professional expertise and seek every opportunity to employ Green Building Techniques and practices. The Project's Preliminary Rating shows performance well in excess of the target of LEED Gold Certification with several additional credit opportunities in discussion, ensuring no ground is lost toward that goal, and a final performance rating beyond the goal is easily possible. LEED Certification for this Project will be pursued.

A LEED checklist is included at the end of this section.

Innovation and Design Process (ID)

<u>ID 1.1 Preliminary Rating - (Prerequisite):</u> The Project team gathered on December 10, 2015. Price Sustainability Associates (PSA), a Green Rater, reviewed the Preliminary Rating with the design team and completed the Preliminary Checklist. Gold Certification is the target goal for the Project.

<u>ID 1.2 Energy Expertise for Mid-Rise - (Prerequisite):</u> The Project team has both expertise for Mid-rise systems and experience modeling ASHRAE 90.1 energy simulation for LEED-NC & LEED for Homes Mid-Rise and meets this requirement.

<u>ID 1.4 Design Charrette – (1 Point):</u> During Schematic Design, the Integrated Project Team will meet for a dedicated Design Charrette (total 8 hours) to optimize green building strategies and integrate them into the design.

ID 1.6 Trades Training for Mid-Rise – (1 Point): PSA will conduct on-site training for the trades responsible for plumbing, mechanical (HVAC) and insulation to review green building concepts and Project goals, specific strategies related to the respective trades and anticipated outcomes.

ID 2.1 Durability Planning – (Prerequisite): The durability evaluation form has been completed and the durability inspection checklist will be developed as the design advances, meeting all of the LEED requirements.

ID 2.2 Durability Management – (Prerequisite): The builder plans to use the durability inspection checklist throughout construction as both an inspection tool and a project management tool for weekly review, to ensure each measure is completed.

ID 2.3 Third-Party Durability Management Verification – (3 Points): PSA will periodically conduct on-site inspections using the Durability Management Checklist to verify that each are installed.

Location and Linkages (LL)

LL 2 Site Selection – (2 Points): The site does not trigger any of the listed environmental sensitivity criteria.

LL 3.2 Preferred Locations: Infill – (2 Points): 75% or more of the perimeter borders previously developed land.

LL 4 Existing Infrastructure – (1 Point): The lot is within a half mile of existing water and sewer service lines.

LL 5.1-5.3 Community Resources/Public Transit – (3 Points): The site has outstanding transit options, maximizing credit in this category.

LL 6 Access to Open Space – (1 Point): The site will meet the criteria of being proximate to space greater than three quarters of an acre within a quarter mile.

Sustainable Sites (SS)

SS 1.1 Erosion Controls during Construction – (Prerequisite): The Project team will develop and implement an erosion control plan prior to the start of construction, which will meet each of the required LEED provisions (a-e).

SS 1.2 Minimize Disturbed Area of Site for Mid-Rise – (1 Point): Project density is 355 units per acre, exceeding the 40 units per acre threshold.

SS 2.1 No Invasive Plants – (Prerequisite): No invasive species are to be included in the landscape plan.

SS 2.2 Basic Landscape Design – (1 Point): Any installed turf will be drought tolerant, will not be used in densely shaded areas, and will not be placed in areas with greater than 25% slope. Mulch or soils amendments will be used as appropriate and compacted soil will be tilled to at least six inches.

SS 3.2 Reduce Local Heat Island Effects – (1 Point): The roof will be installed with a high-albedo material on 75% or more of the roof area.

SS 4.3 Stormwater Quality Control for Mid-Rise – (2 Points): The Project will use a stormwater management plan designed in accordance with state and local standards.

SS 5 Nontoxic Pest Control – (2 Points): The construction style of this Project will meet all of the pest-control alternatives for LEED.

SS 6.1-6.3 Compact Development, Very-High Density – (4 Points): Project density is 355 units per acre, meeting the Very-High Density threshold.

SS 7.1 Public Transit Mid-Rise – (2 Points): The number of transit rides available within a half mile of the Project is in excess of 60.

SS 7.2 Bicycle Storage for Mid-Rise – (1 Points): 200 covered storage spaces for bicycles will be provided, exceeding the LEED requirement.

SS 7.3 Parking Capacity/Low-Emitting Vehicles for Mid-Rise – (1 Point): No new parking will be added as a result of the activity of this Project.

Water Efficiency (WE)

WE 3.1 and 3.2 Indoor Water Use- (5 Points): The Project will specify shower heads with 1.75 or less gallons per minute (gpm), lavatory faucets will use 1.50 or less gpm and the toilets selected will be less than 1.3 gallons per flush.

WE 3.3 Water Efficient Appliances for Mid-Rise- (1 Points): The Project will use high-efficiency clothes washers and dishwashers.

Energy and Atmosphere (EA)

EA 1.1 Minimum Energy Performance for Mid-Rise – (Prerequisite): The Project will exceed the 20% minimum reduction in energy use according to the ASHRAE 90.1 Simulation: Appendix G, well in excess of the LEED minimum threshold.

EA 1.2 Testing and Verification for Mid-Rise – (Prerequisite): The Project intends to comply with Option 1, EPA MFHR Testing and Verification protocol.

EA 1.3 Optimize Energy Performance for Mid-Rise – (10 Points): The Project intends to reach at least a 23% better than the reference in the ASHRAE with EPA simulation modeling.

EA 7.2 Pipe Insulation – (1 Point): All domestic hot water piping shall have R4 pipe insulation installed.

EA 11.1 Refrigerant Charge Test – (Prerequisite): All refrigerant lines for air conditioning will be charge tested per manufacturer's standards.

EA 11.2 Appropriate HVAC Refrigerants – (1 Point): R410A refrigerant will be used on space cooling systems.

Materials and Resources (MR)

MR 1.1 Framing Order Waste Factor – (Prerequisite): A calculation of the wood necessary to frame the building and orders of the amount of wood purchased will be made. The order shall not exceed this calculation by more than 10%.

MR 1.4 Framing Efficiencies - (1 Point): Open web floor trusses will be used to facilitate mechanical infrastructure between floors and reduce structural material.

MR 2.1 FSC Certified Tropical Woods – (Prerequisite): Suppliers will be notified of preference for FSC products and a request for the country of manufacture for each wood product. Any tropical woods used will be FSC Certified.

MR 2.2 Environmentally Preferable Products – (minimum 3 Points): The Project will select environmentally preferable products in accordance with the EPP table to earn a minimum of 3 points.

MR 3.1 Construction Waste Management Planning – (Prerequisite): The Project will investigate any recycling opportunities in the area and document the waste diverted from the landfill.

MR 3.2 Construction Waste Reduction – (3 Points): Construction waste will be minimized with a target of 90% being diverted from landfills.

Indoor Environmental Quality (EQ)

EQ 2.1 Basic Combustion Venting Measures – (Prerequisite): These requirements are included in the design and are requirements for basic code compliance in Boston. There will be no fireplaces in any of the units.

EQ 4.1 Basic Outdoor Air Ventilation – (Prerequisite): Continuous ventilation will be provided to each unit to meet the ASHRAE 62.2 – 2007 ventilation requirement.

EQ 4.2 Enhanced Outdoor Air Ventilation for Mid-Rise – (2 Points): Heat Recovery Ventilation (HRV) will be utilized to reclaim energy from the ventilation exhaust stream.

EQ 4.3 Third Party Performance Testing for Mid-Rise – (1 Point): PSA will test ventilation flow rates into the units to verify compliance with ASHRAE 62.2.

EQ 5.1 Basic Local Exhaust – (Prerequisite): Bath fans and kitchen area exhaust fans will be ASHRAE 62.2 – 2007 compliant. All of the LEED and ENERGY STAR criteria will be met.

EQ 5.2 Enhanced Local Exhaust – (1 Point): Unit ventilation rates will be achieved with continuous ventilation from the units.

EQ 6.1 Room by Room Load Calculations – (Prerequisite): Room by room load calculations will be provided by the HVAC engineer or responsible party stating the calculations were performed according to the ACCA Manual J and D.

EQ 7.2 Air Filtering – (Prerequisite): MERV 8 filters will be installed on ducted distribution systems.

EQ 8.1 Indoor Contaminant Control During Construction – (1 Point): All ductwork will be sealed throughout construction so that debris doesn't contaminate the distribution systems.

EQ 8.2 Indoor Contaminant Controls for Mid-Rise – (2 Points): The Project will install a central entryway system and in-unit shoe removal and storage near entryways.

EQ 8.3 Preoccupancy Flush – (1 Point): The building will be flushed of airborne contaminants per LEED guidance prior to building turnover.

EQ 9.2 Radon-Resistant Construction in Moderate-Risk Areas – (1 Point): The Project site is in EPA Radon Zone 3, and does not require radon mitigation. The team will demonstrate this with radon testing.

EQ 10.1 No HVAC in Garage – (Prerequisite) and EQ 10.3 Detached Garage or No Garage (3 Points): There will be no garage in this Project.

EQ 11 Environmental Tobacco Smoke Control – (1 Point): Restrictions on public smoking will be implemented to reduce smoke exposure and transfer.

EQ 12.1 Compartmentalization of Units – (Prerequisite): A thorough air-sealing protocol will be implemented to ensure leakage below 0.30 CFM50 per sf of enclosure.

EQ 12.2 Enhanced Compartmentalization of Units – (1 Point): Unit compartmentalization will be tested by blower door and target .225 CFM50 per sf of enclosure.

Awareness and Education (AE)

AE 1.1 Education of the Homeowner – (Prerequisite): An electronic Home Owner's Manual will be created and provided to all occupants. A one hour walk through will be conducted with the occupants in group trainings.

AE 1.3 Public Awareness – (1 Point): The developer will create a website about the Project, highlighting the benefits of LEED Homes. The developer will work with regional publications on a newspaper article about this Project. The contractor's Project sign will include LEED for Homes signage at the exterior of the building site.

AE 2 Education of the Building Manager – (1 Point): An operations and training manual will be created and provided to the building manager and a one-hour walk-through will be conducted with the building manager

5.3 Energy Efficiency

The Project team has reached out to Kim Cullinane and has scheduled a meeting to discuss the Eversource/National Grid Energy Incentive Program. Early-stage energy modeling has begun and will be tightly coordinated with utility incentives and programs to leverage all offerings and optimize all systems for highest efficiency possible. Alternative strategies for lowering energy needed for heating, cooling and Domestic Hot Water are being considered. As the design progresses, the Proponent will continue to work with the utilities to minimize energy use and decide which incentive programs are most appropriate for the Project to utilize.

The proposed Project is likely to be permitted under the new energy code, which requires more stringent fenestration and roof insulation requirements relative to 90.1-2007. The design team is looking closely at the detailing of fenestration systems to improve the envelope performance, including analysis of glazing options, best framing practices, addressing thermal bridges at the interior of opaque panel sections (potentially through the use of continuous interior insulation across mullions and panels), solar heat gain coefficients, and adequate air sealing. The preliminary wall sections are being factored into an early energy model evaluation that will illustrate the need for adjustments to the design and specifications in order to maximize incentives. These adjustments may focus on the size of ERV recovery sections, WLHP selection, condensing boilers, or the size of the cooling tower box depending on the results from the energy analysis and ongoing conversations with the utility provider.

5.4 Climate Change Resilience

Projects subject to Article 80, Large Project Review are required to complete the Climate Change Preparedness Checklist. Climate change conditions considered include higher maximum and mean temperatures, more frequent and longer extreme heat events, more frequent and longer droughts, more severe rainfall events, and increased wind events. Due to the Project's location, elevation and topography, sea level rise will not impact the Project site

The expected life of the Project is anticipated to be approximately 50 years. Therefore, the Proponent planned for climate change conditions projected at a 50 year time span. A copy of the completed checklist is included in Appendix E. Given the preliminary level of design, the responses are also preliminary and may be updated as the Project design progresses.

Extreme Heat Events

The Intergovernmental Panel on Climate Change (IPCC) has predicted that in Massachusetts the number of days with temperatures greater than 90°F will increase from the current five-to-twenty days annually, to thirty-to-sixty days annually[1] by 2100. The Project design will incorporate a number of measures to minimize the impact of high temperature events, including:

- Installing operable windows where possible;
- Specifying high reflective paving materials and high albedo roof tops to minimize the heat island effect; and
- Planting new trees to shade areas of hardscape around the site.

Energy modeling for the Project has not yet been completed; however, as indicated on the LEED Checklist, the Proponent will strive to reduce the Project's overall energy demand and GHG emissions that contribute to global warming. The Project's proposed TDM program will also help to lessen fossil fuel consumption.

Drought Conditions

Under the high emissions scenario, the occurrence of droughts lasting one to three months could go up by as much as 75% over existing conditions by the end of the century. To minimize the Project's susceptibility to drought conditions, the landscape design is anticipated to incorporate native and adaptive plant materials and a reduction in potable water use for irrigation when compared to a mid-summer baseline. Aeration fixtures and appliances will be chosen for water conservation qualities, conserving potable water supplies.

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

Rain Events

As a result of climate change, the Northeast is expected to experience more frequent and intense storms. To mitigate, the Proponent will locate critical mechanical and electrical equipment at the highest elevation possible to prevent exposure to flood waters and will install water tight utility conduits.

LEED for Homes Mid-rise Simplified Project Checklist

for Homes

Builder Name:	*Northeastern University*
Project Team Leader (if different):	*Peter W Bartash, CUBE3*
Home Address (Street/City/State):	*761 Columbus Ave., Boston, MA*

Project Description:

Building type: *Mid-rise multi-family* | # of stories: *20*

# of units: *207* | Avg. Home Size Adjustment: *-10*

Adjusted Certification Thresholds

Certified: *35.0* | Gold: *65.0*

Silver: *50.0* | Platinum: *80.0*

Project Point Total

Prelim: *70 + 20 maybe pts* | Final: *14*

Final Credit Category Total Points

ID: *0* | SS: *4* | EA: *7* | EQ: *0*

LL: *0* | WE: *0* | MR: *3* | AE: *0*

Certification Level

Prelim: *Gold* | Final: *Not Certified*

Minimum Point Thresholds Not Met for Final Rating

date last updated :

last updated by :

				Max Pts	Project Points Preliminary			Final
Innovation and Design Process (ID)		(No Minimum Points Required)		Max	Y/Pts	Maybe	No	Y/Pts
1. Integrated Project Planning	1.1	Preliminary Rating		Prereq	Y			Y
	1.2	Energy Expertise for MID-RISE		Prereq	Y			Y
	1.3	Professional Credentialed with Respect to LEED for Homes		1	0	0	N	0
	1.4	Design Charrette		1	1	0		0
	1.5	Building Orientation for Solar Design		1	0	0	N	0
	1.6	Trades Training for MID-RISE		1	1	0		0
2. Durability Management Process	2.1	Durability Planning		Prereq	Y			Y
	2.2	Durability Management		Prereq	Y			Y
	2.3	Third-Party Durability Management Verification		3	3	0		0
3.Innovative or Regional Design	3.1	Innovation #1		1	0	0.5		0
	3.2	Innovation #2		1	0	0.5		0
	3.3	Innovation #3		1	0	0	N	0
	3.4	Innovation #4		1	0	0	N	0
		Sub-Total for ID Category:		11	5	1		0
Location and Linkages (LL)		(No Minimum Points Required)	OR	Max	Y/Pts	Maybe	No	Y/Pts
1. LEED ND	1	LEED for Neighborhood Development	**LL2-6**	10	0	0	N	0
2. Site Selection	2	Site Selection		2	2	0		0
3. Preferred Locations	3.1	Edge Development		1	0	0	N	0
	3.2	Infill	**LL 3.1**	2	2	0		0
	3.3	Brownfield Redevelopment for MID-RISE		1	0	0	N	0
4. Infrastructure	4	Existing Infrastructure		1	1	0		0
5. Community Resources/ Transit	5.1	Basic Community Resources for MID-RISE		1	0	0	N	0
	5.2	Extensive Community Resources for MID-RISE	**LL 5.1, 5.3**	2	0	0	N	0
	5.3	Outstanding Community Resources for MID-RISE	**LL 5.1, 5.2**	3	3	0		0
6. Access to Open Space	6	Access to Open Space		1	1	0		0
		Sub-Total for LL Category:		10	9	0		0
Sustainable Sites (SS)		(Minimum of 5 SS Points Required)	OR	Max	Y/Pts	Maybe	No	Y/Pts
1. Site Stewardship	1.1	Erosion Controls During Construction		Prerequisite	Y			Y
	1.2	Minimize Disturbed Area of Site for MID-RISE		1	1	0		0
2. Landscaping	2.1	No Invasive Plants		Prerequisite	Y			Y
	2.2	Basic Landscape Design	**SS 2.5**	1	1	0		0
	2.3	Limit Conventional Turf for MID-RISE	**SS 2.5**	2	0	1		0
	2.4	Drought Tolerant Plants for MID-RISE	**SS 2.5**	1	0	1		0
	2.5	Reduce Overall Irrigation Demand by at Least 20% for MID-RISE		3	0	0	N	0
3. Local Heat Island Effects	3.1	Reduce Site Heat Island Effects for MID-RISE		1	0	1		0
	3.2	Reduce Roof Heat Island Effects for MID-RISE		1	1	0		0
4. Surface Water Management	4.1	Permeable Lot for MID-RISE		2	0	2		0
	4.2	Permanent Erosion Controls		1	0	0	N	0
	4.3	Stormwater Quality Control for MID-RISE		2	2	0		0
5. Nontoxic Pest Control	5	Pest Control Alternatives		2	2	0		0
6. Compact Development	6.1	Moderate Density for MID-RISE		2	0	0	N	0
	6.2	High Density for MID-RISE	**SS 6.1, 6.3**	3	0	0	N	0
	6.3	Very High Density for MID-RISE	**SS 6.1, 6.2**	4	4	0		4
7. Alternative Transportation	7.1	Public Transit for MID-RISE		2	2	0		0
	7.2	Bicycle Storage for MID-RISE		1	1	0		0
	7.3	Parking Capacity/Low-Emitting Vehicles for MID-RISE		1	1	0		0
		Sub-Total for SS Category:		22	15	5		4

LEED for Homes Mid-rise Pilot Simplified Project Checklist (continued)

Category / Credit	No.	Description		Max Pts	Project Points Preliminary Y/Pts	Preliminary Maybe	Preliminary No	Final Y/Pts
Water Efficiency (WE)		(Minimum of 3 WE Points Required)	OR	Max	Y/Pts	Maybe	No	Y/Pts
1. Water Reuse	1	Water Reuse for MID-RISE		5	0	0	N	0
2. Irrigation System	2.1	High Efficiency Irrigation System for MID-RISE	**WE 2.2**	2	0	0	N	0
	2.2	Reduce Overall Irrigation Demand by at Least 45% for MID-RISE		2	0	0	N	0
3. Indoor Water Use	3.1	High-Efficiency Fixtures and Fittings		3	1	0		0
	3.2	Very High Efficiency Fixtures and Fittings		6	4	0		0
	3.3	Water Efficient Appliances for MID-RISE		2	1	0		0
			Sub-Total for WE Category:	*15*	6	0		0
Energy and Atmosphere (EA)		(Minimum of 0 EA Points Required)	OR	Max	Y/Pts	Maybe	No	Y/Pts
1. Optimize Energy Performance	1.1	Minimum Energy Performance for MID-RISE		Prereq	Y			Y
	1.2	Testing and Verification for MID-RISE		Prereq	Y			Y
	1.3	Optimize Energy Performance for MID-RISE		34	10	0		7
7. Water Heating	7.1	Efficient Hot Water Distribution		2	0	0	N	0
	7.2	Pipe Insulation		1	1	0		0
11. Residential Refrigerant Management	11.1	Refrigerant Charge Test		Prereq	Y			Y
	11.2	Appropriate HVAC Refrigerants		1	1	0		0
			Sub-Total for EA Category:	*38*	12	0		7
Materials and Resources (MR)		(Minimum of 2 MR Points Required)	OR	Max	Y/Pts	Maybe	No	Y/Pts
1. Material-Efficient Framing	1.1	Framing Order Waste Factor Limit		Prereq	Y			Y
	1.2	Detailed Framing Documents	**MR 1.5**	1	0	0		0
	1.3	Detailed Cut List and Lumber Order	**MR 1.5**	1	0	0	N	0
	1.4	Framing Efficiencies	**MR 1.5**	3	1	1		0
	1.5	Off-site Fabrication		4	0	0	N	0
2. Environmentally Preferable Products	2.1	FSC Certified Tropical Wood		Prereq	Y			Y
	2.2	Environmentally Preferable Products		8	3	4		0
3. Waste Management	3.1	Construction Waste Management Planning		Prereq	Y			Y
	3.2	Construction Waste Reduction		3	3	0		3
			Sub-Total for MR Category:	*16*	7	5		3
Indoor Environmental Quality (EQ)		(Minimum of 6 EQ Points Required)	OR	Max	Y/Pts	Maybe	No	Y/Pts
2. Combustion Venting	2	Basic Combustion Venting Measures		Prereq	Y			Y
3. Moisture Control	3	Moisture Load Control		1	0	1		0
4. Outdoor Air Ventilation	4.1	Basic Outdoor Air Ventilation for MID-RISE		Prereq	Y			Y
	4.2	Enhanced Outdoor Air Ventilation for MID-RISE		2	2	0		0
	4.3	Third-Party Performance Testing for MID-RISE		1	1	0		0
5. Local Exhaust	5.1	Basic Local Exhaust		Prerequisite	Y			
	5.2	Enhanced Local Exhaust		1	1	0		0
	5.3	Third-Party Performance Testing		1	0	1		0
6. Distribution of Space Heating and Cooling	6.1	Room-by-Room Load Calculations		Prereq	Y			Y
	6.2	Return Air Flow / Room by Room Controls		1	0	1		0
	6.3	Third-Party Performance Test / Multiple Zones		2	0	2		0
7. Air Filtering	7.1	Good Filters		Prereq	Y			Y
	7.2	Better Filters	**EQ 7.3**	1	0	1		0
	7.3	Best Filters		2	0	0	N	0
8. Contaminant Control	8.1	Indoor Contaminant Control during Construction		1	1	0		0
	8.2	Indoor Contaminant Control for MID-RISE		2	2	2		0
	8.3	Preoccupancy Flush		1	1	0		0
9. Radon Protection	9.1	Radon-Resistant Construction in High-Risk Areas		Prereq	N/A			N/A
	9.2	Radon-Resistant Construction in Moderate-Risk Areas		1	1	0		0
10. Garage Pollutant Protection	10.1	No HVAC in Garage for MID-RISE		Prereq	Y			Y
	10.2	Minimize Pollutants from Garage for MID-RISE	**EQ 10.3**	2	0	0	N	0
	10.3	Detached Garage or No Garage for MID-RISE		3	3	0		0
11. ETS Control	11	Environnmental Tobacco Smoke Reduction for MID-RISE		1	1	0		0
12. Compartmentalization of Units	12.1	Compartmentalization of Units		Prereq	Y			Y
	12.2	Enhanced Compartmentalization of Units		1	1	0		0
			Sub-Total for EQ Category:	*21*	14	8		0
Awareness and Education (AE)		(Minimum of 0 AE Points Required)		Max	Y/Pts	Maybe	No	Y/Pts
1. Education of the Homeowner or Tenant	1.1	Basic Operations Training		Prereq	Y			Y
	1.2	Enhanced Training		1	0	1		0
	1.3	Public Awareness		1	1	0		0
2. Education of Building Manager	2	Education of Building Manager		1	1	0		0
			Sub-Total for AE Category:	*3*	2	1		0

Section 6.0

Urban Design

6.0 URBAN DESIGN

6.1 Project Context

The Northeastern University campus is adjacent to the Fenway, Mission Hill, South End and Lower Roxbury neighborhoods of Boston and has a variety of residential, commercial and institutional neighbors. The University and surrounding neighborhoods are connected through the activities of many students and faculty of Northeastern, who are involved in a multitude of programs and activities that engage community organizations and neighborhood residents. Within these diverse neighborhoods are wide arrays of land uses, including institutional, high-and-medium-density residential, commercial and recreational uses.

The Project site is located on the South Campus of the University, bounded by Columbus Avenue to the north, Tremont Street to the south, Coventry Street to the west and Burke Street to the east. Directly to the northwest of the site, across Columbus Avenue, is the Interdisciplinary Science and Engineering Complex (ISEC) that is currently under construction. The Project will contribute to the pattern of residential infill that Northeastern has undertaken in recent years, anchored by International Village at the end of Columbus Avenue (see Figure 6-1). The Project will contribute to the growing identity of Columbus Avenue by integrating public and University spaces.

6.2 Urban Design Principles

In analyzing the site and its role in the neighborhood context, the planning and design approach is based on three essential urban principles:

Contribute to the Continuity of Columbus Avenue and its Urban Quality

The tallest portion of the building will be located at the center of the block, set back approximately 56 feet from Columbus Avenue to the north and approximately 52 feet from Tremont Street to the south. The eight-story height on Columbus Avenue reflects the predominant scale of the surrounding buildings along the Avenue (see Figures 6-2 and 6-3).

Maintain and Enhance Pedestrian Connections

The Project will replace a surface parking lot with active edges along both Columbus Avenue and Burke Street, enhancing pedestrian connections on Columbus Avenue to the University campus to the north, and beyond the site to the south of Tremont Street. As part of the Project, a small publicly accessible space on Columbus Avenue is proposed between the existing building on the west and the proposed building, which will accommodate public and student interaction as well as the entrance to the student housing and its amenities (see Figure 6-4).

Create Visual Connections

The Project design aims to create visual connections to the ISEC and the University campus beyond.

6.3 Materials and Massing

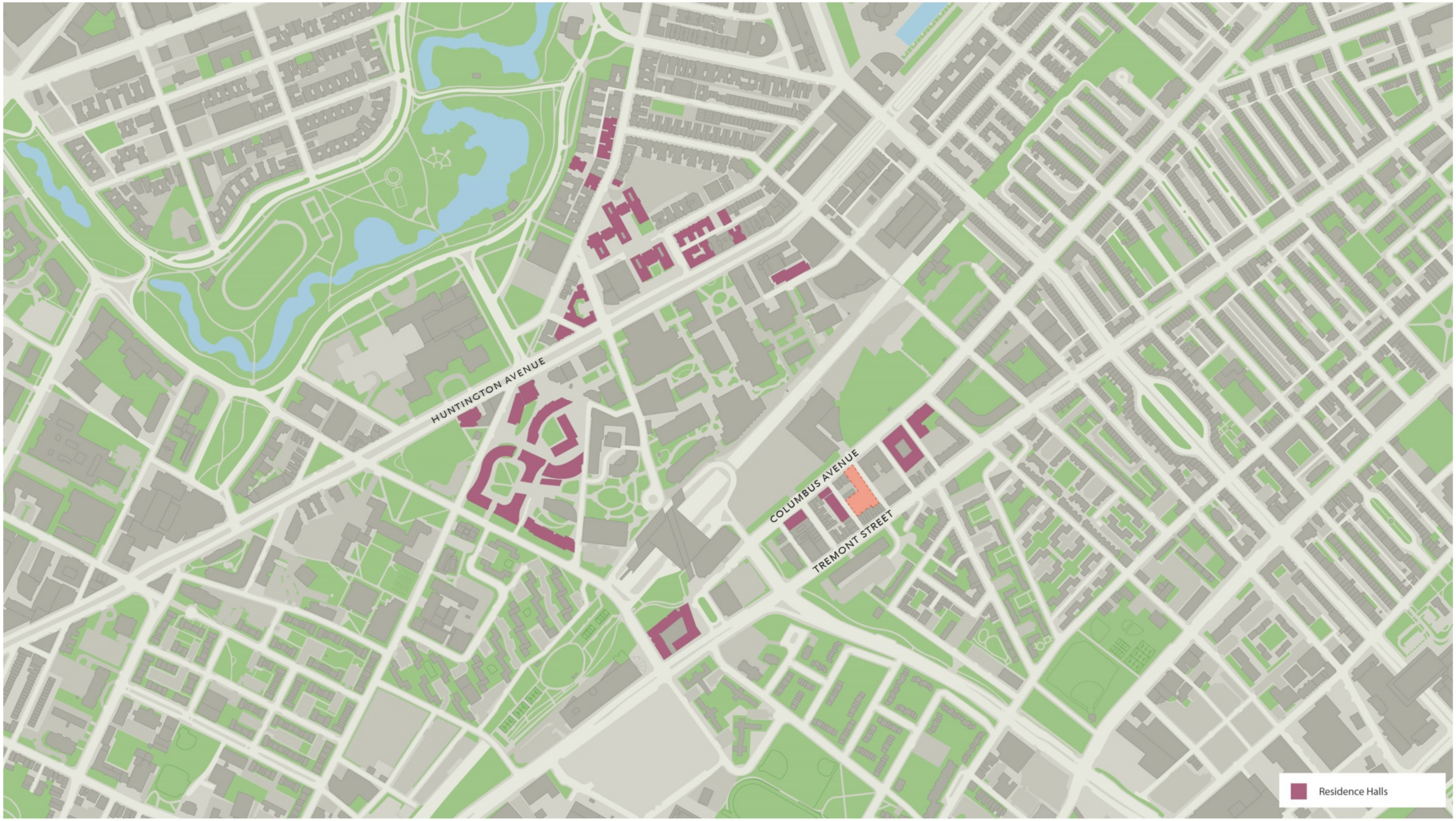
The building massing composition represents an assemblage of components: a low-rise portion of eight stories on Columbus Avenue, a mid-rise portion of 16 stories on Coventry Street and a high-rise portion of 20 stories in the middle of the block on Burke Street. The mid-rise and high-rise parts are connected by a glazed narrow bridge to create transparency through these two component parts (see Figure 6-5).

In order to reinforce the overall massing approach, each of the three main components are clad with different materials. The high-rise component on Burke Street is clad in metal panels; the mid-rise component on Coventry Street is clad in brick; and the low-rise component on Columbus Avenue has a combination of both materials.

6.4 Lighting Design

Exterior lighting will be used to provide comfortable/pleasant low-glare illumination at the ground floor level to facilitate safe and secure access to entries along Columbus Avenue, Burke Street, and Coventry Street. The Columbus Avenue ground floor exterior lighting will provide residents with an identifiable, open and secure entry sequence while minimizing direct light spill-over unto adjacent neighbors. Exterior LED lighting will be used primarily at the high-rise facades facing Columbus Avenue and Burke Street and limited in quantity at the Tremont Street and Coventry Street facades that abut residential neighbors. The exterior façade lighting will be programmed to shut-off at 11:00 p.m.

Interior lighting will be comprised of a combination of recessed, surface mounted and suspended 3000K dimmable LED and fluorescent fixtures. Non-residential common areas such as corridors and ground floor amenity spaces will employ a light control system to reduce illumination levels after 11:00 p.m. to conserve energy and light emittance impact towards the neighborhood areas. The interior lighting at the glazed building connector between the high-rise and mid-rise portions of the building will be dimmable recessed LED downlights with good cut-off to further control light emittance from the building.



Columbus Avenue Student Housing Boston, Massachusetts

CUBE 3 STUDIO architecture interiors planning

ELKUS | MANFREDI ARCHITECTS

Figure 6-1

University Residence Halls

Columbus Avenue Student Housing   Boston, Massachusetts

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Figure 6-2

View from Columbus Avenue

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Figure 6-3

View from the ISEC

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Figure 6-4

Pedestrian View from Columbus Avenue

Columbus Avenue Student Housing **Boston, Massachusetts**

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Figure 6-5

View from Tremont Street Looking North

Section 7.0

Historic and Archaeological Resources

7.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The following section identifies historic resources in the vicinity of the project. A review of the State and National Registers of Historic Places as well as the Inventory of Historic and Archaeological Assets of the Commonwealth (the Inventory) were undertaken to identify historic resources within the Project's vicinity.

7.1 Historic Resources on the Project Site

The Project site at 10 Burke Street is an approximately 23,424 square foot site located on the southeastern edge of the Northeastern University campus. The existing site currently contains a surface parking lot and is bound by Burke Street to the east, Columbus Avenue to the north, Coventry Street to the west, and an existing building to the south of the site. There are no identified historic or archaeological resources located on the Project site.

7.2 Historic Resources in the Vicinity

Within the Northeastern University campus there is one University owned property individually listed in the National Register of Historic Places; the Boston Young Men's Christian Association (YMCA) Building located at 312-320 Huntington Avenue, approximately one-half mile from the Project site. The western wing of the YMCA building, Hastings Hall, is owned by the University. Adjacent to the Project site two University owned properties are located within the Lower Roxbury National Register Historic District; 764- 768 and 780 Columbus Avenue. The Northeastern University Quadrangle within the Northeastern campus; including seven buildings constructed between 1936 and 1959 are included in the Massachusetts Historical Commission's (MHC) Inventory of Historic and Archaeological Assets of the Commonwealth. The area's buildings represent the original purpose-built campus of Northeastern University.

Two historic resources surveys have been completed of the University and its surrounding neighborhoods; a 1984 historic resources survey of the Fenway neighborhood and a 1985 survey of the Parker Hill/Mission Hill neighborhood were completed by the Boston Landmarks Commission and the Boston Redevelopment Authority. The surveys identified buildings listed individually and districts listed in the State and National Register of Historic Places. The 2005 Northeastern University Preservation Plan included an inventory of the existing historic resources within the vicinity of the Northeastern campus. The survey included all buildings 45 years or older within the campus that had not been previously surveyed. In 2013, an update to the 2005 Preservation Plan was completed and included the survey of an additional five academic buildings, one recreational building, three residential facilities, and one parking garage. However none of these properties were recommended for listing in the State or National Registers of Historic Places.

Several historic resources and historic districts listed in the State and National Register of Historic Places are located within the vicinity of the Project site, including the Boston YMCA Building, the South End District, the Lower Roxbury Historic District and the Frederick Douglas Square Historic District. State and National Register listed properties and historic districts within a quarter-mile radius of the Project site are listed in Table 7-1 below and their locations are identified in Figure 7-1.

Table 7-1 Historic Resources within the vicinity of the Project

Map No	*Name*	*Address*	*Designation*
A	Boston Young Men's Christian Association Building	312-320 Huntington Avenue	National Register Individual Property
B	New England Conservatory of Music- Jordan Hall	290 Huntington Avenue	National Historic Landmark, National Register Individual Property, Preservation Restriction
C	Peoples Baptist Church	134 Camden Street	State Register, Preservation Restriction
1	South End District	Bound by Southwest Corridor Park, Columbus Ave., East Berkeley St., Harrison Ave., Northampton St.	National Register Historic District
2	South End Landmark District	Bound by Southwest Corridor Park, East Berkeley St. Washington St., Harrison St., Albany St., Camden St.	Local Historic District
3	Frederick Douglas Square Historic District	Hammond St., Windsor St., Warwick St., Tremont St.	National Register Historic District
4	Lower Roxbury Historic District	Tremont St., Melnea Cass Blvd, Columbus Ave., Coventry St., Burke St.	National Register Historic District

7.3 Archaeological Resources

The Northeastern University campus was developed and largely constructed on filled land created in the late nineteenth century. In addition, because the new construction will occur on land previously disturbed by the construction of the existing surface parking lot, it is anticipated that the site is unlikely to contain significant archaeological remains.

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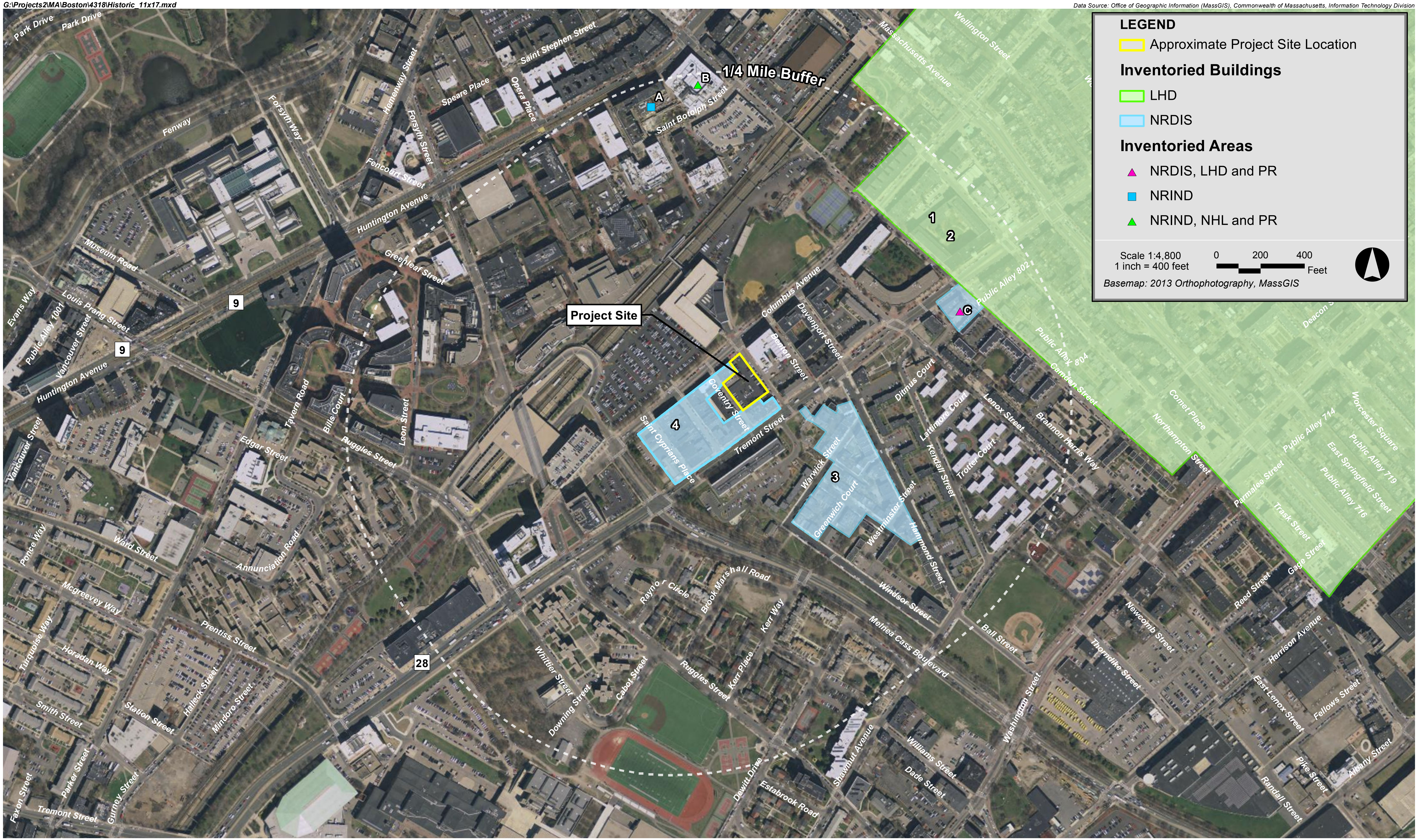
Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



Columbus Avenue Student Housing Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 7-1

Historic Resources

7.4 Impacts to Historic Resources

7.4.1 Design and Visual Impacts

The Columbus Avenue Student Housing Project is an approximately 310,000 sf building dedicated mainly to student residential use, as well as commercial space and student amenities and services. The Project will be eight stories along Columbus Avenue, while the eastern half, set back from Tremont Street, will be 20 stories and the western portion, facing Coventry Street, will be 16 stories. The eastern portion of the building (20 stories) will have a slender east-west profile to decrease its visual impact when viewed from Columbus Avenue and Tremont Street. The greatest mass of the design will be set mid-block to maintain the existing streetwall along Columbus Avenue. The ground floor will include approximately 3,000 sf of ground floor commercial space, connecting the internal campus life with the public. The building will contain student amenities including a social lounge, recreation and gaming area, fitness center, Academic Success Center and laundry room. The upper levels will contain 207 apartment units, consisting of two-bedroom apartments with both shared and private accommodations, as well as four-bedroom apartments with private accommodations. No on-site parking will be constructed within the Project site.

7.4.2 Shadow Impacts

As discussed in greater detail in Section 4.2, the Project will result in some new shadow. 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, summer solstice, autumnal equinox and winter solstice. Shadow studies were also conducted for the 6:00 p.m. time period during the summer solstice and autumnal equinox. The 14 time periods studied show that impact of new shadows is generally limited to nearby streets and sidewalks.

New shadow will be cast within the Lower Roxbury Historic District at 9:00 a.m. on March 21, June 21, September 21, and December 21. During this time shadow will be focused on the intersection of Columbus Avenue and Coventry Street; northwest of the Project site. New shadow will also be cast within the district at 6:00 p.m. on June 21, 3:00 p.m. on March 21, 12:00 p.m. on December 21. During these time periods the new shadow will be focused on the intersection of Columbus Avenue and Coventry Street, as well as on the intersection of Coventry Street and Tremont Street, southwest of the Project site. Impacts will be mainly limited to the rooftops of late 19th century apartment houses on the southern side of Columbus Avenue.

New shadow will be cast within the Frederick Douglas Square Historic District at 6:00 p.m. on June 21; this shadow will be centered on the intersection of Tremont Street, Cabot Street and Hammond Street, southeast of the Project site. Within this district shadows will be limited to the rooftops of late 19-century single family dwellings and apartment buildings.

7.5 Status of Project Review with Historical Agencies

Massachusetts Historical Commission

The Proponent does not anticipate that the Project will require any state or federal licenses, permits or approvals, and does not anticipate utilizing any state or federal funds. Therefore, review by the Massachusetts Historical Commission (MHC) is not anticipated at this time. In the event that state or federal licenses, permits, approvals or funding is involved, the Proponent will file an MHC Project notification form to initiate review of the Project.

Section 8.0

Infrastructure

8.0 INFRASTRUCTURE

This chapter of the DPIR outlines the existing utilities surrounding the Project site, the proposed connections required to provide service to the new structure, and any impacts on the existing utility systems that may result from the construction of the Project. The following utility systems are discussed herein:

- Sewer
- Domestic water
- Fire protection
- Stormwater

The Project includes the development of an existing parking lot into a building dedicated mainly to student residential use, as well as first floor commercial space and student amenities and services. The Project site is bounded by Burke Street to the east, Columbus Avenue to the north, Coventry Street to the west, and an existing building to the south of the site.

8.1 Wastewater

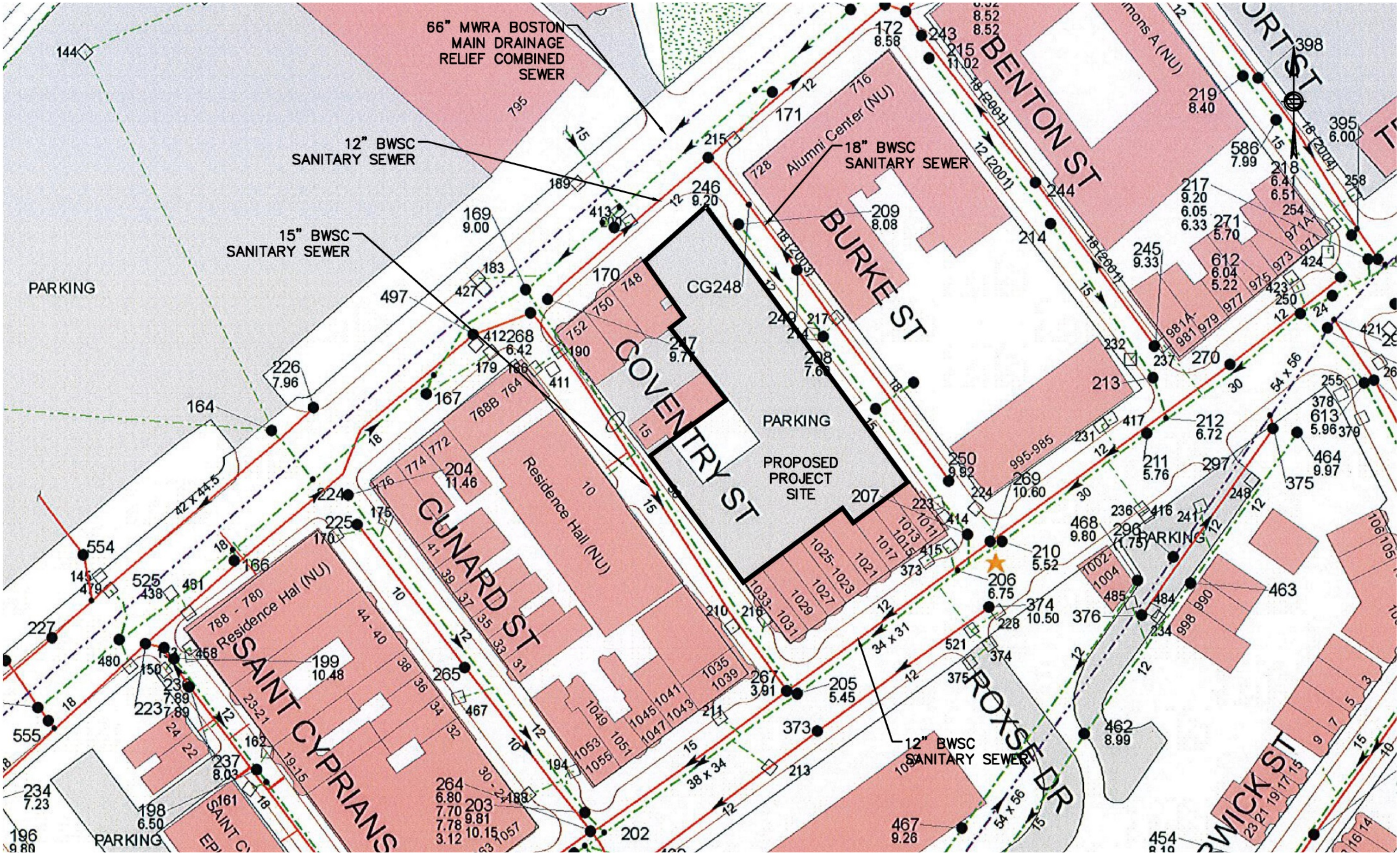
8.1.1 Existing Sewer System

The Project site is a parking lot; there are currently no sewer services. The existing sewer system is illustrated in Figure 8-1.

There are existing Boston Water and Sewer Commission (BWSC) sanitary sewer mains located in Columbus Avenue, Burke Street, and Coventry Street adjacent to the Project site. There is a 66-inch Massachusetts Water Resources Authority (MWRA) Boston Main Drainage Relief Sewer located in Columbus Avenue which flows in a southwesterly direction. Also beneath Columbus Avenue, there is a 12-inch sewer main which flows in a northeasterly direction. Beneath Burke Street, there begins an 18-inch sewer main which flows in a northwesterly direction to connect to the 12-inch sewer main beneath Columbus Avenue. Beneath Coventry Street, there is a 15-inch sewer main which flows from the Columbus Avenue main in a southeasterly direction to the 15-inch main in Tremont Street. All sanitary sewage from the Project site will ultimately be directed to the Deer Island Waste Water Treatment Plant.

8.1.2 Project-Generated Sanitary Sewer Flow

The Project's sewage generation rates were estimated using the Massachusetts State Environmental Code Regulating Septic Systems ("Title 5") at 310 CMR 15.00. 310 CMR 15.00 lists typical generation values for the sources listed in Table 8-1 for the Project. Typical generation values are generally conservative values for estimating the sewage flows



Columbus Avenue Student Housing   **Boston, Massachusetts**

Figure 8-1

Existing Sewer System

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from new construction. 310 CMR 15.00 sewage generation values are used to evaluate new sewage flows or the increase in flows to existing connections. Table 8-1 describes the increased sewage generation due to the Project.

Table 8-1 Proposed Sewer Flow Estimation

Room Use	*GSF*	*Size*		*310 CMR Value (gpd/unit)*		*Total Flow (gpd)*
Dormitory	800 people	800	people	65	/person	52,000
Retail	3,000 sf	3,000	sf	50	/1000 sq. ft. (min. 200 gpd)	200
					Proposed Sewer Flows (gpd):	52,200

Note: Average sewer flows taken from 310 CMR 15.0, Section 2.03

8.1.3 Sanitary Sewer Connection

The Project's impact to the existing BWSC sewer systems in Burke Street, Coventry Street, and Columbus Avenue was analyzed. The existing sewer system capacity calculations are presented in Table 8-2.

Table 8-2 Sewer Hydraulic Capacity Analysis

Manhole (BWSC Number)	*Distance (ft)*	*Invert Elevation (Up)*	*Invert Elevation (Down)*	*Slope (%)*	*Diameter (inches)*	*Manning's Number*	*Flow Capacity (cfs)*	*Flow Capacity (MGD)*
250 to 246	285	9.92	9.20	0.3%	18	0.013	5.28	3.41
247 to 246	151	9.77	9.20	0.4%	12	0.013	2.19	1.41
268 to 267	319	6.42	3.91	0.8%	15	0.013	5.73	3.70

Note:
1. Manhole numbers taken from BWSC Sewer System Maps
2. Flow calculations based on Manning's Equation
3. All pipes assumed to be vitrified clay, to be conservative

Sewer services for the Project are expected to tie into the 18-inch main under Burke Street (between manholes 250 and 246). Sewer services are also proposed to tie into the 15-inch main under Coventry Street (between manholes 268 and 267).

Table 8-2 shows that the minimum flow capacity of the surrounding sanitary sewers is 1.41 million gallons per day (MGD). With a factor of safety of 10, the expected flow from the Project is 0.52 MGD, which is less than the flow capacity. Therefore, no capacity problems are expected within either the Burke Street/Columbus Avenue system or Coventry Street/Tremont Street system.

This Project will result in a net increase in flows of greater than 15,000 gpd and will therefore be required to contribute an Inflow and Infiltration fee to BWSC. All improvements and connections to BWSC infrastructure will be reviewed as part of the

BWSC's site plan review process for the Project. This process includes a comprehensive design review of the proposed service connections, an assessment of Project demands and system capacity, and the establishment of service accounts.

8.2 Water System

8.2.1 Existing Water Service

The existing site is a parking lot; there are currently no domestic water or fire protection services. The existing water system is illustrated in Figure 8-2.

Water for the Project site is provided by the BWSC. There are five different water systems within the City, and these provide service to portions of the City based on ground surface elevation. The five systems are Southern Low (commonly known as low service), Southern High (commonly known as high service), Southern Extra High, Northern Low, and Northern High. There are a 12-inch BWSC Southern Low main, an 8-inch BWSC Southern Low main, and 30-inch Southern High main beneath Columbus Avenue. There are a 12-inch BWSC Southern Low main beneath Coventry Street, a 12-inch BWSC Southern Low main and a 12-inch BWSC Southern High main beneath Tremont Street, and an 8-inch BWSC Southern Low main and an 8-inch BWSC Southern High main beneath Burke Street.

Hydrant flow data will be requested from BWSC. Additional tests will be requested as necessary.

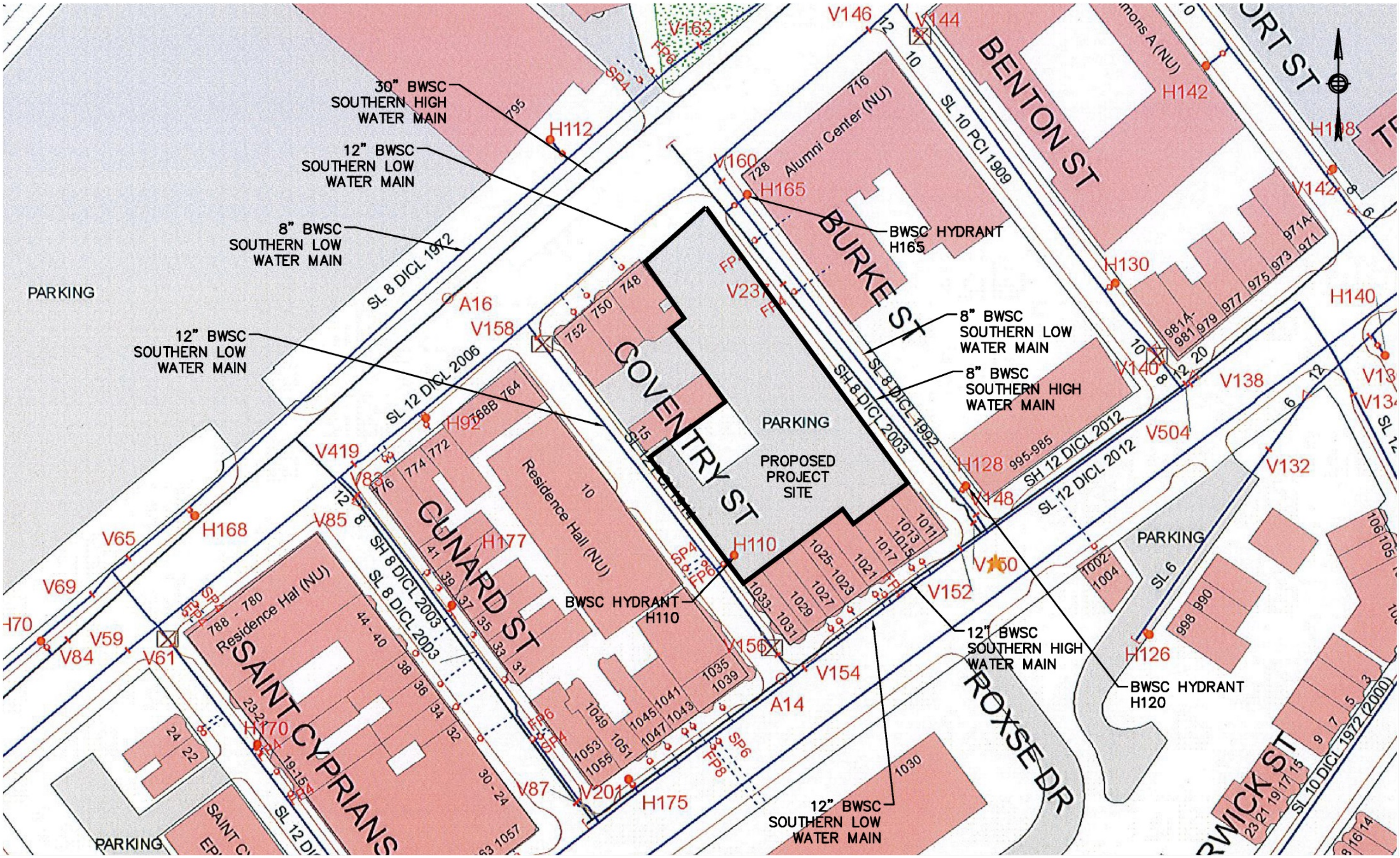
8.2.2 Anticipated Water Consumption

The Project's water demand estimate for domestic services is based on the Project's estimated sewage generation, described above. A conservative factor of 1.1 (10%) is applied to the estimated average daily wastewater flows calculated with 315 CMR 15.00 values to account for consumption, system losses and other usages to estimate an average daily water demand. The Project will require approximately 57,420 gpd of domestic water. The water for the Project will be supplied by the BWSC system.

8.2.3 Proposed Water Service

Domestic services for the Project are proposed to connect to either the 12-inch Southern Low main beneath Coventry Street and the 8-inch Southern Low main beneath Burke Street, or the 12-inch Southern Low main beneath Columbus Avenue.

Two fire protection services are required for the Project. These services must connect to a BWSC Southern High main. Fire protection services will connect to either the 8-inch Southern High main beneath Burke Street or the 30-inch Southern High main beneath Columbus Avenue. Gate valves will be installed as necessary to provide the separation between the services. If required, the 8-inch BWSC Southern High main in Burke Street will be extended to connect to the 30-inch Southern High main in Columbus Avenue.



Columbus Avenue Student Housing Boston, Massachusetts

Figure 8-2

Existing Water System

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The domestic and fire protection water service connections required by the Project will meet the applicable City and State codes and standards, including cross-connection backflow prevention. Compliance with the standards for the domestic water system service connection will be reviewed as part of BWSC's Site Plan Review Process. This review includes, but is not limited to, sizing of domestic water and fire protection services, calculation of meter sizing, backflow prevention design, and location of hydrants and siamese connections that conform to BWSC and Boston Fire Department requirements.

8.2.4 Water Supply Conservation and Mitigation Measures

The State Building Code requires the use of water-conserving fixtures. Water conservation measures such as low-flow toilets and restricted flow faucets will help reduce the domestic water demand on the existing distribution system. Aeration fixtures and appliances will be chosen for water conservation qualities. In public areas, sensor operated faucets and toilets will be installed.

All new water services will be installed in accordance with the latest Local, State, and Federal codes and standards. Backflow preventers will be installed at both domestic and fire protection service connections. New meters will be installed with Meter Transmitter Units (MTU's) as part of the Boston Water and Sewer Commission's Automatic Meter Reading (AMR) system.

8.3 Stormwater

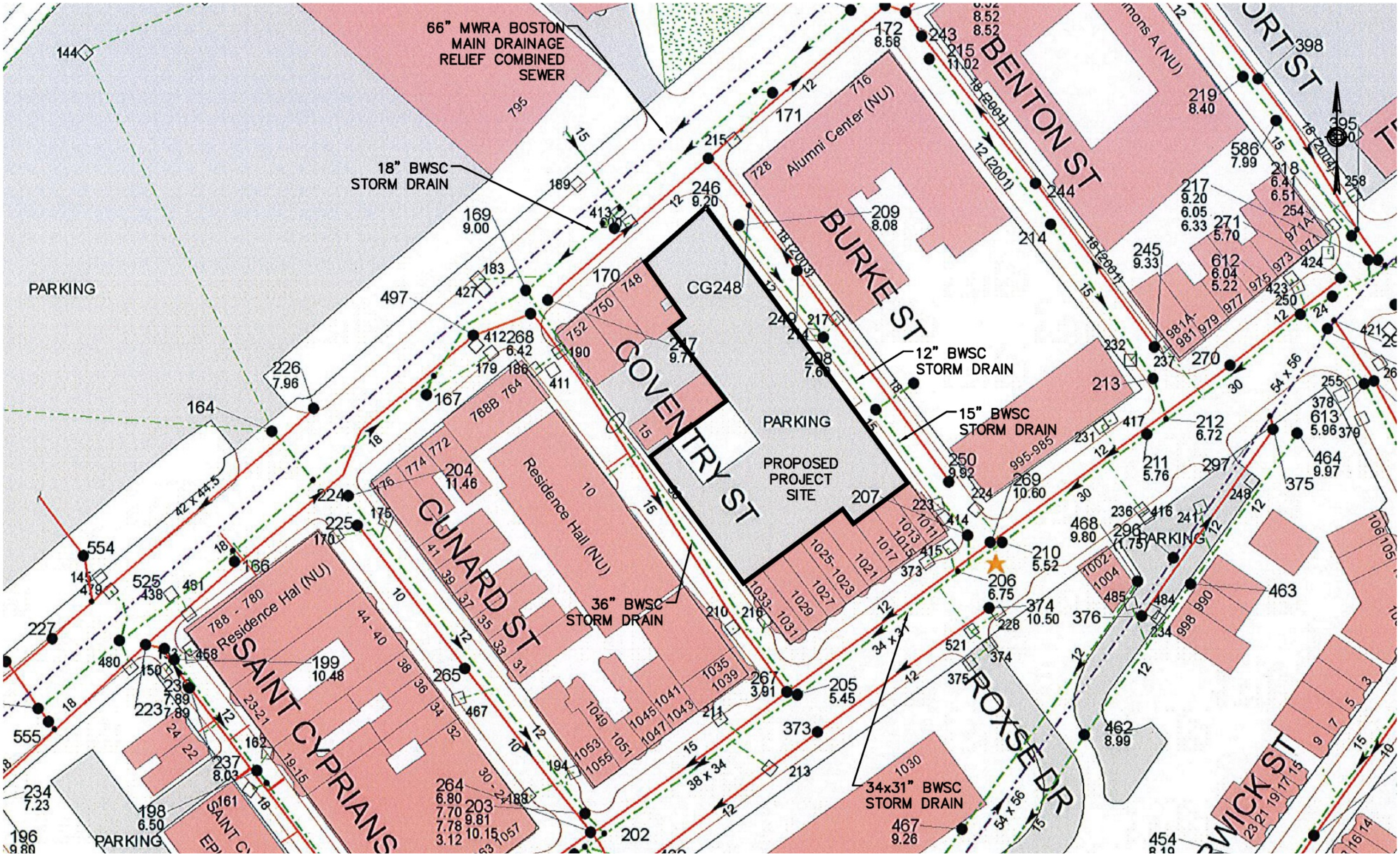
8.3.1 Existing Stormwater System

There is an 18-inch BWSC storm drain which flows in a southwesterly direction beneath Columbus Avenue. Beneath Burke Street, there begins a 12-inch to 15-inch BWSC storm drain which flows in a southeasterly direction. There is a 36-inch BWSC storm drain beneath Coventry Street which flows in a southeasterly direction to connect to the 34x31-inch BWSC storm drain beneath Tremont Street. As described above, there is a 66-inch MWRA Boston Main Drainage Relief Sewer located in Columbus Avenue.

The existing stormwater system is illustrated in Figure 8-3.

8.3.2 Proposed Stormwater System

The site is currently a parking lot and is completely impervious; the Project will also have 100% impervious ground cover. The site is not within the Groundwater Conservation Overlay District; however, the BWSC-required one inch of rainwater will likely be recharged through recharge wells in the sidewalk. These wells will be permitted through the Public Improvement Commission.



Columbus Avenue Student Housing **Boston, Massachusetts**

Figure 8-3

Existing Stormwater System

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

All necessary dewatering will be conducted in accordance with applicable MWRA and BWSC discharge permits. Once construction is complete, the Project will be in compliance with all local and state stormwater management policies. See below for additional information.

8.3.3 DEP Stormwater Management Policy Standards

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

A brief explanation of each Policy Standard and the system compliance is provided below:

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

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

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

Compliance: The proposed design will comply with this Standard. The existing discharge rate will be met or decreased as a result of the improvements associated with the Project.

Standard #3: Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.

Compliance: The Project will comply with this Standard to the maximum extent practicable.

Standard #4: For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when: Suitable nonstructural practices for source control and pollution prevention are implemented; Stormwater management best management practices (BMPs) are sized to capture the prescribed runoff volume; and Stormwater management BMPs are maintained as designed.

Compliance: The proposed design will comply with this Standard. Within the Project's limit of work, there will be mostly roof and pedestrian areas. Any paved areas that would contribute unwanted sediments or pollutants to the existing storm drain system will be collected by deep sump, hooded catch basins and conveyed through water quality units before discharging into the BWSC system.

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

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

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

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

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

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

Standard #8: Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities.

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

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

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

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

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

8.4 Electrical Service

The site is supplied electricity from Eversource Energy. The Proponent will work with Eversource to confirm adequate system capacity as the design is finalized.

8.5 Natural Gas

National Grid has gas services in the vicinity of the Project site. The Proponent will work with National Grid to confirm adequate system capacity as design is finalized.

8.6 Telecommunications Systems

Telecommunication services for the site are supplied by Verizon. The Proponent will internally work to provide service for the Project and will work with Verizon as needed.

8.7 Utility Protection During Construction

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

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

Section 9.0

Coordination with other Governmental Agencies

9.0 COORDINATION WITH OTHER GOVERNMENTAL AGENCIES

9.1 Architectural Access Board Requirements

The Project will comply with the requirements of the Massachusetts Architectural Access Board and will be designated to comply with the standards of the Americans with Disabilities Act. See Appendix F for the Accessibility Checklist.

9.2 Massachusetts Environmental Policy Act (MEPA)

The Proponent does not expect that the Project will 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, state funding or involve any state land transfers.

9.3 Massachusetts Historical Commission

The Proponent does not anticipate that the Project will require any state or federal licenses, permits or approvals, and does not anticipate utilizing any state or federal funds. Therefore, review by the Massachusetts Historical Commission (MHC) is not anticipated at this time. In the event that state or federal licenses, permits, approvals or funding is involved, the Proponent will file an MHC Project Notification Form to initiate review of the Project.

9.4 Boston Civic Design Commission

The Project will comply with the provisions of Article 28 of the Boston Zoning Code. The Project was presented to the Boston Civic Design Commission on March 1, 2016 as part of the Article 80 process. The Project was referred to subcommittee for further review and is currently working through that process.

Section 10

Response to Comments

10.0 RESPONSE TO COMMENTS

This chapter provides responses to the BRA Scoping Determination and the associated comment letters that were received on the IMPNF/PNF filed with the BRA on January 21, 2016. The comment letters have been annotated and individual comments coded in the right-hand margin. Responses to the comments follow each individual letter and can be matched using the comment code numbers. Comment letters were received from the following agencies and organizations.

- Boston Redevelopment Authority Scoping Determination
- Interagency Green Building Committee
- Katie Pedersen (BRA)
- Boston Water and Sewer Commission
- Boston Transportation Department
- Fenway Community Development Corporation
- Fenway Civic Association
- Mission Hill Neighborhood Housing Services
- Carol Blair
- Melvin King
- Alison Pultinas
- Stephen Wuycheck

Boston Redevelopment Authority

Boston's Planning & Economic Development Office

Martin J. Walsh, *Mayor*
Timothy J. Burke, *Chairman*
Brian P. Golden, *Director*

One City Hall Square
Boston, MA 02201-1007
Tel 617·722·4300
Fax 617·248·1937

March 11, 2016

Mr. John Tobin
Vice President
City and Community Affairs
Northeastern University
360 Huntington Avenue
Boston, MA 02115

Re: **Scoping Determination for the proposed First Amendment to the Northeastern University Institutional Master Plan and Proposed Columbus Avenue Student Housing Project**

Dear Mr. Tobin:

Please find enclosed the Scoping Determination for the proposed First Amendment to the Northeastern University Institutional Master Plan and Proposed Columbus Avenue Student Housing Project. The Scoping Determination describes information required by the Boston Redevelopment Authority in response to the Institutional Master Plan Notification Form/Project Notification Form ("IMPNF/PNF"), which was submitted under Article 80D and Article 80B of the Boston Zoning Code on January 21, 2016 by Northeastern University and American Campus Communities. Additional information may be required during the course of the review of the proposals.

If you have any questions regarding the Scoping Determination or the review process, please contact me at (617) 918-4425.

Sincerely,

Katelyn Sullivan
Senior Project Manager

CC: Jason Wills, American Campus Communities
Jonathan Greeley, BRA
Jerome Smith, Mayor's Office of Neighborhood Services

BOSTON REDEVELOPMENT AUTHORITY

SCOPING DETERMINATION

FOR

THE NORTHEASTERN UNIVERSITY
FIRST INSTITUTIONAL MASTER PLAN AMENDMENT/ DRAFT PROJECT IMPACT REPORT
COLUMBUS AVENUE STUDENT HOUSING PROJECT

PREAMBLE

On January 21, 2016, Northeastern University ("Northeastern") and American Campus Communities ("ACC") submitted to the Boston Redevelopment Authority ("BRA") an Institutional Master Plan Notification Form/ Project Notification Form ("IMPNF/PNF") seeking an amendment to the Northeastern Institutional Master Plan (" IMP Amendment") and detailing the Columbus Avenue Student Housing Project totaling approximately 310,000 square feet containing approximately 800 to be located at 10 Burke Street ("Proposed Project").

The BRA will review the proposed IMP Amendment and Draft Project Impact Report ("DPIR") pursuant to Sections 80D and 80B of the Boston Zoning Code ("Code"). As part of the BRA's Article 80 review, Northeastern and ACC are required to prepare and submit to the BRA a proposed IMP Amendment pursuant to Section 80D and a proposed Draft Project Impact Report pursuant to Section 80B. The document/s must set forth in sufficient detail the planning framework of the institution and the cumulative impacts of the Proposed Project included in the IMP Amendment to allow the BRA to make a determination about the merits of the proposed IMP Amendment and Proposed Project. The proposed IMP Amendment and Draft Project Impact Report shall contain the information necessary to meet the specifications of Article 80 as well as any additional information requested below.

Copies of the IMPNF/PNF were made available to the public in both electric and hard copy format. A scoping session was held on February 8, 2016 with public agencies and a Task Force/Public meeting was held on February 23, 2016 at which the Proposed Project was presented. The comment deadline for the IMPNF/PNF was March 1, 2016.

Based on review of the IMPNF/PNF, related comments, as well as a scoping session and public meeting, the BRA hereby issues its written Scoping Determination ("Scope") pursuant to Section 80D and Section 80B the Code. Northeastern is requested to respond to the specific elements outlined in this Scope. <u>Written comments constitute an integral part of the Scoping Determination and should be responded to in the IMP Amendment, Draft Project Impact Report or in another appropriate manner over the course of the review process.</u> At other points during the public review of the IMP Amendment and Draft Project Impact Report, the BRA and other

City agencies may require additional information to assist in the review of the Proposed IMP Amendment and Draft Project Impact Report.

To facilitate the preparation and review of the two documents referenced above, the Scope contains two discrete sections, one setting forth the submission requirements for the IMP Amendment, and another setting forth the submission requirements for the DPIR. When appropriate, information requested in one section may be provided in the submission that responds to the other section.

In addition to the specific submission requirements outlined in the sections below, the following general issues should be noted:

- The City of Boston views its academic institutions as important economic and cultural assets and as valuable partners in a wide range of public policy priorities. However, while the benefits of Boston's academic institutions are felt across the city and even regionally, nationally, and globally, the negative impacts are generally limited to the immediate neighborhood. This dictates that both the BRA and academic institutions work to carefully balance the goals of vibrant institutions and healthy neighborhoods.
- It is the City's policy to encourage colleges and universities to expand their on-campus housing facilities for their students so that there is a decreasing use of private housing market resources in Boston neighborhoods by students. The BRA applauds Northeastern for proposing housing that will further Mayor Walsh's policy which seeks to increase the number of students living in on campus housing rather than using scarce neighborhood housing resources.

SUBMISSION REQUIREMENTS

FOR THE

NORTHEASTERN IMP AMENDMENT

The Scope requests information required by the BRA for its review of the proposed IMP Amendment in connection with the following:

1. Approval of the Northeastern IMP Amendment pursuant to Article 80D and other applicable sections of the Code.

2. Recommendation to the Zoning Commission for approval of the Northeastern IMP Amendment.

The Northeastern IMP Amendment should be documented in a report of appropriate dimensions and in presentation materials which support the review and discussion of the IMP Amendment at public meetings. Ten (10) hard copies of the full report should be submitted to the BRA, in addition to an electronic version in .pdf format. Hard copies of the document should also be available for distribution to the Northeastern Task Force, community groups, and other interested parties in support of the public review process. The IMP Amendment should include a copy of this Scoping Determination. The IMP Amendment should include the following elements:

1. MISSION AND OBJECTIVES

- **Organizational Mission and Objectives.** Define Northeastern's institutional mission and objectives, and describe how the development contemplated or proposed in the IMP Amendment advances the stated mission and objectives. In particular, the IMP Amendment should address Northeastern's intentions related to enrollment and how the Proposed Project and Proposed Future Projects play into percentage of students housed on campus and how this is tracked. **BRA 1**

- **Major Programs and Initiatives.** Update any major academic programs or initiatives that will drive academic and physical planning in the future. Included in the description should be current and future trends that are impacting Northeastern and shaping program objectives. **BRA 2**

2. EXISTING PROPERTY AND USES

The IMP Amendment should present applicable updated maps, tables, narratives, and site plans clearly providing the following information:

- **Owned and Leased Properties.** Provide an updated inventory of land, buildings, and other structures in the City of Boston owned or leased by Northeastern as of the date of submission of the IMP Amendment, with the following information for each property. **BRA 3**

- Illustrative site plans showing the footprints of each building and structure, together with roads, sidewalks, parking, and other significant improvements.
- Land and building uses.
- Building gross square footage and, when appropriate, number of dormitory beds or parking spaces.
- Building height in stories and, approximately, in feet, including mechanical penthouses.
- Tenure (owned or leased by Northeastern).

3. CAMPUS DEMOGRAPHICS

- **Student Population.** The IMP Amendment should provide a thorough explanation future projections of the size and other characteristics of Northeastern's student body. These data should be referenced as appropriate in other sections, e.g. the Student Housing Plan should make clear the relationship between student population and student housing goals, including targets for percentage of students housed and how enrollment is tracked. The IMP Amendment should include an explanation of Northeastern's target student enrollments for five years and 10 years in the future. **BRA 4**
- **Employment.** Provide any updates to Northeastern's current employee population, disaggregated by faculty/staff, full-time/part-time, Boston residents/non-residents, as well as projected employment over the term of the IMP, given targeted levels of growth in the student body. **BRA 5**

4. PROPOSED PROJECT

Article 80D Requirements. Pursuant to Article 80D, the IMP Amendment should provide the following information for the Proposed Project: **BRA 6**

- Site location and approximate building footprint.
- Uses (specifying the principal subuses of each land area, building, or structure, such as classroom, laboratory, parking facility).
- Square feet of gross floor area.
- Square feet of gross floor area eliminated from existing buildings through demolition of existing facilities.
- Floor area ratio.
- Building height in stories and feet, including mechanical penthouses.
- Parking areas or facilities to be provided in connection with Proposed Projects;
- Any applicable urban renewal plans, land disposition agreements, or the like.
- Current zoning of site.
- Total project cost estimates.
- Estimated development impact payments.
- Approximate timetable for development of proposed institutional project, with the estimated month and year of construction start and construction completion for each.

Rationale for Proposed Project. Discuss the rationale for the program and location of proposed buildings in light of discussions on mission, facilities needs, and campus planning objectives. Discuss the rationale for the scale of the proposed building. **BRA 7**

5. PLANNING FRAMEWORK

This section should discuss, at a minimum, the following:

- **Existing Context.** Describe Northeastern's place in the broader context of adjacent land uses, and the surrounding neighborhoods. Reference any City policies or plans that shape the planning context for the area and for Northeastern. **BRA 8**
- **Factors Driving Facilities Needs.** Provide any update since filing the IMP of current facilities utilization rates and Northeastern's ability to accommodate growth in its student body with existing facilities, by type of facility. **BRA 9**
- **Campus Vision and Identity.** Describe any updates to Northeastern's vision of its desired physical identity and, in general terms, strategies for achieving that identity. **BRA 10**
- **Overview of Urban Design Guidelines and Objectives.** Discuss any new or modified urban design guidelines and objectives that have emerged and strategies for implementing them in conjunction with the Proposed Project or in the future. **BRA 11**
- **Public Realm.** Discuss any updates to the existing public realm conditions (i.e. parks, plazas, streetscapes) in the vicinity of Northeastern facilities, regardless of ownership. Discuss key urban design and public realm goals and objectives proposed by Northeastern for the campus, with a focus on creating a high-quality interface between the campus and the surrounding neighborhoods and transit stations. **BRA 12**
- **Pedestrian Circulation Goals and Guidelines.** Provide a statement of goals and guidelines for pedestrian circulation both within and through Norheastern's campus and in relation to the Proposed Project. **BRA 13**

6. STUDENT HOUSING PLAN UPDATE

The IMP Amendment should provide any updates that address both the requirements set forth in Article 80D, which are reproduced below, and the additional requirements set forth in this section.

- **Article 80 Student Housing Plan Requirements.** Pursuant to Article 80D, the IMP Amendment should address or update the following: **BRA 14**

  - The number of full-time undergraduate and graduate students living in housing facilities owned or operated by the Institution, including a breakdown by type of degree of program (undergraduate or graduate) and type of housing facility (dormitory, apartment, or cooperative housing facility).
  - The number of housing units owned or operated by the Institution, by type of housing facility (dormitory, apartment or cooperative housing facility).
  - Any housing requirements or restrictions the Institution places on its students (e.g. eligibility for on-campus housing, requirement to live on campus).
  - The process by which the Institution directs its students to housing facilities.
  - The Institution's short-term and long-term plans for housing its undergraduate and graduate students on-campus and off–campus.
  - Impacts of the Institution's student housing demand on housing supply and rental market rates in the surrounding neighborhoods, including those neighborhoods adjacent to the Institution's campus and other neighborhoods where the Institution's students are concentrated.

- A plan for mitigating the impacts of the Institution's student housing demand on surrounding neighborhoods.
- **Other.** Describe existing supervision and disciplinary procedures in dormitories, as well as policies related to student behavior generally and for the Proposed Project. Detail the Northeastern and ACC's plans for filing beds in the Proposed Project including number/percentage of students anticipated from other colleges and universities to be housed.

7. TRANSPORTATION AND PARKING MANAGEMENT / MITIGATION PLAN

The following submission requirements relate to the proposed IMP Amendment; the DPIR will be required to present more specific information on the transportation impacts of the Proposed Project. In addition to the submissions detailed in this Scope, Northeastern should continue to work closely with the Boston Transportation Department ("BTD") to outline an appropriate scope for studying and mitigating any transportation impact of the Proposed Project.

- **Existing Conditions.** Provide any updates to Northeastern's existing transportation and parking characteristics, including data on mode share for employees and students, parking spaces owned and operated by Northeastern, and policies regarding student and employee parking, transportation demand management measures in place, etc. **BRA 15**
- **Impact of New Project.** Discuss the impact of the Proposed Project on parking demand and supply. **BRA 16**
- **Student Auto Ownership, Use, and Parking.** Describe Northeastern's current policies with regard to student ownership and use of automobiles, including the eligibility of students living in dormitories to obtain resident parking permits and any measures to enforce existing regulations. **BRA 17**
- **Move-In/Move-Out Traffic Management Procedures.** Describe Northeastern's current procedures for managing traffic and parking impact generated by students moving into and out of dormitories, and any proposed changes to those procedures. This information may be consolidated with the Move-In/Move-Out Plan required as part of the DPIR. **BRA 18**
- **Bicycle Transportation.** Given the proposed addition of a significant number of new residents to the campus, the IMP Amendment should discuss the adequacy of Northeastern's existing bicycle storage facilities and the facilities to be in included in the Proposed Project or elsewhere on campus. **BRA 19**

8. ECONOMIC DEVELOPMENT

The IMP Amendment should address the following topics:

- **Employment and Workforce Development.** Provide any updates to existing and proposed programs to train and hire Boston residents for Northeastern jobs. **BRA 20**

9. COMMUNITY BENEFITS PLAN

The IMP Amendment should describe any updates to Northeastern's Community Benefits Plan since the approval of the IMP and in relation to the Proposed Project. Describe how Northeastern **BRA 21** plans to apply the commitments in the Jobs and Procurement section of the Cooperation Agreement to the Proposed Project including the commitment to increase business with SLBEs to 20% of its discretionary spending and W/MBEs to 12% of discretionary spending within 10 years and the commitment to direct 30% of major design/construction spending in the Northeastern IMP to MBEs and 10% to WBEs. Additionally, discuss the on-campus business siting commitment and opportunities for the Proposed Project.

10. ENVIRONMENTAL SUSTAINABILITY

The City of Boston expects a high level of commitment to principles of sustainable development from all developers and institutions. Northeastern's campus expansion provides exciting opportunities for innovation and excellence not only in individual buildings, but across the campus as a whole. Northeastern will be expected to work with the BRA, the City of Boston Environment Department, and others to set and meet ambitious environmental sustainability goals in the design of the Proposed Project. The IMP Amendment should present as much information as possible on the topics below, with the understanding that not all of them may be relevant at this current time. Additional topics related to sustainability are included in the DPIR Scope for the Proposed Project.

- **Existing Sustainability Measures.** Update if applicable Northeastern's existing sustainability measures at the building and campus-wide level, including but not limited to energy, stormwater, solid waste, transportation, and infrastructure and utilities. Explain the administrative structure for making decisions about and promoting innovation in the area of building a sustainable campus. Describe any formal goals or principles that Northeastern has adopted in the area of sustainability since the approval of the IMP. **BRA 22**
- **Green Building.** New campus buildings should achieve a superior level of performance in the areas of materials and resources (recycled content, construction waste management, local/regional materials), energy (energy performance, renewable energy), water management (water efficiency, stormwater management, graywater and stormwater recycling, etc.), indoor environmental quality, and other standard performance areas of high-performance or "green" buildings. Whenever possible, buildings should achieve a high level of certification through LEED or another appropriate system. **BRA 23**
- **Energy Use.** Future campus development should consider the impact of new buildings on the existing heating and cooling infrastructure. Reducing the current energy use of existing buildings should be addressed prior to expanding or building new power plants. Planning should consider the possible benefits of localized heating and cooling systems within a section of the campus or within an individual building, allowing for alternative energy sources to be easily explored. **BRA 24**
- **Water Use.** Future campus development should incorporate water use, conservation, and rainwater harvesting strategies at a campus level. New construction allows opportunities for storage systems to be installed for use by the new and adjacent buildings. Collected water can be used for flushing, HVAC make-up water, and irrigation. **BRA 25**
- **Stormwater Retention/Treatment/Reuse and Groundwater Recharge.** Northeastern's development should go beyond the minimum requirements related to stormwater runoff. In particular, the new developments proposed as part of this IMP Amendment should set a goal of reducing stormwater discharge from the sites into the storm sewers, not simply avoiding any additional runoff. This goal should be considered in conjunction with strategies for reuse of retained stormwater and strategies for groundwater **BRA 26**

recharge. Individual building design, site design, and street-level interventions should all maximize the opportunities for stormwater retention, treatment, and reuse, as well as groundwater recharge, through innovative approaches. To the extent possible, the systems put in place should strive to work with the natural hydrology of the area.

- **Solid Waste.** Campus master planning should set the goal of reducing the level of solid waste generation in both the construction and operation of buildings. **BRA 27**

11. OTHER

- **Public Notice.** Northeastern will be responsible for preparing and publishing in one or more newspapers of general circulation in the city of Boston a Public Notice of the submission of the IMP Amendment to the BRA as required by Section 80A-2. This Notice shall be published within five (5) days after the receipt of the IMP Amendment by the BRA. In accordance with Article 80, public comments on the IMP Amendment shall be transmitted to the BRA within sixty (60) days of the publication of this notice. A sample form of the Public Notice is attached as Appendix 3. Following publication of the Public Notice, Northeastern shall submit to the BRA a copy of the published Notice together with the date of publication. **BRA 28**

SUBMISSION REQUIREMENTS

FOR

NORHEASTERN COLLEGE

COLUMBUS AVENUE STUDENT HOUSING PROJECT

The Scope requests information required by the BRA for its review of the Proposed Projects in connection with the following:

1. Certification of Compliance and approval of the Proposed Project pursuant to Article 80, Section 80B of the Code.

2. Certification of Consistency with the Northeastern Institutional Master Plan pursuant to Article 80, Section 80D-10 of the Code.

The requirements below apply to the Draft Project Impact Reports (DPIRs) for the Proposed Project.

Subsequent to the end of the forty-five (45) day public comment period on the DPIR, the BRA will issue a Preliminary Adequacy Determination ("PAD") that indicates the additional steps necessary for Northeastern to satisfy the requirements of the Scoping Determination and all applicable sections of Article 80 of the Code. If the BRA finds that the DPIRs adequately describe the Proposed Projects' impacts and, if appropriate, propose satisfactory measures to mitigate, limit or minimize such impacts, the PAD will announce such a determination and that the requirements for the filing and review of a Final Project Impact Report ("FPIR") are waived pursuant to Section 80B-5.4(c)(iv) of the Code. Before reaching said findings, the BRA shall hold a public hearing pursuant to Article 80 of the Code. Sections 80B-6 and 80D-10 require the Director of the BRA to issue a Certification of Compliance and a Certification of Consistency, respectively, before the Commissioner of Inspectional Services can issue any building permit for the Proposed Project.

The DPIR may be consolidated with the IMP Amendment. In addition to full-size scale drawings, ten (10) hard copies of the full bound report should be submitted to the BRA, in addition to an electronic version in .pdf format. Hard copies of the document should be available for distribution to the Northeastern Task Force, community groups, and other interested parties in support of the public review process. The report should contain all submission materials reduced to size 8-1/2"x11", except where otherwise specified, and should be printed on both sides of the page. A copy of this Scoping Determination must be included in the report submitted for review.

The DPIR should include the following elements.

1. GENERAL INFORMATION

- **Applicant/Proponent Information.** Pursuant to Article 80B, the DPIR should provide the following information:

  - Development Team BRA 29

    - Names of developer(s), including description of development entity(ies), attorney, project consultants and architects.
    - Business address, telephone number, fax number and e-mail, where available, for each.
    - Designated contact for each.

  - Legal Information BRA 30

    - Legal judgments or actions pending concerning the Proposed Project
    - History of tax arrears on property owned in Boston by Applicant.
    - Evidence of site control over project area, including current ownership and purchase options of all parcels in the Proposed Project, all restrictive covenants and contractual restrictions affecting the Proponent's right or ability to accomplish the Proposed Project, and the nature of the agreements for securing parcels not owned by the Applicant.
    - Nature and extent of any and all public easements into, through, or surrounding the site.

- **Disclosure of Beneficial Interests.** Disclosure of Beneficial Interests in the Proposed Project must be provided pursuant to Section 80B-8 of the Boston Zoning Code. BRA 31
- **Regulatory Controls and Permits.** The DPIR shall include an up-to-date listing of all anticipated permits or approvals required from other municipal, state or federal agencies, including a proposed application schedule. A statement on the applicability of the Massachusetts Environmental Policy Act ("MEPA") should be provided. If the Proposed Project is subject to MEPA, all required documentation should be provided to the BRA, including but not limited to, copies of the Environmental Notification Form, decisions of the Secretary of Environmental Affairs, and the proposed schedule for coordination with BRA procedure. BRA 32

2. PROJECT DESCRIPTION

- **Project Site.** The DPIR shall include a complete description of the Project Site including, at minimum, square footage of the site, a map indicating the boundaries, a legal description including metes and bounds, existing site conditions, and the surrounding development context, i.e. a description of the surrounding environment including the height, other dimensions, use, and other relevant characteristics of existing nearby buildings, as well as an inventory of surrounding proposed projects. Only projects that have completed or are currently undergoing Article 80 review should be included and should be included as proposed in their filings at the Boston Redevelopment Authority. The Project Site, as defined in the DPIR, must be utilized for each Project Description and for any calculations or comparisons. BRA 33
- **Project Description.** The DPIR shall contain a full description of the Proposed Project and any alternative(s) and their elements, including size, physical characteristics, FAR (utilizing BRA 34

the definition for calculation as provided for in the Boston Zoning Code), and proposed uses, including any uses planned or considered for all elements of the project during the summer months.

3. PROJECT ALTERNATIVES

The analyses as provided for in the Transportation Component, Environmental Protection Component, and Urban Design Component sections of this Scoping Determination, as well as any additional analysis specified by the BRA, shall be required for the following alternatives: **BRA 35**

- **Alternative 1.** No build as a means of measuring the baseline.
- **Alternative 2.** The Proposed Project as set forth in PNF or as modified via formal notification to the BRA in advance of submission of the DPIR.
- **Alternative 3.** Any additional alternative or alternatives defined by the BRA. As of the date of issuance of this Scope, the BRA does not intend to require analysis of any alternative but the two described above; however, the BRA reserves the right to extend the requirement of any and all elements of the analysis described herein to an additional alternative.

4. TRANSPORTATION COMPONENT

The DPIR shall include a detailed traffic and transportation analysis that examines the Proposed Project's impact on the transportation network and proposes measures intended to mitigate, limit, or minimize any adverse impact reasonably attributable to the Proposed Project. The scope of the analysis must utilize as its framework the Transportation Access Plan guidelines to be further defined in consultation with the Boston Transportation Department ("BTD"). Pursuant to Section 80B-3.1 of the Boston Zoning Code, this section of the DPIR should contain, at a minimum, the following elements. Additional questions and required submissions have been added to the baseline requirements of Article 80 based on concerns specific to the project and on comment letters. Not all items will apply to the Proposed Project. Please reach out to the Boston Transportation Department to discuss attached comment letter.

- **Traffic Management Element.** Northeastern shall work with BTD to identify applicable items of study: **BRA 36**

    - Identify the Proposed Project's impact on the transportation network from expected travel volumes, vehicle trip generation, and directional distribution; the location of loading and unloading activities, including service and delivery; the Proposed Project's impact on the vehicular and circulation systems within the impact area, including the number and type of vehicles, pedestrians, and bicyclists, vehicle occupancy rates (VOR), and the Proposed Project's impact on road corridors and intersection capacities, including Levels of Service and intersection delays from 6:00 a.m. to 8:00 p.m. and for any other times of day that significant activity is anticipated in the Proposed Project.
    - Inventory, map, and discuss on- and off-street loading, provide estimates of the level of loading and delivery activity, and describe in detail any special loading policies and procedures to be implemented.
    - Identify mitigation procedures that are intended to mitigate, limit, or minimize the number of vehicle trips generated by the development, and the Proposed Project's interference with the safe and orderly operation of the transportation network; such measures may

include an on-site traffic circulation plan, flexible employee work hours, dissemination of transit information, changes in traffic patterns, and full or partial subsidies for public mass transit.

- The DPIR shall describe Transportation Demand Management ("TDM") measures that are being considered for the Proposed Project.
- Review provisions for service and emergency vehicle access to the proposed dormitory building.

- **Parking Management Element.** Northeastern shall work with BTD to: **BRA 37**

  - Identify the location of proposed drop-off/pick-up, short-term parking, loading, and queuing for both autos and trucks. If no queuing area is available for trucks, identify steps to be taken to avoid negative impacts, referencing the projected frequency of delivery activity and any operational procedures to ensure that deliveries are adequately timed and spaced out.
  - Identify the demand created by the Proposed Project for tenant, commuter, and short- and long-term visitor parking; nontenant and other parking needs within the Impact Area; and evening and weekend parking needs
  - Include operational policies and strategies for the Proposed Project that address the location, cost, and number of public, private, high-occupancy vehicle, and special-needs parking demand; short-term and long-term space availability; pricing structure of parking rates; location and type of off-site parking; and methods of transporting people to the site from off-site parking;
  - Document parking impacts of the Proposed Project. Describe alternative off-street parking locations for displaced parkers as necessary.

- **Article 80 Construction Management Element.** The Construction Management Element shall, at a minimum: **BRA 38**

  - Identify the impact from the timing and routes of truck movement and construction deliveries for the Proposed Project; proposed street closings; and the need for employee parking.
  - Identify, and provide a plan for implementing, mitigation measures that are intended to mitigate, limit, or minimize, to the extent economically feasible, the construction impact of the Proposed Project by limiting the number of construction vehicle trips generated by the Proposed Project, the demand for construction-related parking (both on-site and off-site), and the interference of building construction with the safe and orderly operation of the Transportation Network, such measures to include the use of alternative modes of transport for employees and materials to and from the site; appropriate construction equipment, including use of a climbing crane; staggered hours for vehicular movement; traffic controllers to facilitate equipment and trucks entering and exiting the site; covered pedestrian walkways; alternative construction networks and construction planning; and restrictions of vehicular movement
  - Designate a liaison between the Proposed Project, public agencies, and the surrounding residential and business communities.

- **Move-In/Move-Out Plan.** The DPIR should describe the plan to limit the impact of a large number of residents moving into and out of the Proposed Project within the span of a few **BRA 39** days on both building residents and neighbors. The Move-In/Move-Out Plan shall address, at a minimum, the following:

- A description of the procedures used at Northeastern's existing dormitories to ensure orderly move-in and move-out with a minimum of disruption to the neighborhood, and the planned procedures for the Proposed Project. This should address, among other things, vehicular access and parking, use of loading docks, and handling of garbage.
- A statement of the peak move-in/move-out periods and an estimate of the number of move-ins/move-outs per day and over the course of the period as a whole, based on data from Northeastern's existing dormitories.
- A description and explanation of the adequacy of the Proposed Project's design features relevant to move-in and move-out capacity, in particular those features related to vehicular access, loading docks, elevator capacity, etc.

- **Pedestrian Analysis.** Address the adequacy of sidewalks and other pedestrian infrastructure in the area of the Proposed Projects and potential safety issues at pedestrian crossings. Propose improvements to facilitate pedestrian circulation to and around the Proposed Project and ways that development can improve the overall pedestrian circulation system of the campus. **BRA 40**
- **Mitigation.** Identify measures to mitigate any transportation impacts identified in the preceding sections. **BRA 41**

5. ENVIRONMENTAL PROTECTION COMPONENT

The DPIR shall contain an Environmental Protection Component as outlined below. Opportunities for sustainable design, as well as other issues, are described in the written comments from public agencies. These comments are included in Appendix 1 and are incorporated herein by reference and made a part hereof. The analyses as provided for in the Environmental Protection Component section of this Scoping Determination shall be required for each of the alternatives.

- **Wind.** A quantitative wind tunnel analysis of the potential pedestrian level wind impacts shall be required for the DPIR. This analysis shall determine potential pedestrian level winds adjacent to and in the vicinity of the project site and shall identify the projected annual wind speeds for each season at each location. Expected wind levels should be reported using the amended Melbourne scale. The DPIR shall identify any areas where wind velocities are expected to exceed acceptable levels, including the BRA's guideline of an effective gust velocity of 31 mph not to be exceeded more than 1% of the time. **BRA 42**

  Particular attention shall be given to areas of pedestrian use, including, but not limited to, the entrances to the proposed buildings and existing buildings in the vicinity of the Proposed Project, the sidewalks and walkways within and adjacent to the Proposed Project development and in the vicinity of the proposed development. Specific locations to be evaluated shall be determined in consultation with the BRA and the City of Boston Environment Department.

  For areas where wind speeds are projected to exceed acceptable levels, measures to reduce wind speeds and to mitigate potential adverse impact shall be identified and tested in the wind tunnel to quantify the expected benefit. Should the qualitative analysis indicate the possibility of excessive or unacceptable pedestrian level wind speeds, additional study may be required.

The wind tunnel testing shall be conducted in accordance with the following guidelines and criteria:

- Data shall be presented for both the existing (no-build) and for the future build scenario(s) (see above).
- The analysis shall include the mean velocity exceeded 1% of the time and the effective gust velocity exceeded 1% of the time. The effective gust velocity shall be computed as the hourly average velocity plus 1.5 x root mean square variation about the average. An alternative velocity analysis (e.g., equivalent average) may be presented with the approval of the Authority.
- Wind direction shall include the sixteen compass points. Data shall include the percent or probability of occurrence from each direction on seasonal and annual bases.
- Results of the wind tunnel testing shall be presented in miles per hour (mph).
- Velocities shall be measured at a scale equivalent to an average height of 4.5-5 feet.
- The model scale shall be such that it matches the simulated earth's boundary and shall include all buildings within at least 1,600 feet of the project site. All buildings taller than 25 stories and within 2,400 feet of the project site should be placed at the appropriate location upstream of the project site during the test. The model shall include all buildings recently completed, under construction, and planned within 1,500-2,000 feet of the project site. Prior to testing, the model shall be reviewed by the Authority. Photographs of the area model shall be included in the written report.
- The written report shall include an analysis which compares mean and effective gust velocities on annual and seasonal bases, for no-build and build conditions, and shall provide a descriptive analysis of the wind environment and impacts for each sensor point, including such items as the source of the winds, direction, seasonal variations, etc., as applicable. The report shall also include an analysis of the suitability of the locations for various activities (e.g., walking, sitting, standing, driving etc.) as appropriate, in accordance with Melbourne comfort categories.
- The report also shall include a description of the testing methodology and the model, and a description of the procedure used to calculate the wind velocities (including data reduction and wind climate data). Detailed technical information and data may be included in a technical appendix but should be summarized in the main report.
- The pedestrian level wind impact analysis report shall include, at a minimum, the following maps and tables:

    - Maps indicating the location of the wind impact sensors, for the existing (no-build) condition and future build scenario(s).
    - Maps indicating mean and effective gust wind speeds at each sensor location, for the existing (no-build) condition and each future build scenario, on an annual basis and seasonally. Dangerous and unacceptable locations shall be highlighted.
    - Maps indicating the suitability of each sensor location for various pedestrian-related activities (comfort categories), for the existing (no-build) condition and each future build scenario, on an annual basis and seasonally. To facilitate comparison, comfort categories may be distinguished through color coding or

other appropriate means. In any case, dangerous and unacceptable conditions shall be highlighted.

- Tables indicating mean and effective gust wind speeds and the comfort category at each sensor location, for the existing (no build) condition and for each future build scenario, on an annual basis and seasonally.
- Tables indicating the percentage of wind from each of the sixteen compass points at each sensor location, for the existing (no-build) condition and for each future build scenario, on an annual basis and seasonally.
- All maps should include a north arrow and be oriented and of the same scale as shadow diagrams.

- **Shadow.** A shadow analysis shall be required for existing and build conditions for the hours 9:00 a.m., 12:00 noon, and 3:00 p.m. for the vernal equinox, summer solstice, autumnal equinox, and winter solstice and for 6:00 p.m. during the summer and autumn. This analysis should use the same metrics as applied by Mass. DEP for Chapter 91 shadow analyses and include documentation of net new shadows lasting more than one hour. It should be noted that due to time differences (daylight savings vs. standard), the autumnal equinox shadows would not be the same as the vernal equinox shadows and therefore separate shadow studies are required for the vernal and autumnal equinoxes. Shadows shall be determined using the Boston Altitude and Azimuth data (Sun Altitude/Azimuth Table, Boston, Massachusetts). **BRA 43**

  The shadow impact analysis must include net new shadow as well as existing shadow. Diagrams must clearly show the incremental impact of the proposed new buildings. For purposes of clarity, new shadow should be shown in a dark, contrasting tone distinguishable from existing shadow. The shadow impact study area shall include, at a minimum, the entire area to be encompassed by the maximum shadow expected to be produced by the Proposed Project (i.e., at the winter solstice). The build condition shall include all buildings under construction and any proposed buildings anticipated to be completed prior to completion of the Proposed Project. Shadow from all existing buildings within the shadow impact study area shall be shown. A North arrow shall be provided on all figures and street names, doorways, bus stops, open space and areas where pedestrians are likely to congregate (in front of historic resources or other tourist destinations, for example) should be identified.

  Particular attention shall be given to areas of pedestrian use, including, but not limited to, the entrances to the project buildings and existing buildings in the vicinity of the Proposed Project, the sidewalks and walkways within and adjacent to the Proposed Project development.

  The DPIR should propose mitigation measures to minimize or avoid any adverse shadow impact.

- **Combined Wind and Shadow Impacts.** Figures depicting no-build and build wind monitoring locations should be of an orientation and scale consistent with that used for shadow diagrams so that the cumulative effect of wind and shadow can be determined.
- **Daylight.** A daylight analysis for both build and no-build conditions shall be conducted by measuring the percentage of skydome that is obstructed by the Proposed Project and evaluating the net change in obstruction. The study should treat two elements as controls for data comparisons: existing conditions and context examples. Daylight analyses should be taken for each major building facade fronting these essentially public ways or open spaces. **BRA 44**

The midpoint of each public accessway or roadway should be taken as the study point. The BRADA program must be used for this analysis.

- **Solar Glare.** Please refer to the BRA's Environmental Review comment letter. **BRA 45**
- **Air Quality.** Please refer to the BRA's Environmental Review Comment letter. **BRA 46**

- **Solid and Hazardous Wastes.** The presence of any contaminated soil or groundwater and any underground storage tanks at the project site shall be evaluated and remediation measures to ensure their safe removal and disposal shall be described. Any assessment of site conditions pursuant to the requirements of M.G.L. Chapter 21E that has been or will be prepared for the site shall be included in the DPIR (reports may be included in an appendix but shall be summarized in detail, with appropriate tables and figures, within the main text). Materials in the building to be demolished should be characterized and measures to mitigate impacts during demolition should be identified. **BRA 47**

  The DPIR shall quantify and describe the generation, storage, and disposal of all solid wastes from the construction and operation of the Proposed Project. The DPIR shall identify the specific nature of any hazardous wastes that may be generated and their quantities and shall describe the management and disposal of these wastes. In addition, measures to promote the reduction of waste generation and recycling, particularly for paper, glass, plastics, metals, and other recyclable products, and compliance with the City's recycling program, shall be described in the DPIR.

- **Noise.** The DPIR shall establish the existing noise levels at the project site and vicinity based upon a noise-monitoring program and shall calculate future noise levels after project completion based on appropriate modeling and shall demonstrate compliance with the Design Noise Levels established by the U.S. Department of Housing and Urban Development for residential and other sensitive receptors and with all other applicable Federal, State, and City of Boston noise criteria and regulations. Any required mitigation measures to minimize adverse noise impacts shall be described. **BRA 48**

  An analysis of the potential noise impacts from the project's mechanical and exhaust systems, including emergency generators, and compliance with applicable regulations of the City of Boston shall be required. A description of the project's mechanical and exhaust systems and their location shall be included. Measures to minimize and eliminate adverse noise impacts on nearby sensitive receptors, including the project itself, from mechanical systems and traffic shall be described.

  The DPIR should identify the potential for adverse noise impacts stemming from building activities and occupants, referencing any noise impacts from Northeastern's other dormitories and any relevant similarities or differences between those facilities and the Proposed Project, e.g. operable windows.

- **Nighttime Lighting.** The DPIR should explain, in text or graphics as appropriate: **BRA 49**

  - The type of exterior lighting to be used on each façade or other portion of the building and the elements of the design that mitigate nighttime lighting impacts of the building on surrounding areas.

- The DPIR should specify the type of interior lighting (i.e. fluorescent vs. incandescent, recessed or not) to be used in each portion of the building and, in the case of the common areas and non-residential portions of the program, the hours that the lighting will be on. The DPIR should also discuss the measures being taken to minimize the impact of interior lighting on the surrounding areas.

- **Stormwater Management/Water Quality.** Stormwater management requirements and suggestions are included in the section on environmental sustainability below.
- **Flood Hazards/Wetlands.** Describe any affected flood hazard zones or wetlands and proposed actions. **BRA 50**
- **Tidelands/Chapter 91.** The project site does not include tidelands, and Chapter 91 does not apply to the Proposed Project.
- **Geotechnical Impact/Groundwater.** A description and evaluation analysis of existing sub-soil conditions at the project site, groundwater levels, potential for ground movement and settlement during excavation and foundation construction, and potential impact on adjacent buildings, utility lines, and the roadways shall be required. This analysis shall also include a description of the foundation construction methodology, the amount and method of excavation, and measures to prevent any adverse effects on adjacent buildings, utility lines, and roadways. Measures to ensure that groundwater levels will be maintained and will not be lowered during or after construction also shall be described. In addition, the geotechnical analysis shall evaluate the earthquake potential in the project area and shall describe measures to be implemented to mitigate any adverse impacts from an earthquake event. **BRA 51**
- **Construction Impacts.** A construction impact analysis shall include a description and evaluation of the following: **BRA 52**

  - Measures to protect the public safety.
  - Potential dust and pollutant emissions and mitigation measures to control these emissions.
  - Potential noise generation and mitigation measures to minimize increase in noise levels.
  - Location of construction staging areas and construction worker parking; measures to encourage carpooling and/or public transportation use by construction workers.
  - Construction schedule, including hours of construction activity.
  - Access routes for construction trucks and anticipated volume of construction truck traffic.
  - Construction methodology (including foundation construction), amount and method of excavation required, disposal of the excavate, description of foundation support, maintenance of groundwater levels, and measures to prevent any adverse effects or damage to adjacent structures and infrastructure.
  - Method of demolition of the existing building on the project site and disposal of the demolition debris.
  - Potential for the recycling of construction and demolition debris, including asphalt from the existing parking lots.
  - Measures to make construction fencing as attractive as possible to ensure the visual character of the streetscape.
  - Identification of best management practices to control erosion and to prevent the discharge of sediments and contaminated groundwater or stormwater runoff into the City's drainage system during the construction period.
  - Impact of project construction on rodent populations and description of the proposed rodent control program, including frequency of application and compliance with applicable City and State regulatory requirements.

6. URBAN DESIGN COMPONENT

Northeastern will be expected to undertake design review on the Proposed Project in accordance with standard BRA procedure. In addition to the BRA's Urban Design Department, the Boston Civic Design Commission (BCDC) will review the Proposed Project. The DPIR should also respond to the following elements.

- **Signage and Lighting.** Northeastern will be required to perform design review with the BRA Urban Design Department on any current and future plans for signage and lighting. **BRA 53**
- **Views.** The DPIR shall present views of the Proposed Project from locations to be determined through consultation with the BRA's Urban Design Department. **BRA 54**
- **Relationship to Surrounding Context.** The DPIR should describe the design of the Proposed Project in relationship to the surrounding urban context, including adjacent buildings, streets, and plazas. **BRA 55**
- **Design Submission Requirements.** The following urban design materials for the Proposed Project's schematic design must be submitted for the DPIR. Materials must be at the required scale and in a printed form that is reproducible, as well as in electronic file form: **BRA 56**

    - A written description of program elements and space allocation for each element.
    - Black and white 8"x10" photographs of the site and neighborhood.
    - Plans and sections for the area surrounding the project at an appropriate scale (1"=100' or larger) showing relationships of the Proposed Project to the surrounding area and district regarding massing, building height, open space, major topographic features, pedestrian and vehicular circulation, and land use.
    - Sketches and diagrams of alternative proposals to clarify design issues and massing options.
    - Eye-level perspectives showing the proposal in the context of the surrounding area; views should display a particular emphasis, on important viewing areas such as key intersections, accessways, or public parks/attractions. Long-ranged (distanced) views of the Proposed Project must also be studied to assess the impact on the skyline or other view lines. At least one bird's-eye perspective should also be included. All perspectives should show (in separate comparative sketches) both the build and no-build conditions. The BRA must approve the view locations before analysis is begun. View studies should be cognizant of light and shadow, massing and bulk.
    - Aerial views of the project in perspective or isometric form.
    - A site plan at 1 "= 16' or larger showing:

        - Relationships of proposed and existing adjacent buildings and open spaces.
        - Open spaces defined by buildings on adjacent parcels and across streets.
        - Location of pedestrian ways, driveways, parking, service areas, streets, and major landscape features.
        - Accessible pedestrian, vehicular, and service access and flow through the parcel and to adjacent areas.
        - Phasing possibilities clearly indicating the scheme for completing the improvements.
        - Construction limits.

    - Site sections at 1"=16' or larger showing relationships to adjacent buildings and spaces.

- A massing model at 1"=40' showing all buildings in the area and a study model at 1"=16' showing facade design.
- Drawings at an appropriate scale (e.g., 1"=8') describing architectural massing, facade design, and proposed materials including:
    - Site plans before and after construction.
    - Elevations in the context of the surrounding area.
    - Sections showing organization of functions and spaces.
    - Building plans showing ground floor and typical upper floor.
- A site survey at 1"=40' showing nearby structures, utilities and bench marks.
- A written and/or graphic description of the building materials and its texture, color, and general fenestration patterns is required for the proposed development.
- Electronic files describing the site and Proposed Project at Representation Levels one and two ("Streetscape" and "Massing") as described in the document Boston "Smart Model": CAD & 3D Model Standard Guidelines.
- The schedule for submittal of Design Development materials.

7. ENVIRONMENTAL SUSTAINABILITY

In addition to the overall campus-wide approach to sustainability discussion in the IMP, new development of the size and complexity of the Proposed Project presents opportunities for sustainable design and construction to prevent damage to the environment, consistent with the goals of Executive Order 385 and recent initiatives of the Mayor and the BRA. Opportunities for sustainable design are described below and are incorporated herein by reference and made a part hereof. Not all the topics below need be addressed in the DPIR; rather, some of them constitute suggestions that can be discussed through the design process in conjunction with the BRA and the Environment Department.

- **Building Orientation, Envelope, and Façade Design.** Reduce thermal loads entering the building as much as possible. Consider the building orientation, envelope, and design carefully, including glazing selection, window and door shading, wall construction, roof color, and building shape. Make use of thermal mass to absorb heat and shift peak heating to off-peak hours. Building massing and façade treatment should respond to microclimate conditions and enhance appropriate solar control. The DPIR should describe any simulation designed to quantify the effects of these design choices. **BRA 57**
- **Energy.** Energy conservation strategies should be explored at an early stage in the design and should include such approaches as taking advantage of natural day lighting, passive solar gain, passive cooling and ventilation which tie into HVAC systems, use of alternative energy strategies (including making the building design adaptable for the future inclusion of innovative energy and environmental technologies as they develop over time), in addition to properly sized efficient heating and ventilating systems, with heat recovery and other conservation strategies. Siting, orientation and massing of building should optimize passive strategies for light and energy management and design for natural and displacement ventilation. Building design should specify energy efficient HVAC and lighting systems, appliances, and other equipment, and solar preheating of makeup air. Early quantification **BRA 58**

and cost-benefit analysis through iterative energy simulation is helpful and would provide feedback on size of systems and envelope design early enough to impact those decisions.

- **Water Management.** Sustainable water management practices should be considered early in the site and building design process, and the process should explore integrated approaches to stormwater retention, treatment, and reuse, building and landscape water needs, and groundwater recharge. To the extent possible, the systems put in place should strive to work with the natural hydrology of the area, and the building should incorporate additional opportunities to conserve water beyond water-saving technologies required by law. **BRA 59**

  Possibilities for using graywater for functions that are conventionally served by potable water should be explored. Stormwater captured from impervious areas or from roofs and hardscapes can be used for non-potable water uses.

  The DPIR shall contain an evaluation of the project site's existing and future stormwater drainage and stormwater management practices. The DPIR shall illustrate existing and future drainage patterns from the project site and shall describe and quantify existing and future stormwater runoff from the site and the Proposed Project's impacts on site drainage. The Proposed Project's stormwater management system, including best management practices to be implemented, measures proposed to control and treat stormwater runoff and to maximize on-site retention of stormwater, measures to prevent groundwater contamination, and compliance with the Commonwealth's Stormwater Management Policies, also shall be described. The DPIR shall describe the project area's stormwater drainage system to which the project will connect, including the location of stormwater drainage facilities and ultimate points of discharge.

  The DPIR shall respond to the comments from the Boston Water and Sewer Commission, which are contained in Appendix 1 and incorporated herein by reference.

8. HISTORIC RESOURCES COMPONENT

The DPIR should summarize any historic resources that will be affected by the Proposed Project, the position of public agencies on those resources (including any necessary regulatory process), and present a plan to minimize the adverse impact of the Proposed Project. **BRA 60**

9. INFRASTRUCTURE SYSTEMS COMPONENT

The DPIR must include an infrastructure impact analysis. The written comments of the Boston Water and Sewer Commission (BWSC) are included in Appendix 1 and are incorporated herein by reference and made a part hereof. Responses to the BWSC comments shall be included in the DPIR.

The discussion of Proposed Project impacts on infrastructure systems should be organized system-by-system as suggested below. The DPIR must include an evaluation of the Proposed Project's impact on the capacity and adequacy of existing water, sewerage, energy (including gas and steam), and electrical communications (including telephone, fire alarm, computer, cable, etc.) utility systems, and the need reasonably attributable to the Proposed Project for additional systems or facilities. Thorough consultation with the planners and engineers of the utilities will be required, and should be referenced in the Infrastructure Component section.

Any system upgrading or connection requiring a significant public or utility investment, creating a significant disruption in vehicular or pedestrian circulation, or affecting any public or neighborhood park or streetscape improvements, constitutes an impact which must be mitigated.

- **Water and Sewer.** Provide the following information on the Proposed Project's impact on water and sewer infrastructure and on water quality. As appropriate, this information can be integrated with the sustainability sections of the IMP Amendment and the DPIR. **BRA 61**

    - Estimated water consumption and sewage generation from the Proposed Project and the basis for each estimate. Include separate calculations for air conditioning system make-up water.
    - Description of the capacity and adequacy of water, sewer, and storm drain systems and an evaluation of the impacts of the Proposed Project on those systems.
    - Description of the Proposed Project's impacts on the water quality of Boston Harbor or other water bodies that could be affected by the project, if applicable.
    - Description of mitigation measures to reduce or eliminate impacts on water quality.
    - Description of impact of on-site storm drainage on water quality; if this is described more fully in another section, reference that analysis here.
    - Detail methods of protection proposed for infrastructure conduits and other artifacts, including BSWC sewer lines and water mains, during construction.
    - Detail the energy source of the interior space heating; how obtained, and, if applicable, plans for reuse of condensate.
    - Identification of measures to conserve resources, including any provisions for water recycling.

- **Energy Systems.** The DPIR should discuss the Proposed Project's approach to energy systems and conservation. As appropriate, this information can be integrated with the sustainability sections of the IMP and the DPIR. The discussion should include at a minimum the following: **BRA 62**

    - Description of all energy (heat, electrical, cooling, etc.) requirements of the project and evaluation of the Proposed Project's impacts on resources and supply.
    - Description of measures to conserve energy usage. and consideration of the feasibility of including solar energy provisions or other on-site energy provisions.

- **Other Systems.** The DPIR should also discuss emergency systems, gas, steam, optic fiber, cable, and any other systems impacted by the Proposed Project. The location of transformer and other vaults required for electrical distribution or ventilation must be chosen to minimize disruption to pedestrian paths and public improvements both when operating normally and when being serviced, and must be described. **BRA 63**

10. OTHER

- **Public Notice.** Northeastern will be responsible for preparing and publishing in one or more newspapers of general circulation in the city of Boston a Public Notice of the submission of the DPIR to the BRA as required by Section 80A-2. This Notice shall be published within five (5) days after the receipt of the DPIR by the BRA. In accordance with Article 80, public comments on the DPIR shall be transmitted to the BRA within forty-five (45) days of the publication of this notice. A sample form of the Public Notice is attached as Appendix 3. Following publication of the Public Notice, Northeastern shall submit to the BRA a copy of the published Notice together with the date of publication. BRA 64

BRA 1-28 Submission requirements for the IMP Amendment

These comments are addressed in the IMP Amendment.

BRA 29 Development Team

Please see Section 1.2.

BRA 30 Legal Information

Please see Section 1.6.

BRA 31 Disclosure of beneficial interests

A Disclosure of Beneficial Interests will be provided pursuant to Section 80B-8.

BRA 32 Regulatory controls and permits

Please see Section 1.7.

BRA 33 Project Site

Please see Section 2.1 for a description of the Project site.

BRA 34 Project Description

Please see Section 2.2

BRA 35 Project alternatives

All analyses in the DPIR include both the Build and No Build alternatives.

BRA 36 Traffic management element

Please see Chapter 3.

BRA 37 Parking management element

Please see Chapter 3.

BRA 38 Construction management element

Please see Section 3.13.

BRA 39 **Move-In/Move-Out plan**

Please see Section 3.11.

BRA 40 **Pedestrian analysis**

Please see Section 3.4.

BRA 41 **Mitigation**

Please see Chapter 3.

BRA 42 **Wind**

Please see Section 4.1 for the wind tunnel analysis.

BRA 43 **Shadow**

Please see Section 4.2 for the shadow analysis.

BRA 44 **Daylight**

Please see Section 4.3 for the daylight analysis.

BRA 45 **Solar glare**

Solar glare impacts are not currently anticipated.

BRA 46 **Air Quality**

Please see Section 4.5.

BRA 47 **Solid and Hazardous Wastes**

Please see Section 4.9.

BRA 48 **Noise**

Please see Section 4.10.

BRA 49 **Nighttime Lighting**

Please see Section 6.4.

BRA 50 **Flood hazards**

Please see Section 4.7.

BRA 51 **Geotechnical impact/ groundwater**

Please see Section 4.8.

BRA 52 **Construction Impacts**

Please see Section 4.11.

BRA 53 **Signage and lighting**

Please see Section 6.4.

BRA 54 **Views**

Please see Chapter 6 for renderings.

BRA 55 **Relationship to surrounding context.**

Please see Chapter 6.

BRA 56 **Design Submission Requirements**

All the required urban design materials will be submitted.

BRA 57 **Building Orientation, Envelope, and Façade Design**

Please see Chapter 5 for sustainable design and energy efficiency measures.

BRA 58 **Energy**

Please see Section 5.3.

BRA 59 **Water management**

Please see Section 8.3 for a discussion of stormwater management measures being proposed.

BRA 60 **Historic resources component**

Please see Chapter 7.

BRA 61 **Water and sewer**

Please see Chapter 8.

BRA 62 **Energy Systems**

Please see Chapter 5

BRA 63 **Other systems**

Please see Chapter 8.

BRA 64 **Public Notice**

A Public Notice was been published in the Boston Herald on April 11, 2016.

Martin J. Walsh
Mayor

Article 37 Interagency Green Building Committee

March 10, 2016

Northeastern University
360 Huntington Avenue
Boston, MA 02115

Re: Northeastern University Columbus Avenue Student Housing
Article 37 Boston Zoning Code, Green Buildings

Dear Jason Wills:

The Boston Interagency Green Building Committee (IGBC) has reviewed for compliance with Boston Zoning Article 37, Green Buildings the Institutional Master Plan Notification Form/Project Notification Form (IMPNF/PNF) submitted on January 21, 2016, which includes a LEED checklist, a Sustainability Narrative and Climate Change Preparedness and Resiliency Checklist.

The IMPNF/PNF indicates that the project, now in the design stage, will use the LEED for LEED for Homes Mid-Rise rating system and shows the intent to achieve LEED Silver with 61.5 points. The IGBC accepts LEED for Homes Mid-Rise Rating System selection and encourages the Proponent to continue to pursue additional credits and strive to achieve LEED Gold.

In support of the City of Boston's Greenhouse (GHG) emissions reduction goals, the IGBC requests that:

- The project fully utilize utility and state-funded energy efficiency and clean/renewable energy programs to minimize energy use and adverse environmental impacts. Please provide information utility and state programs that project anticipated utilizing including specific program(s) and contact(s). **IGBC 1**
- The project include renewable and/or clean energy systems. Please note numerous service providers will assess project opportunities and prepare detailed proposals at no cost. Please provide information on any renewable and/or clean energy systems to be included or feasibility analysis assessing potential systems. Inclusion of renewable energy technologies and/or clean energy systems in the project. Numerous energy providers often analyze opportunities and prepare detailed proposals at no cost. Please provide either information on any viable renewable and/or clean energy systems to be included in the project or a feasibility analysis assessing potential systems. **IGBC 2**
- The project include strategies to reduce energy usage to 30% or more below the ASHRAE 90.1-2007 baseline. **IGBC 3**
- Early energy modeling supports integrated project planning and optimal building energy performance. Please provide a preliminary energy model indicating, at minimum, overall building energy use and peak loads by source. **IGBC 4**

Please follow up within the next three weeks with your BRA Project Manager in responding to IGBC comments and provision of requested materials. The IGBC will conclude review of the initial submittal upon receipt of your response and provision of requested materials.

Please note that prior to the Inspectional Services Department's (ISD) issuance of a building permit, all projects must demonstrate compliance with Article 37 and have obtained approval of the requisite submissions from the IGBC. In order to demonstrate compliance, the IGBC requires that you submit a Draft Green Building Report (Draft Report). The Draft Report shall provide a comprehensive narrative describing in detail proposed strategies and paths that will be used to meet LEED prerequisites and achieve the selected credits.

Please contact your BRA Project Manager if you have questions.

Interagency Green Building Committee

INTERAGENCY GREEN BUILDING COMMITTEE

IGBC 1 Utility and state programs

The Project team has reached out to Kim Cullinane and has scheduled a meeting to discuss the Eversource/National Grid Energy Incentive Program. As the design progresses, the Proponent will continue to work with the utilities to minimize energy use and decide which incentive programs are most appropriate for the Project to utilize.

IGBC 2 Clean energy systems

The Proponent will evaluate the potential for a roof-mounted solar photovoltaic (PV) system, and the availability of grants and renewables funding. A majority of the rooftop of the tallest portion of the building, which would have the most exposure to sun, will be almost entirely devoted to roof-top mechanical space, leaving minimal space for rooftop solar.

IGBC 3 Reduce energy usage

Please see Section 5.3.

IGBC 4 Energy modeling

Early-stage energy modeling has begun and will be tightly coordinated with utility incentives and programs to leverage all offerings and optimize all systems for highest efficiency possible. Alternative strategies for lowering energy needed for heating, cooling and Domestic Hot Water are being considered. As the design progresses, the Proponent will continue to work with the utilities to minimize energy use and decide which incentive programs are most appropriate for the Project to utilize.

BRA MEMORANDUM

TO: Katelyn Sullivan

FROM: Katie Pedersen

DATE: March 1, 2016

RE: Columbus Avenue Student Housing
Northeastern University
Institutional Master Plan Notification Form/Project Notification Form

I have reviewed the Institutional Master Plan Notification Form/Project Notification Form (the "IMP/PNF") dated January 21, 2016 and submit the following comments for the Environmental Protection component. Northeastern University (the "University") and American Campus Communities (ACC) submitted an Institutional Master Plan Notification Form/Project Notification Form amending the University's existing IMP.

Northeastern University is proposing the construction of an approximately 310,000 square foot student residential housing building, which will include approximately 207 apartment units (approximately 800 beds), ground floor commercial use as well as student amenities and services (the "Proposed Project").

<u>Wind</u>

The Proponent has stated that Proposed Project building will be approximately 230 feet in height and accordingly the Proponent shall be required to conduct a quantitative (wind tunnel) analysis for both existing (no-build) and build conditions. **KP 1**

The analysis shall determine potential pedestrian level winds adjacent to and in the vicinity of the Proposed Project site and shall identify any areas where wind velocities are expected to exceed acceptable levels, including the Boston Redevelopment Authority's guideline of an effective gust velocity of 31 miles per hour (mph) not to be exceeded more than 1% of the time. The analysis also shall determine the suitability of particular locations for various activities (e.g., walking, sitting, eating, etc.) as appropriate. The Proponent shall be required to pay particular attention to public and other areas of pedestrian use, including, but not limited to, entrances to the Proposed Project and adjacent buildings, sidewalk(s) adjacent to and in the vicinity of the Proposed Project building as well as parks, plazas, and other open spaces and pedestrian areas near the Proposed Project. Wind speeds shall be measured in miles per hour and for areas where wind speeds are projected to be dangerous or to exceed acceptable levels, measures to reduce wind speeds and to mitigate potential adverse impact(s) shall be identified and, if appropriate, tested. Should the results indicate the possibility of excessive or dangerous pedestrian level winds, additional analyses, including wind tunnel testing may be required. The wind tunnel testing shall be conducted in accordance with the Protocol for Quantitative Pedestrian Level Wind Impact Analysis, as described in Appendix 5 of the ***BRA Development Review Guidelines.***

Shadow

The Proponent shall be required to conduct a shadow analysis for the existing (no-build) and build conditions for the hours of 9:00 a.m., 12:00 noon, and 3:00 p.m. for the vernal equinox, summer solstice, autumnal equinox, and winter solstice and for 6:00 p.m. in the summer and fall. The shadow analysis shall be conducted using the Sun Altitude/Azimuth Table, as found in Appendix 6 of the ***BRA Design Review Guidelines.*** The shadow impact analysis must include net new shadows as well as existing shadows; net new shadows shall have a clear graphic distinction. For purposes of clarity, new shadows shall be shown in a dark, contrasting tone distinguishable from existing shadows. In addition, the shadow analysis must show the incremental effects of the Proposed Project on existing and proposed public open spaces and pedestrian areas (including transit stops), including, but not limited to, sidewalks and pedestrian walkways adjacent to and in the vicinity of the Proposed Project and parks, plazas, and other open space areas. The analysis must clearly label all streets, vehicular paths, public open spaces, and pedestrian areas adjacent to and in the vicinity of the proposed project area. A North arrow shall be provided on all figures. **KP 2**

Daylight

(Please refer to Urban Design's comments) **KP 3**

Solar Glare

The Proponent has stated that the Proposed Project is designed so as not to present an adverse safety impact on Proposed Project area traffic as a result of reflected solar glare. The Proponent has further stated that although the façade materials of the Proposed Project have not been finalized, facades are not anticipated to be reflective glass and will incorporate low E high performance glass. However, should the Proposed Project design change and incorporate substantial glass-facades (reflective glass), a solar glare analysis shall be required. The analysis shall measure potential reflective glare from the buildings onto potentially affected streets and public open spaces and sidewalk areas in order to determine the likelihood of visual impairment or discomfort due to reflective spot glare. Mitigation measures to eliminate any adverse reflective glare shall be identified. **KP 4**

Air Quality

The Proponent shall be required to provide an evaluation of the impact on local and regional air quality from a significant stationary source. In addition, a microscale analysis, predicting localized carbon monoxide concentrations shall be performed, including identification of any locations projected to exceed the National or Massachusetts Ambient Air Quality Standards, for projects in which: **KP 5**

1) Project traffic would impact intersections or roadway links currently operating at Level of Service ("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.

If deemed appropriate, a mesoscale analysis predicting the change in regional emissions of volatile organic compounds ("VOCs") and nitrogen oxides ("NOx") shall be performed for projects that generate more than 10,000 vehicle trips per day.

The above analyses shall be conducted in accordance with the modeling protocols established by the Massachusetts Department of Environmental Protection ("DEP") and the U.S. Environmental Protection Agency ("EPA").

Noise

Noise impacts from the Proposed Project shall be analyzed, including rooftop mechanical equipment and other noise sources (e.g., emergency generators), and a determination made of compliance with City of Boston noise regulations and applicable state and federal regulations and guidelines. In addition, noise levels shall be evaluated to determine conformance with the Interior Design Noise Level (not to exceed day night average sound level of 45 decibels) established by the U.S. Department of Housing and Urban Development (24 CFR Part 51, Subpart B). In deemed necessary, mitigation measures to reduce excessive noise levels to acceptable limits must be included and described. **KP 6**

Sustainable Design/Green Buildings

(Please see the Interagency Green Building Committee Article 37 Comment Letter) **KP 7**

BOSTON REDEVELOPMENT AUTHORITY – KATIE PEDERSEN

KP 1 **Wind**

Please see Section 4.1.

KP 2 **Shadow**

Please see Section 4.2.

KP 3 **Daylight**

Please see Section 4.3.

KP 4 **Solar glare**

Solar glare impacts are currently not anticipated.

KP 5 **Air quality**

Please see Section 4.5.

KP 6 **Noise**

Please see Section 4.10.

KP 7 **Sustainable design**

Please see Chapter 5 and the responses to the Interagency Green Building Committee comment letter.

Boston Water and
Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

February 19, 2016

Ms. Katelyn Sullivan
Senior Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201-1007

Re: Columbus Avenue Student Housing, South End
Project Notification Form/Institutional Master Plan Notification Form

Dear Ms. Sullivan:

The Boston Water and Sewer Commission (Commission) has reviewed the Project Notification Form/Institutional Master Plan Notification Form (PNF/IMPNF) for the proposed Columbus Avenue Student Housing project located at 10 Burke Street in the South End neighborhood of Boston. This letter provides the Commission's comments on the PNF/IMPNF.

The project site is an approximately 23,242 square foot (sf) site located on the southeastern edge of the Northeastern University campus. The site is currently a surface parking lot. The proponent, Northeastern University and American Campus Communities, proposes to construct a new approximately 230-foot tall, approximately 310,000 sf building for student residential use that will include ground floor commercial use as well as student amenities and services. The proposed structure will have approximately 207 apartment units (approximately 800 beds) consisting of two-bedroom apartments with both shared and private accommodations and four-bedroom apartments with private accommodations. The project will include a social lounge, recreation and gaming center, fitness center, and a laundry room. The project site is bounded by Burke Street to the east, Columbus Avenue to the north, Coventry Street to the west and an existing building to the south.

The Commission owns and maintains a 12-inch storm drain and an 18-inch sanitary sewer in Burke Street, an 18-inch storm drain and a 12-inch sanitary sewer in Columbus Avenue, and a 36-inch storm drain and a 15-inch sanitary sewer in Coventry Street. The Massachusetts Water Resources Authority (MWRA) owns and maintains a 78-inch combined sewer in Columbus Avenue.

For water service there is a 12-inch Southern High and 12-inch Southern Low water main and a 30-inch Southern High transmission main in Columbus Avenue, an 8-inch Southern

High and 8-inch Southern Low water main in Burke Street and a 12-inch Southern Low water main in Coventry Street. The Commission will not permit the proponent to connect to the 30-inch transmission main in Columbus Avenue.

The PNF/IMPNF states that water demand for the proposed project will be 80,630 gallons per day (gpd) and wastewater generation will be 73,300 gpd.

The Commission has the following comments regarding the PNF/IMPNF:

General

1. All new or relocated water mains, sewers and storm drains must be designed and constructed at American Campus Communities' expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use Regulations, and Requirements for Site Plans. To assure compliance with the Commission's requirements, the proponent must submit a site plan and a General Service Application to the Commission's Engineering Customer Service Department for review and approval when the design of the new water and wastewater systems and the proposed service connections to those systems are 50 percent complete. The site plan should include the locations of new, relocated and existing water mains, sewers and drains which serve the site, proposed service connections as well as water meter locations. **BWSC 1**

2. The Department of Environmental Protection (DEP), in cooperation with the Massachusetts Water Resources Authority and its member communities, are implementing a coordinated approach to flow control in the MWRA regional wastewater system, particularly the removal of extraneous clean water (e.g., infiltration/ inflow (I/I)) in the system. In April of 2014, the Massachusetts DEP promulgated new regulations regarding wastewater. The Commission has a National Pollutant Discharge Elimination System (NPDES) Permit for its combined sewer overflows and is subject to these new regulations [314 CMR 12.00, section 12.04(2)(d)]. This section requires all new sewer connections with design flows exceeding 15,000 gpd to mitigate the impacts of the development by removing four gallons of infiltration and inflow (I/I) for each new gallon of wastewater flow. In this regard, any new connection or expansion of an existing connection that exceeds 15,000 gallons per day of wastewater shall assist in the I/I reduction effort to ensure that the additional wastewater flows are offset by the removal of I/I. Currently, a minimum ratio of 4:1 for I/I removal to new wastewater flow added. The Commission supports the policy, and will require proponent to develop a consistent inflow reduction plan. The 4:1 requirement should be addressed at least 90 days **BWSC 2**

prior to activation of water service and will be based on the estimated sewage generation provided on the project site plan.

3. The design of the project should comply with the City of Boston's Complete Streets Initiative, which requires incorporation of "green infrastructure" into street designs. Green infrastructure includes greenscapes, such as trees, shrubs, grasses and other landscape plantings, as well as rain gardens and vegetative swales, infiltration basins, and paving materials and permeable surfaces. The proponent must develop a maintenance plan for the proposed green infrastructure. For more information on the Complete Streets Initiative see the City's website at http://bostoncompletestreets.org/ **BWSC 3**

4. American Campus Communities should be aware that the US Environmental Protection Agency issued a draft Remediation General Permit (RGP) for Groundwater Remediation, Contaminated Construction Dewatering, and Miscellaneous Surface Water Discharges. If groundwater contaminated with petroleum products, for example, is encountered, American Campus Communities will be required to apply for a RGP to cover these discharges. **BWSC 4**

5. American Campus Communities is advised that the Commission will not allow buildings to be constructed over any of its water lines. Also, any plans to build over Commission sewer facilities are subject to review and approval by the Commission. The project must be designed so that access, including vehicular access, to the Commission's water and sewer lines for the purpose of operation and maintenance is not inhibited. **BWSC 5**

6. It is American Campus Communities' responsibility to evaluate the capacity of the water, sewer and storm drain systems serving the project site to determine if the systems are adequate to meet future project demands. With the site plan, American Campus Communities must include a detailed capacity analysis for the water, sewer and storm drain systems serving the project site, as well as an analysis of the impacts the proposed project will have on the Commission's water, sewer and storm drainage systems. **BWSC 6**

Water

1. American Campus Communities must provide separate estimates of peak and continuous maximum water demand for residential, commercial, industrial, irrigation of landscaped areas, and air-conditioning make-up water for the project with the site plan. Estimates should be based on full-site build-out of the proposed project. American Campus Communities should also provide the methodology used to estimate water demand for the proposed project. **BWSC 7**

2. American Campus Communities should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular, American Campus Communities should consider outdoor landscaping which requires minimal use of water to maintain. If American Campus Communities plans to install in-ground sprinkler systems, the Commission recommends that timers, soil moisture indicators and rainfall sensors be installed. The use of sensor-operated faucets and toilets in common areas of buildings should be considered. **BWSC 8**

3. American Campus Communities is required to obtain a Hydrant Permit for use of any hydrant during the construction phase of this project. The water used from the hydrant must be metered. American Campus Communities should contact the Commission's Meter Department for information on and to obtain a Hydrant Permit. **BWSC 9**

4. The Commission is utilizing a Fixed Radio Meter Reading System to obtain water meter readings. For new water meters, the Commission will provide a Meter Transmitter Unit (MTU) and connect the device to the meter. For information regarding the installation of MTUs, American Campus Communities should contact the Commission's Meter Department. **BWSC 10**

<u>Sewage / Drainage</u>

1. A Total Maximum Daily Load (TMDL) for Nutrients has been established for the Lower Charles River Watershed by the Massachusetts Department of Environmental Protection (MassDEP). In order to achieve the reductions in Phosphorus loading required by the TMDL, phosphorus concentrations in the lower Charles River from Boston must be reduced by 64%. To accomplish the necessary reductions in phosphorus, the Commission is requiring developers in the lower Charles River watershed to infiltrate stormwater discharging from impervious areas in compliance with MassDEP. American Campus Communities will be required to submit with the site plan a phosphorus reduction plan for the proposed development. American Campus Communities must fully investigate methods for retaining stormwater on-site before the Commission will consider a request to discharge stormwater to the Commission's system. The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining their stormwater discharge on-site. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer. **BWSC 11**

   In conjunction with the Site Plan and the General Service Application the American Campus Communities will be required to submit a Stormwater Pollution Prevention Plan. The plan must: **BWSC 12**

- Identify best management practices for controlling erosion and for preventing the discharge of sediment and contaminated groundwater or stormwater runoff to the Commission's drainage system when the construction is underway.

- Include a site map which shows, at a minimum, existing drainage patterns and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control or treatment structures to be utilized during construction.

- Provide a stormwater management plan in compliance with the DEP standards mentioned above. The plan should include a description of the measures to control pollutants after construction is completed.

2. Developers of projects involving disturbances of land of one acre or more will be required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency and the Massachusetts Department of Environmental Protection. American Campus Communities is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required, it is required that a copy of the permit and any pollution prevention plan prepared pursuant to the permit be provided to the Commission's Engineering Services Department, prior to the commencement of construction. The pollution prevention plan submitted pursuant to a NPDES Permit may be submitted in place of the pollution prevention plan required by the Commission provided the Plan addresses the same components identified in item 1 above. **BWSC 13**

3. The Commission encourages American Campus Communities to explore additional opportunities for protecting stormwater quality on site by minimizing sanding and the use of deicing chemicals, pesticides, and fertilizers. **BWSC 14**

4. The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission. American Campus Communities is advised that the discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the dewatering drainage is contaminated with petroleum products, American Campus Communities will be required to obtain a Remediation General Permit from the Environmental Protection Agency (EPA) for the discharge. **BWSC 15**

5. American Campus Communities must fully investigate methods for retaining stormwater on-site before the Commission will consider a request to discharge stormwater to the Commission's system. The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining their **BWSC 16**

stormwater discharge on-site. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer.

6. The Massachusetts Department of Environmental Protection (MassDEP) established Stormwater Management Standards. The standards address water quality water quantity and recharge. In addition to Commission standards, American Campus Communities will be required to meet MassDEP Stormwater Management Standards. **BWSC 17**

7. Sanitary sewage must be kept separate from stormwater and separate sanitary sewer and storm drain service connections must be provided. The Commission requires that existing stormwater and sanitary sewer service connections, which are to be re-used by the proposed project, be dye tested to confirm they are connected to the appropriate system. **BWSC 18**

8. The Commission requests that American Campus Communities install a permanent casting stating "Don't Dump: Drains to Boston Harbor" next to any catch basin created or modified as part of this project. American Campus Communities should contact the Commission's Operations Division for information regarding the purchase of the castings. **BWSC 19**

9. If a cafeteria or food service facility is built as part of this project, grease traps will be required in accordance with the Commission's Sewer Use Regulations. American Campus Communities is advised to consult with the Commission's Operations Department with regards to grease traps. **BWSC 20**

Thank you for the opportunity to comment on this project.

Yours truly,

John P. Sullivan, P.E.
Chief Engineer

JPS/afh

cc: Jason Willis, American Campus Communities
M. Zlody, BED via e-mail
P. Larocque, BWSC via e-mail

BOSTON WATER AND SEWER COMMISSION

BWSC 1 New or relocated water mains

It is not anticipated that any new mains will be constructed for the Project. However, if it is determined that new mains are required, they will be constructed at the Proponent's expense. A site plan will be submitted to the BWSC for site plan review at approximately 50% design.

BWSC 2 Infiltration/Inflow (I/I)

The design flows for the Project are greater than 15,000 gallons per day. The Project will provide 4:1 infiltration/inflow mitigation as required by BWSC at least 90 days prior to the activation of the water service.

BWSC 3 Complete Streets

The Project will comply with the City of Boston's Complete Streets Initiative as required by the scope of work.

BWSC 4 Remediation General Permit

The Proposed Project will apply for a Remediation General Permit if it is determined to be applicable to the Project.

BWSC 5 Water and sewer lines

The Project does not include the construction of a structure over BWSC owned water lines, sewer or drain lines.

BWSC 6 Water, sewer and storm drain capacities

The sewer mains adjacent to the site have been analyzed and are adequate to serve the demands of the Project. The Project site is 100% impervious in the existing and proposed condition, and recharge wells will likely be provided for the first inch of runoff. The proposed stormwater runoff rates and volumes will be the same or less than in the existing condition. Water service capacity will be determined during the site plan approval process. There are a number of mains adjacent to the site in Burke Street, Coventry Street and Columbus Avenue.

BWSC 7 Peak and continuous water demand

Peak and continuous water demand for the Proposed Project will be provided to the BWSC with the Site Plan submittal during the design phase.

BWSC 8 **Water conservation measures**

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

All efforts to reduce water consumption will be made. Aeration fixtures and appliances will be chosen for water conservation qualities. In public areas, sensor operated faucets and toilets will be installed.

BWSC 9 **Hydrant permit**

A Hydrant Permit will be obtained if a hydrant is used during construction.

BWSC 10 **Meter Transmitter Units**

New meters will be installed with Meter Transmitter Units (MTU's) as part of the Boston Water and Sewer Commission's Automatic Meter Reading (AMR) system.

BWSC 11 **Stormwater retention**

The Project will include phosphorous treatment prior to discharging to the BWSC storm drain system. This will likely consist of recharge wells in the sidewalk adjacent to the site. The Project will permit recharge wells through the Public Improvements Commission as necessary.

BWSC 12 **Stormwater Pollution Prevention Plan**

A Stormwater Pollution Prevention Plan will be prepared for the Project which will include best management practices for minimizing and controlling erosion and preventing the discharge of sediment offsite. BWSC catch basins immediately downstream of the site will be protected with silt sacks. This plan will be submitted to BWSC with the Site Plan submission.

BWSC 13 **NPDES General Permit for Construction**

The Project site is approximately one-half acre and is not anticipated to require a NPDES General Permit for Construction.

BWSC 14 **Stormwater quality**

The Project will explore additional methods for protecting stormwater quality. The Project will be 100% impervious.

BWSC 15 Discharge of dewatering drainage

If required, the Project will obtain a Drainage Discharge permit from BWSC and a Remediation General Permit from the Environmental Protection Agency.

BWSC 16 On-site stormwater retention

The Project will explore retaining the first inch of stormwater onsite prior to discharging to the BWSC system. The Project will likely contain recharge wells in the sidewalk adjacent to the site. These wells will be sized to infiltrate the first inch of stormwater runoff for phosphorous treatment.

BWSC 17 MassDEP Stormwater Management Standards

See Section 8.3.3 for a discussion of the MassDEP Stormwater Management Standards.

BWSC 18 Sanitary sewer and storm drain service connections

The Project will consist of all new storm and sewer service connections, which will be separated.

BWSC 19 "Don't Dump: Drains to Boston Harbor" castings

"Don't Dump" plaques will be provided at all drain inlets created or modified as part of the Project.

BWSC 20 Grease Traps

If required, grease traps will be provided in accordance with BWSC's Sewer Use Regulations.

BOSTON
TRANSPORTATION
DEPARTMENT

ONE CITY HALL SQUARE • ROOM 721
BOSTON, MASSACHUSETTS 02201
617-635-4680 • FAX 617-635-4295

March 1, 2013

Katelyn Sullivan
Boston Redevelopment Authority
One City Hall Square, 9th Floor
Boston, MA 02201

RE: Northeastern – Institutional Master Plan/Project Notification Form
Columbus Avenue Student Housing

Dear Katelyn,

Thank you for the opportunity for BTD to comment on the Institutional Master Plan/Project Notification Form (IMPNF/PNF) for the Columbus Avenue Student Housing Project. The project includes a new student residence building on Columbus Avenue at Burke Street with approximately 207 residential units with 800 beds, and approximately 3,000 square feet of ground floor commercial space.

The building will displace approximately 58 existing surface parking spaces that will be accommodated in the existing Columbus Garage or other university owned parking facilities that have capacity for this additional demand.

Information and analysis provided by the proponent will lead to a Transportation Access Plan Agreement (TAPA) that will codify the projects' transportation-related elements, including mitigation items.

Bicycle Access and Parking

Figure 3-8 shows existing covered and uncovered bike parking on the Northeastern Campus, with a total of 945 spaces. Specific information, including a site plan showing the specific location of indoor and outdoor bike parking, will need to be provided as part of the TAPA process to show how the new building will meet the current City of Boston Bike Parking Guidelines. **BTD 1**

Northeastern currently sponsors a Hubway station with 15 bicycles in the North Lot of the campus, and is also served by Hubway Stations at Ruggles Station and at Columbus and Mass Ave. As part of the TAPA we will request that Northeastern either sponsor an additional station or contribute to a fund for additional Hubway stations. **BTD 2**

MARTIN J. WALSH, Mayor

Motor Vehicle Parking

The Columbus Avenue Student Housing project will reduce the number of surface parking spaces in the Columbus Lot by approximately 58 spaces and will add no new parking. The parking displaced will be absorbed by the existing parking spaces on campus.

Northeastern's commitment to sustainable transportation and its robust transportation demand management initiative have resulted in a reduction in drive alone trips since the year 2000 from 27% to 11% for students and from 49% to 28% for employees. Programs such as bicycling and transit incentives, the availability of car share, provision of ample bike parking, and sponsorship of Hubway stations make it convenient for students to live on campus without a motor vehicle.

We commend Northeastern for its successful efforts to promote non-motorized commuting, and for making efficient use of existing parking through consolidation. We look forward to updates on actual usage as Northeastern continues to buildout its campus.

As part of the TAPA for this project, it will be confirmed that residents in the new dorm will be exempted **BTD 3**
from the city's Residential Parking Permit program. Northeastern will also be expected to charge non- **BTD 4**
subsidized, market rates for parking.

Traffic

Given that enrollment is not anticipated to increase, this new dormitory project should reduce the number of commuting trips and have a minimal impact on area traffic.

To ensure that the campuswide mode share for driving remains low and the mode shares for walking, biking and transit continue to increase, Northeastern will be expected to continue an aggressive **BTD 5**
program of Transportation Demand Management, to be codified in the TAPA.

Green Links: Roxbury to Fenway Connector

As noted in the IMPNF/PNF, Northeastern has been working collaboratively with the city promote the Roxbury to Fenway Connector, a proposed shared use path from Ruggles Station to Parker Street, and a proposed protected bicycle lane along Parker Street to Museum Road across Huntington Avenue. This is an important missing link in the greenway network that would connect people travelling on the Southwest Corridor in Roxbury to the Emerald Necklace and beyond.

As we develop detailed plans for this path, we will continue to work with Northeastern to find ways to make this path a reality. The path and the network it connects will be a great amenity for the school and the larger community.

Public Transportation

Northeastern is well served by public transportation, with the Orange Line, three Commuter Rail lines, and 12 bus lines servicing Ruggles Station, and ready access to the Green Line and route 39 bus on Huntington Avenue. In addition, four MASCO shuttles provide service to the Northeastern community and others between Ruggles and the Longwood Medical Area.

As part of the TAPA process, we will ask Northeastern to identify TDM strategies to encourage the use of transit by students, faculty and staff. **BTD 6**

Northeastern has been working with the MBTA to "adopt" Ruggles Station to do maintenance and cleaning operations of the public access areas of the station. To enhance the identity of Ruggles Station as a multimodal transit hub, we request that Northeastern continue to work with the MBTA to improve signage within the station, provide real-time information in a central location for buses, subways and commuter rail lines, and provide signage directing transit users to Hubway stations and car share. **BTD 7**

Pedestrian Access

Proposed sidewalk improvements should be consistent with the Boston's Complete Streets Guidelines (www.bostoncompletestreets.org), including goals for tree cover and sustainable stormwater management. We look forward to reviewing the sidewalk designs as part of the TAPA process. **BTD 8**

Service and Loading/Pickup and Dropoff

As noted in the expanded PNF, service and loading will be served by off-street loading facilities. Further details must be provided as part of the TAPA process. **BTD 9**

Transportation Demand Management

The expanded PNF outlines many of the measures Northeastern currently employs to minimize traffic and encourage students and staff to shift from single occupancy driving to other modes. BTD looks forward to reviewing more details of the program and any methods proposed to measure and improve its effectiveness. Using the existing program as a foundation, BTD will work with Northeastern to determine the specifics to be codified in the TAPA.

Site Plan

The proponent needs to submit an engineered site plan within the context of the surrounding roadways at 1:20 scale depicting: **BTD 10**

- Vehicular Access and Circulation
- Parking Layout and Circulation
- Pedestrian Access and Circulation
- Bicycle Access and Circulation
- Shuttle/Van Pool Pickup and Dropoff
- Parking Spaces for Car Sharing services
- Service and Loading*
- Roadways and Sidewalks
- Building Layout
- Bicycle Parking Locations and Types (covered, indoor, Hubway, etc)
- Transit Stops and Connections
- Electric Vehicle Charging Stations

* *Trash compactors/dumpsters need to be depicted as well.*

Construction Management Plan

As the project advances, the proponent will be required to develop and submit a detailed Construction Management Plan (CMP) to BTD for review and approval. The CMP will address TDM measures for construction workers, proposed street occupancies, equipment stating, sidewalk relocations and hours of construction work. BTD will work with the proponent to execute the CMP.

We look forward to working cooperatively with Northeastern and the community to reach an agreement on the plans and mitigation measures to be codified in the TAPA.

Sincerely,

Charlotte Fleetwood
Transportation Planner

Cc: Vineet Gupta, Director of Policy and Planning

BOSTON TRANSPORTATION DEPARTMENT

BTD 1 Bike Parking

Please see Section 3.9.

BTD 2 Hubway station

ACC and Northeastern will focus on transportation improvements that will improve pedestrian and bike safety in the immediate vicinity of the proposed development.

BTD 3 Residential Parking Permit program

Residents of the proposed Project will be exempted from the city's Residential Parking Permit Program.

BTD 4 Market rate parking

Northeastern evaluates its parking rates for student, faculty and staff annually. The University has increased rates 10% each year for the last two years to align with the market.

BTD 5 Transportation Demand Management

Northeastern will continue an aggressive program of transportation demand management, including strategies to encourage the use of transit by students, faculty, and staff.

BTD 6 TDM strategies

Northeastern will continue an aggressive program of transportation demand management, including strategies to encourage the use of transit by students, faculty, and staff.

BTD 7 Ruggles Station

Northeastern will continue to work with the MBTA.

BTD 8 Boston's Complete Streets Guidelines

Proposed sidewalk improvements will be consistent with Boston's Complete Streets Guidelines.

BTD 9 Service and Loading

Please see Section 3.10.

BTD 10 Site Plan

Please see Figure 3-1.

FENWAY CDC

March 1, 2016

Katelyn Sullivan
Boston Redevelopment Authority
One City Hall Plaza, 9th floor
Boston, MA 02201

Dear Ms. Sullivan:

Re: Northeastern University IMP amendment for the Burke Street dormitory proposal.

Thank you for the opportunity to comment on the proposal by Northeastern University (NU) for a new dormitory (Columbus Ave Student Housing) on the Burke Street parking lot. We submit this letter on behalf of the Fenway Community Development Corporation (Fenway CDC), a 43-year-old, community-based organization that builds and preserves affordable housing and promotes projects that engage our full community in enhancing the neighborhood's diversity and vitality. Fenway CDC in general supports the NU proposal to build this proposed dormitory on its Burke Street parking lot.

We applaud NU for addressing its responsibilities under its current Institutional Master Plan to build 1,000 dorm beds during its ten year duration. That IMP called for the creation of at least 600 beds in the first five years of the plan. The proposal under consideration could exceed this goal as the facility would house almost 800 beds, of which a minimum of 600 would be exclusively for NU students.

The proposal is innovative in that NU proposes to control the property but enter into a long term ground lease with American Campus Communities (ACC). ACC would build the dorm and operate it but the students would be under the NU code of student conduct and there would be resident assistants on site as part of the arrangement. ACC is a very capable partner with a successful track record as they have built and operate dorms for dozens of campuses and manage
and house more than 90,000 students. In addition, such an arrangement will mean that ACC will **FCDC 1**
pay real estate taxes to the City of Boston. However, the details of the arrangements between NU
and ACC need to be made available for public scrutiny and comment. NU has alluded to the fact **FCDC 2**
that they want to fill the entire dorm with NU students, but will settle for a hard goal of 600 NU students in the facility. If that case should come to pass, we need to know what the process will be for filling the remaining beds, and how those students will be monitored.

Fenway CDC supports the goal of housing as many students on campus a possible to free up rental housing in the surrounding communities. We appreciate that ACC has done marketing surveys of thousands of off campus students to understand what designs and amenities the want to see in a dorm room. However, dorm room creation will only entice students out of the rental market if the dorms are at least competitive with the rents in the private market for student housing as far as pricing, layout and amenities. **FCDC 3**

Fenway CDC would like ACC to agree to adhere to NU's obligations regarding the construction and operation of the dorm with respect to the procurement and hiring commitments related to local minority and women owned businesses. **FCDC 4**

Since this is a partnership and ground lease arrangement is a new development model for Universities in Boston, we believe that the Cooperation Agreement for this project should be available in public to the Task Force for scrutiny and comment. In addition, we would the Cooperation Agreement to spell out the total percentage of NU students to be housed with the inclusion of this dorm and the total undergraduate enrollment numbers projected at the opening of this dorm and during the IMP reiterated. **FCDC 5** **FCDC 6**

We would also like to remind all concerned that should there be a reduction in height and floor area ratio as a result of the Article 80 process, that the original requirements to house 1,00 students in ten years is still in force. Given all of these considerations, Fenway CDC supports this proposal put forward by Northeastern University and America Campus Communities.

Sincerely,

Leah Camhi

Executive Director, Fenway CDC

Louvere Walker

Louvere Mercedes Walker

President, Fenway CDC

cc: City Councilor Josh Zakim
City Councilor Tito Jackson
Senator William Brownsberger
Representative Jay Livingstone
Representative Byron Rushing

FENWAY COMMUNITY DEVELOPMENT CORPORATION

FCDC 1 Real estate taxes

By choosing a developer equity model, Northeastern is able to preserve debt capacity for academic facilities development rather than student housing and deliver the project on the City's required timeline.

FCDC 2 Arrangement details

Northeastern agrees to provide an annual report on the number of students residing in the Columbus Ave Student Housing project through the University Accountability Report for Student Housing, which it submits to the City twice per year. Given the wait list for on-campus beds (approximately 800-1,000 after the housing lottery), the market analysis conducted by ACC, and the competitive rent that ACC will be charging, we do not expect that there will be excess capacity. If any beds are not rented by Northeastern University students at the conclusion of one year, the University and ACC will work with the City to resolve the vacancies.

FCDC 3 Competitive rents

Based on the market analysis conducted, ACC is confident that the apartment layouts and amenities offered as part of the Project will entice students out of the rental market.

FCDC 4 Procurement and hiring commitments

ACC and its contractor, John Moriarty Associates (JMA), will strive for the same procurement goals that the University committed to in its IMP Cooperation Agreements. The University will work with JMA to promote job and contracting opportunities though the University's annual job and vendor fairs, as well as through established community connections.

FCDC 5 Cooperation Agreement

The City of Boston will be taking the lead on the development of the Cooperation Agreement.

FCDC 6 Percent students housed and enrollment numbers

The number of Northeastern students to be housed with the development of this Project is addressed in Chapter 4 of the IMP Amendment.

Fenway Civic Association – P.O. Box 230435 – Astor Station – Boston, MA 02123

March 1st, 2016

Katelyn Sullivan
Project Manager
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Via Email

Re: Northeastern University - Columbus Avenue Student Housing

Dear Ms. Sullivan,

The Fenway Civic Association is the Fenway neighborhood's oldest and all-volunteer neighborhood group that accepts no public or developer funds. Founded in 1961, our mission is to promote a safe and vital neighborhood that serves the interest of its residents.

Upon review of the Columbus Avenue Student Housing project (dormitory, the project) submitted by Northeastern University (NEU, the university) on January 21st, 2016 , the Fenway Civic Association (FCA) offers the following comments:

<u>The Fenway Civic Association views sufficient on campus student housing as the number one issue of concern and community benefit with the most dramatic impact on the Fenway's quality of life.</u>

Thusly, FCA is supportive of this proposed 800 bed project for exceeding the requirement in the Cooperation Agreement: that within the first five years of the Institutional Master Plan (IMP) a new minimum 600 bed dormitory be constructed and occupied; toward a 10 year goal of creating a minimum of 1,000 beds.

With regard to the site and scale of the project, FCA did not object to concept and location of the proposed project within the IMP, and we believe the university must have the ability with zoning allowances to construct sufficient dormitory beds. However, as the project is not located in the Fenway, we defer ultimate judgment to the neighborhood organizations and abutters in Lower Roxbury on the appropriateness of the proposed increase in scale from the approved IMP concept.

During the IMP process FCA proposed a requirement for a follow-up housing study to gauge the level of success achieved by the university toward resolving the student housing problem. We would like to again request this **FCA 1**
study to be conducted one year after the occupancy of this project; as the university, in conjunction with the

completed Grandmark dormitory, will have added 1,800+ beds from the time of the previous housing study. A follow-up study would provide a tangible metric for determining how well NEU has addressed the student housing problem and to what extent the university may need to exceed the 1,000 new bed goal required by the IMP.

Thank you for the opportunity to offer these comments.

Sincerely,

Matthew A. Brooks, IMPTF member, Fenway Civic Association

CC: City Councilor Josh Zakim
CC: Jacob Wessel, Mayor's Office of Neighborhood Services

FENWAY CIVIC ASSOCIATION

FCA 1 Follow-up housing study

Northeastern is committed to funding a housing impact study in order to examine any changes in the impact of Northeastern students on local rental housing stock. It makes sense to conduct this study after the Project has been on line for at least one year. At that time, Northeastern will have added approximately 1,500 new beds (720 at the Grandmarc/East Village development and approximately 800 at the proposed Project).

Katelyn Sullivan <katelyn.sullivan@boston.gov>

Northeastern Comments

Patricia Flaherty <pflaherty@missionhillnhs.org> Thu, Feb 25, 2016 at 2:21 PM
To: Katelyn Sullivan <katelyn.sullivan@boston.gov>
Cc: "rep.jeffreysanchez@hou.state.ma.us" <rep.jeffreysanchez@hou.state.ma.us>, Josh Zakim <josh.zakim@boston.gov>, Jacob Wessel <jacob.wessel@boston.gov>

NHS MISSION HILL NEIGHBORHOOD HOUSING SERVICES

February 25, 2016

Katelyn Sullivan

Boston Redevelopment Authority

Via email: Katelyn.Sullivan@boston.gov

Dear Katelyn:

Given the short comment period from the Task Force Meeting this week to when comments are due, please allow this email to serve as formal comment from Mission Hill Neighborhood Housing Services.

At its meeting on February 25, 2016, the Executive Committee voted on behalf of the organization to go on record in support of the Northeastern dorm proposal know as "Columbus Avenue Student Housing".

As many are aware, Mission Hill Neighborhood Housing Services and many of our Mission Hill neighbors and Mission Hill community based organizations led the advocacy for need for additional student housing to be prioritized in the Northeastern University IMP. That effort resulted in the IMP requirement that Northeastern build at least 600 dorm beds in the first 5 years of the IMP. Northeastern intends to meet and exceed that commitment with this proposal of 798 beds in 207 apartment style units. Mission Hill Neighborhood Housing Services supports the production of beds and the timeline proposed. We were never wedded to a particular site and expressed the need for multiple sites in the past. Nevertheless, at this juncture, the creation of beds at the Burke Street lot is the only development plan that could come close to meeting the timeline obligation, it was included in the IMP as a proposed dorm site at the 600 bed density and we support the project.

We do have some comments and concerns that we believe should be addressed in a public forum through the official Task Force process. They are as follows:

- This is one of the first attempts to come up with a successful model for the private development of a dorm on college property in Boston. As such, it is important that the process is transparent and all efforts are made share information and think out potential problems collectively with the impacted communities. That effort needs to start immediately. MHNHS 1

- We have received very little information on how the partnership will work. We would like to understand the ground lease for a few reasons. First the ground rent may add to the cost of the project thus making the dorm beds less appealing to students now living off campus and their families. These beds need to compete economically with the private student housing market. Additionally we think the ground lease is one tool that can be used to pass the obligations of the institution to the developer/owner of the dorm building. These include the procurement and hiring commitments related to local m/wbes. MHNHS 2

- We want to see a successful marketing effort to Northeastern University students currently living off campus in our residential housing stock. We think task force members and neighbors should be included in this discussion. MHNHS 3 We are pleased with the change to apartment style dorms to attract upper class students back to campus. We also know further discussion to ensure a similar code of contact on campus and off campus is needed. MHNHS 4

- We want to see and comment on the Cooperation Agreement for this project in a public Task Force forum. MHNHS 5 Cooperation Agreement should put forth how the obligations of the institution are passed through the IMP to th developer/owner. It should also address what happens if the beds are not leased to Northeastern students, how that is going to be monitored, and what the consequences will be.

- We'd like the criteria for selecting this particular dorm developer/owner to be shared and some measure not only included in the ground lease but also in the Cooperation Agreement for this developer/owner or future. MHNHS 6

- We'd like to see in the Cooperation Agreement the total percentage of NU students to be house with the inclusion of this dorm and the total undergraduate enrollment numbers projected at the opening of this dorm a during the IMP reiterated. MHNHS 7

On behalf of Mission Hill Neighborhood Housing Services,

Patricia Flaherty

Member of the NU Task Force

Patricia S. Flaherty

Executive Director

Mission Hill Neighborhood Housing Services

M Level / One Brigham Circle

1620 Tremont Street

Mission Hill, MA 02120

pflaherty@missionhillnhs.org

617-566-6565

MISSION HILL NEIGHBORHOOD HOUSING SERVICES

MHNHS 1 Transparent process

Both Northeastern University and American Campus Communities are committed to conducting a comprehensive and transparent community outreach program and public review process. A follow-up task force meeting was conducted on March 30, 2016, and an additional meeting will be scheduled during the DPIR comment period to continue discussions with the community.

MHNHS 2 Ground lease

Northeastern and ACC are entering into a long-term partnership. Northeastern will ground lease the land to ACC, and ACC will own and operate the building. ACC will be responsible for all of the operations of the building, including setting rents and marketing the property. ACC is planning to invest significant equity in the Project and has carefully studied the local housing market, including surveying and conducting focus groups with Northeastern students, including those who currently live off campus. From this market research, and in anticipation of the competitive rents that the Project will offer, ACC has confirmed that there is a significant demand to draw approximately 800 students to the new apartment style housing. Northeastern is confident that demand exists for these additional beds and that there are over 800 students who are interested in on-campus housing this year.

ACC and its contractor, John Moriarty Associates (JMA), will strive for the same procurement goals that the University committed to in its IMP Cooperation Agreements. The University will work with JMA to promote job and contracting opportunities though the University's annual job and vendor fairs, as well as through established community connections.

MHNHS 3 Marketing effort

ACC and Northeastern are developing a marketing plan that will target upperclassmen, and facilitate opportunities to bring off-campus students back to on-campus living environments. The program and unit mix are already designed to respond to the stated preferences of students moving off campus seeking more privacy and multiple price points. The marketing plan will identify and strategically market to three key markets; 1.) rising middlers, 2.) off-campus upperclassmen, and 3.) students returning from co-ops. We intend to utilize incentives, priority leasing periods, and a co-op notification process to market to these student segments.

MHNHS 4 Code of conduct

Please see Section 2.3.

MHNHS 5 Cooperation agreement

The City of Boston will take the lead on the development of the Cooperation Agreement. Northeastern agrees to provide an annual report on the number of students residing in the Columbus Ave Student Housing project through the University Accountability Report for Student Housing, which it submits to the City twice per year. Given the wait list for on-campus beds (approximately 800 -1000 after the housing lottery) the market analysis conducted by ACC, and the competitive rent that ACC will be charging, we do not expect that there will be excess capacity. If any beds are not rented by Northeastern University students at the conclusion of one year, the University and ACC will work with the City to resolve the vacancies. However, ACC is highly confident in the market demand for the Project, and considers this scenario where the building is not filled exclusively with Northeastern students highly unlikely.

MHNHS 6 Developer criteria

ACC was selected based on their extensive and singular focus on student housing development and operational experience, particularly in urban markets. ACC was also selected based on the strength of the design and construction teams that they proposed. The RFP specified the following requirements that potential developers would be measured against:

- **Experience** – A strong track record of success in the following areas:
  - Development, marketing and long-term management and maintenance of similarly-scaled, urban, student housing projects.
  - Real estate development projects in the City of Boston or similar urban areas.
  - Experience with institutional academic partners;
  - Strong relationships with local communities; and
  - Examples of previous projects that successfully integrate with existing university housing programs.
- **Financial Strength** – A strong balance sheet demonstrating the financial capability to execute and operate a project of this magnitude.
- **Quality Team** - A strong commitment of resources (financial and staff) to this project.

The ground lease between Northeastern University and ACC will only permit ACC to transfer or sell its interest in the Project to a qualified assignee. Qualified assignees shall have a minimum net worth and student housing management experience sufficient to ensure that the project continues to be high quality student housing that is well managed and maintained

MHNHS 7 Percentage of NU students

The University's total undergraduate enrollment is 18,800. This total includes students living outside of the Boston area on co-op and studying abroad; in general due to the dynamic elements of co-op, study abroad and other student activities, in-region student population general hovers around 14,000.

The total number of university–controlled student beds will be 9,197, including approximately 600 beds in the Master Leased Property Program and 38 new beds that will come online in Fall 2016. With the addition of the proposed approximately 800 beds in the Columbus Ave Student Housing project, the total student beds available would be 9,997. Cumulatively, Northeastern will offer housing in Boston for 53% of its total undergraduate student body and 71% of the Northeastern undergraduates in Boston at any one time.

A Northeastern University alum, a long-time resident of the South End and Roxbury, and president of the Chester Square Area Neighborhood Association, I'm pleased to comment on this proposal to build housing for NU students on Burke St. We are grateful the City of Boston and NU have committed to new student housing, and welcome the opportunity to partner with NU to transform parking lots into vibrant elements of our community. That said, I must express considerable concern with the scale of this project (twice as tall as NU's Institutional Master Plan indicates), and ask that this project not move forward before planning and agreements to insure that both students and residents of the larger community experience an improved environment for walking, cycling, transit, and outdoor activity. **CB 1**

The area is ideal for transit-oriented development. When it was laid out, in the late 1800s, there were no automobiles. But today's streetscape (generous travel lanes, parking along most curbs and minimal sidewalks with closet-sized openings for trees) is largely the result of car-centric planning in the 1900s. Occasional wide sidewalks and bike lanes have appeared more recently.

My household and many in the neighborhood are car-free, thanks to so many alternatives for getting around. But the car-free life is complicated; and new development should be challenged to improve conditions for those who choose car-free. NU's IMP shows many existing transit services, but doesn't acknowledge overcrowded trains and busses. **CB 2** The plan notes locations where pedestrians bleed into the street from congested sidewalks. The plan proposes "a landscaped crossing of the public transit rail line to better knit the Roxbury and Fenway communities and enhance access for persons with disabilities" a project I understand has been abandoned. **CB 3**

What might be done to make the car-free experience more attractive and effective? **CB 4**

- Wide sidewalks to allow large numbers of people to walk comfortably
- Reserved lanes for buses and bicycles
- Metered parking and drop-off/pick-up space at curb near building entry (to load and unload a Zipcar, to get in and out of a cab or Uber safely, to accommodate visitors)
- Bike parking, both inside building (for residents) and out front (for visitors)
- Green space and seating between sidewalk and building.
- Constrain height of buildings to allow sunshine on SW Corridor Park.
- Improve pedestrian paths over the Southwest Corridor (possibly developing Camden St crossing to provide safe and comfortable passage over trains and to allow legal/paid access to Orange Line).
- Improve continuity of Southwest Corridor bicycle path between Massachusetts Ave and Ruggles Station.
- Improve visibility of Ruggles Station, to make bus and train connections obvious.
- Space/programming to feed interest in cycling/walking/transit and also work with youth from the community (consider, for instance, workshop space for a program like Bikes Not Bombs).
- What can we learn from International Village, where students live in a tower at the campus edge? **CB 5** What are their travel patterns? What observations do students have concerning getting around? Why has ground-floor retail not been more

successful? How could the building be better integrated with the community? Would we expect the same for "student apartments" at Burke St?

While NU builds mega-floor-space, we're seeing new housing along Columbus, Tremont, and connecting streets, and "Tremont Crossing" proposes 1.4 million square feet of new activity at Ruggles. Beyond is new development along Melnea Cass to Dudley. We're in the middle of a blizzard of transformation. Let's do it right! NU is clearly a leader for our community. Please show us your best! I'm happy to help in any way I can and hope you'll call on me.

Sincerely,
Carol W Blair

cc: Councilors Tito Jackson, Michelle Wu, and Bill Linehan; Alison Frazee, Boston Preservation Alliance; Michelle Maniscalo, South End News

CAROL BLAIR

CB 1 Improved environment for walking, cycling, transit and outdoor activity

Northeastern and ACC share an interest in improving the safety of travel, as well as the travel experience for pedestrians and bicyclists

CB 2 Overcrowded trains

Northeastern is working with the MBTA on its platform extension project which is designed to add capacity for additional commuter rail trains to service Ruggles station. Additionally, Northeastern is planning an enhanced pedestrian crossing to create better passage between the Fenway and Roxbury neighborhoods.

CB 3 Landscaped crossing

The landscaped crossing of the rail lines has not been abandoned, but rather revised. The original project offered to two points of entry on the Fenway side of the tracks, whereas the revised crossing has a single point of entry on each side of the tracks. This project is currently in review by the rail agencies with an expected completion date of 2018, before the Columbus Ave Student Housing project is complete.

CB 4 Car free experience

Northeastern and ACC share an interest in improving the safety of travel, as well as the travel experience for pedestrians and bicyclists, particularly as the majority of the students living in the proposed development will not rely on cars for their primary mode of transportation.

The building has been designed to accommodate bicycle use. Each of the residential apartment units will be provided wall-mounted bike storage with a combined capacity totaling 590 bikes (or 74 percent of building residents). An additional 44 bike parking spaces will be provided in a secure, covered bicycle storage room at the ground level that will serve residents, visitors, and guests. Outdoor storage for up to 48 bicycles around the Project site for building visitors and customers of the commercial space. A self-service bicycle repair station will be provided within the ground-floor bicycle storage room.

Northeastern is currently working with Howard Stein Hudson to study the pedestrian experience on Columbus Avenue between Ruggles Street and Camden Street. The study will offer recommendations to enhance pedestrian safety and the overall pedestrian experience. The University will then work with the Boston Transportation Department and the Boston Redevelopment Authority to explore these recommendations and determine how to best to act on them.

CB 5 Lessons from International Village

International Village was built at a time when the parcel was considered a planned development area, which did not have a defined identity. This proposed development will be better integrated with the community given the location, which shares the same corridor of frontage with existing private residences and local businesses.

The University and ACC hope to identify a ground floor commercial use that serves both the local community and the student community. With the ISEC project, major renovation of Carter Field, and the development of approximately 800 student beds, the pedestrian traffic on Columbus Avenue will increase significantly which will be a benefit to any retail on the street.

Katelyn Sullivan <katelyn.sullivan@boston.gov>

Fwd: Northeastern University Dormitory Dvlp.

1 message

Tammy Donovan <tammy.donovan@boston.gov> Mon, Feb 8, 2016 at 10:05 AM
To: Jonathan Greeley <jonathan.greeley@boston.gov>, Katelyn Sullivan <katelyn.sullivan@boston.gov>, Teresa Polhemus <teresa.polhemus@boston.gov>

There is a meeting on this tonight - please see the email below.

thanks

Tammy Donovan
Special Assistant to the Executive Director/Secretary
617-918-4388

BRA/EDIC
One City Hall Square | Boston, MA 02201
BostonRedevelopmentAuthority.org

---------- Forwarded message ----------
From: **Melvin H King** <mhking@mit.edu>
Date: Sat, Feb 6, 2016 at 12:08 PM
Subject: Fwd: Northeastern University Dormitory Dvlp.
To: "byron.rushing@mahouse.gov" <byron.rushing@mahouse.gov>, Kenneth E Kruckemeyer <kek@mit.edu>, "Cc: Theodore Landsmark Landsmark" <Tammy.Donovan@boston.gov>, "brian.golden@boston.gov" <brian.golden@boston.gov>, **John Barros** <john.barros@boston.gov>

Sent from my iPhone
Sent from my iPhone

Begin forwarded message:

> **From:** Melvin H King <mhking@mit.edu>
> **Date:** February 6, 2016 at 11:56:04 AM EST
> **To:** Scotland <knowledgeinsight03@gmail.com>
> **Cc:** Highland Park Neighborhood Watch <highland-park-neighborhood-watch@googlegroups.com>
> **Subject: Re: Northeastern University Dormitory Dvlp.**
>
> Tell northeastern to build their
> Housing over the parking they need to value housing students over housing cars **MK 1**
> Sent from my iPhone
>
> On Feb 6, 2016, at 11:34 AM, "Scotland" <knowledgeinsight03@gmail.com> wrote:
>
>> Northeastern has filed to begin the review of an IMP Amendment and Large Project Review for the Burke Street/Columbus Avenue dormitory.

A meeting to gather feedback on the proposal on **February 8, 2016 at 6PM in the Alumni Center at 716 Columbus Avenue, 6th floor, Boston, MA 02120.**

-There will be a presentation on the Proposed Project,
-time for Task Force discussion and;
-a portion of time for community questions and comment.

This is a compilation of messages from Katelyn at the CoB that I put together to summarize the NU meeting.

katelyn.sullivan@boston.gov

End Message

--

MELVIN H KING

MK 1 Prioritize housing over parking

The proposed residential Project does not include parking.

Katelyn Sullivan
Boston Redevelopment Authority
Boston, Mass. 02201

March 11, 2016

Comments on the Columbus Ave/Burke St. Dormitory IMPNF

Dear Katelyn,

I realize these comments are quite late so I hope they still can be considered. Unfortunately for me the March 1 deadline came up very quickly after the Feb.23rd public meeting. The significance of this "residential infill" project is that it isn't on the campus but within a neighborhood; an historic and vibrant neighborhood but also in transition, with few owner occupants. Northeastern has steadily expanded across the tracks; this plan undoubtedly moves the boundaries further. There are clearly impacts on the streetscape but more complicated to understand are the impacts on the community of such a huge facility with high end amenities, will there be destabilizing consequences?

The 230 ft. height of the proposed dormitory related to the scale of the nearby historic buildings **AP 1**
and to the narrow streets, Burke and Coventry is a concern. I understand that state funding is not **AP 2**
involved however federal and state approvals are required; specifically FAA approval and a DEP permitted sewer connection is likely (Table 2-1,Anticipated Permits and Approvals).
Massachusetts Historical Commission review at this early stage would be most helpful and in the **AP 3**
spirit of full compliance I would urge ACC and Northeastern to submit a PNF to the agency. I believe MHC should be given the opportunity to assess the impacts of the proposed dormitory on the adjacent properties in the Lower Roxbury NR District.

From Secretary Galvin's website-

"Any new construction projects or renovations to existing buildings that require funding, licenses, or permits from any state or federal governmental agencies must be reviewed by the Massachusetts Historical Commission (MHC) for impacts to historic and archaeological properties. It is the nature of the federal or state agency involvement that triggers MHC review, not listing in the National or State Registers of Historic Places."

"Any projects that require funding, licenses, or permits from any state agency must be reviewed by MHC in compliance with Massachusetts General Laws Chapter 9, sections 26-27C." Sewer connection permits are included on the list.

"MHC review provides project proponents with the opportunity to ensure that their projects are planned responsibly, so that development takes place without causing harm to historic properties and important archaeological sites. ***Even where a project does not require federal or state funding, licensing, or permitting, the consultation process can offer a forum in which to discuss the issues and can assist the proponent in addressing community and preservation concerns."***

The Lower Roxbury National Register District was designated in 1995 and includes several buildings on the same block between Columbus and Tremont as the proposed project. Specifically the c. 1899 Classical Revival apartment building at 750-752 Columbus Avenue and the 3-4 story residential block on Tremont directly abutting the proposed dormitory.

Notably, several pages in the NR Nomination are devoted to the very special 1011-1033 Tremont Street block (photographs included), a rich and dense variety of architectural styles. The Greek Revival/Italianate 1011-1019 Tremont red brick building at the corner of Burke and Tremont "likely dates from the 1850's" according to the NR form and is the oldest in the Lower Roxbury district. The block is special for its traditional urban character, narrow buildings with multiple entrances, totally the opposite of the typical institutional superblock. There is a variety of retail on the ground floor, none of it national chains.

The dormitory will be extremely close to the rear of these Tremont Street buildings. In the PNF the project's design is related to Columbus Avenue and the institution's new science building across the street, however the very tall dorm will have a large impact on Tremont and especially on the two side streets-Coventry and Burke. What is missing from the PNF are elevations from those other perspectives- the rear of the Tremont residences, the homes across the street on the other side of Burke and the Coventry elevation. **AP 4**

ADDITIONAL QUESTIONS

On page 2-1 in the paragraph about enrollment, the difference between the numbers of beds available in 2015 (9,161) and the number of students housed on campus (8,707 + 101 grad students) is confusing. Are there unoccupied rooms? Also two different numbers are given for the Master Leased beds (553 and 593). **AP 5**

Several time the phrase is repeated that the future "apartments are <u>expected</u> to be restricted to student housing uses. This is also confusing, is there a possibility that the building will be occupied by non-students? **AP 6**

Sincerely,

Alison Pultinas

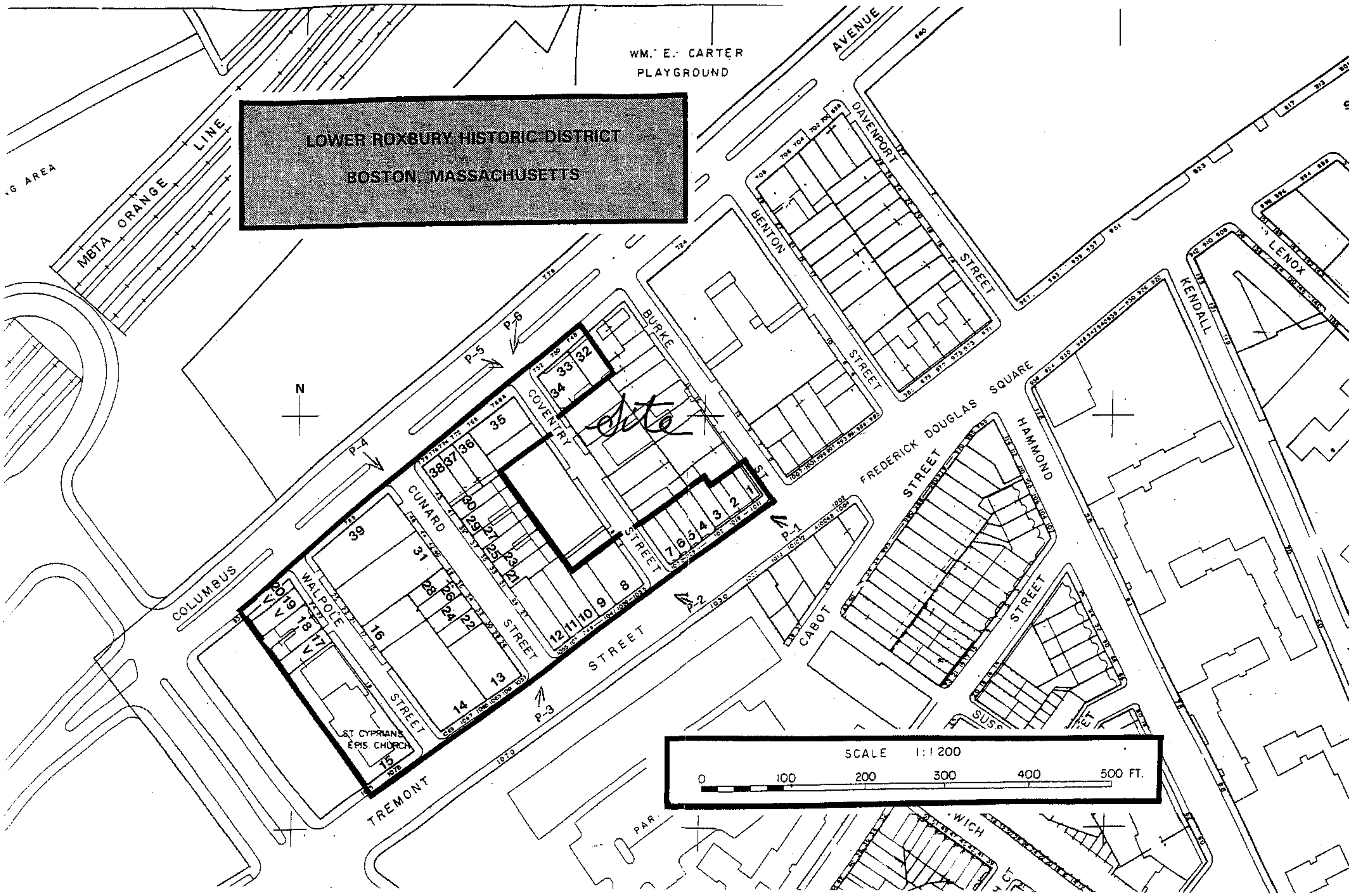
Alison Pultinas

81 LAWN ST ROXBURY 02120

Cc: City Councilor Tito Jackson

Brona Simon/MHC

David Carlson/BCDC



LOWER ROXBURY HISTORIC DISTRICT
BOSTON, MASSACHUSETTS
WM. E. CARTER
PLAYGROUND
MBTA ORANGE LINE
AVENUE
DAVENPORT
STREET
BENTON
STREET
BURKE
ST
COVENTRY
STREET
CUNARD
STREET
WALPOLE
STREET
ST CYPRIANS
EPIS. CHURCH
COLUMBUS
TREMONT
STREET
CABOT
FREDERICK DOUGLAS SQUARE
STREET
HAMMOND
STREET
KENDALL
LENOX
N
P-1
P-2
P-3
P-4
P-5
P-6
site
SCALE 1:1200
0
100
200
300
400
500 FT.

1. 1011-1013 Tremont St. thru 1057-1063 Tremont St. View looking northwest. (Photograph: Susan Cessacci, ca. 1994)

March 2016 1033-1011 Tremont

ALISON PULTINAS

AP 1 Height

The building height can be described by three distinct categories that speak to the relationship between people and the areas of the building which are experienced from different distances. These distances are: close-, mid-, and long-range. In each case, the façade and massing are designed to address individuals at the scale which most closely affects their degree of experience. The character of Burke and Coventry Streets is and will be defined by the nature of the close-range experience – the proposed Project contains active amenity spaces along Burke Street to reinforce a sense of transparency and openness at the street level. At both Burke and Coventry Streets, close attention will be paid to the articulation, materiality, and treatment of façade as it meets the first floor and becomes an element of the pedestrian realm. The design team is exploring options for the introduction of trees along Burke Street to further soften the pedestrian edge. At the mid-range distance, the building massing weaves itself into the existing built environment along Columbus by stepping down to the height of an adjacent 8-story building. The building is buffered by existing low-rise buildings along Tremont Avenue. For individuals traveling along Columbus or Tremont Avenues, the intersections with Coventry and Burke Streets will preserve their existing scale and serve as a transition to the taller building height concentrated toward the middle of the block. The 17-story mass on Coventry Street will be clad with a material that has a color and texture reminiscent of the surrounding built environment. The size and placement of window openings will allow the building skin to feel light and transparent when viewed from a mid-range distance. The totality of the building will be experienced mostly by individuals viewing the building from a long-range distance, where its height will be viewed in context of nearby high-rises such as International Village, the ISEC building, GrandMarc, MassArt, and others.

AP 2 Federal and state approvals

A DEP Sewer Connection Permit is not anticipated to be required, and although FAA approval will be required prior to construction, this approval does not trigger MEPA or MHC review.

AP 3 MHC review

Review by the Massachusetts Historical Commission (MHC) is not anticipated at this time. In the event that state or federal licenses, permits, approvals or funding is involved, the Proponent will file an MHC Project notification form to initiate review of the Project.

AP 4 Elevations and perspectives

See Chapters 2 for additional elevations, and Chapter 6 for additional renderings of the Project.

AP 5 Student enrollment

Please see response to comment MHNHS 7.

AP 6 Building occupants

ACC is planning to invest significant equity in the Project and has carefully studied the local housing market, including surveying and conducting focus groups with Northeastern students, including those who currently live off campus. From this market research, and in anticipation of the competitive rents that the Project will offer, ACC has confirmed that there is a significant demand to draw approximately 800 students to the new apartment style housing. Northeastern is confident that demand exists for these additional beds on campus because there is currently a waiting list of over 800 students who are seeking on-campus housing this year.

---------- Forwarded message ----------
From: <kentico@cityofboston.gov>
Date: Sat, Mar 5, 2016 at 2:52 PM
Subject: Zoning Viewer Contact form
To: zoningquestions@boston.gov

CommentsSubmissionFormID: 60ParcelId: 0901406000Browser Agent Info: Mozilla/5.0 (Windows NT 6.1; WOW64; rv:44.0) Gecko/20100101 Firefox/44.0Form inserted: 3/5/2016 2:51:56 PMForm updated: 3/5/2016 2:51:56 PMDocument Name: Zoning Viewer ContactDocument Name Path: /Zoning/Zoning Viewer ContactOrigin Page Url: /zoning/zoning-contact-us?Id=0901406000First Name: Stephen WLast Name: WuycheckEmail: swuycheck@gmail.comPhone: (772) 216-4913Comments:

Hello, I just read this article and am very concerned on how this will impact my community. http://www.northeastern.edu/news/2016/01/northeastern-announces-latest-plans-for-new-residence-hall/ This building, located on Burke Street, between Columbus and Tremont Street does not fit in with the community, which is mostly 4 story building, with a few 5-7 story residential buildings and dorms. How is such a large building, 20 stories tall, being built / approved which goes against the entire architectural identity and restrictions previously imposed on developers? Has this building already been approved or will there be a method to oppose this colossal design and architectural eyesore. SW 1

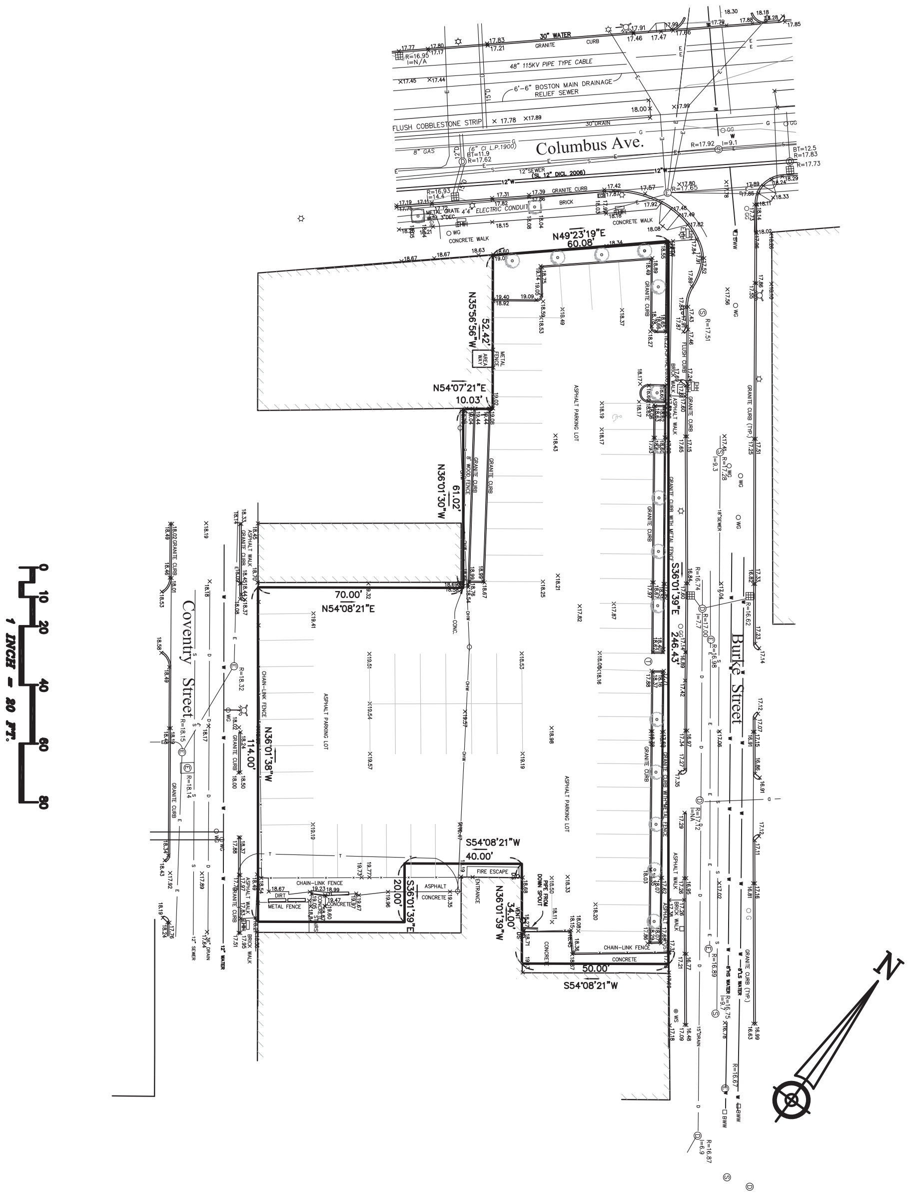
STEPHEN WUYCHECK

SW 1 Height

Please see the response to AP 1.

Appendix A

Site Survey



R.E. Cameron & Associates, Inc.
Land Surveyors Civil Engineers
681 Washington Street, Norwood Massachusetts 02062
Tel.(781) 769-1777 Fax (781) 769-8644

TOPOGRAPHIC PLAN
Northeastern University
Burke Street Parking Lot
BOSTON, MASSACHUSETTS

Scale: 1" = 20'	Drawn By: RPH	Job: RPH31/4
Date: 2	Checked By: SDC	Dwg:

REVISION – DATE

JOB NO.

4121

Appendix B

Transportation Appendix

Available Upon Request

Appendix C

Wind Appendix

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
1	A	Spring	16		Walking	24		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
	B	Spring	14	-12%	Standing	21	-12%	Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
2	A	Spring	15		Standing	23		Acceptable
		Summer	12		Sitting	20		Acceptable
		Fall	13		Standing	22		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	14		Standing	22		Acceptable
	B	Spring	21	+40%	Uncomfortable	30	+30%	Acceptable
		Summer	18	+50%	Walking	26	+30%	Acceptable
		Fall	19	+46%	Walking	28	+27%	Acceptable
		Winter	21	+50%	Uncomfortable	31	+35%	Acceptable
		Annual	20	+43%	Uncomfortable	29	+32%	Acceptable
3	A	Spring	18		Walking	27		Acceptable
		Summer	15		Standing	23		Acceptable
		Fall	16		Walking	25		Acceptable
		Winter	17		Walking	28		Acceptable
		Annual	17		Walking	26		Acceptable
	B	Spring	15	-17%	Standing	24	-11%	Acceptable
		Summer	13	-13%	Standing	20	-13%	Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	16		Walking	25	-11%	Acceptable
		Annual	15	-12%	Standing	24		Acceptable
4	A	Spring	20		Uncomfortable	30		Acceptable
		Summer	17		Walking	25		Acceptable
		Fall	19		Walking	28		Acceptable
		Winter	20		Uncomfortable	31		Acceptable
		Annual	19		Walking	29		Acceptable
	B	Spring	24	+20%	Uncomfortable	34	+13%	Unacceptable
		Summer	19	+12%	Walking	25		Acceptable
		Fall	22	+16%	Uncomfortable	31	+11%	Acceptable
		Winter	24	+20%	Uncomfortable	33		Unacceptable
		Annual	22	+16%	Uncomfortable	31		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
5	A	Spring	18		Walking	27		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	17		Walking	25		Acceptable
		Winter	18		Walking	28		Acceptable
		Annual	17		Walking	26		Acceptable
	B	Spring	21	+17%	Uncomfortable	30	+11%	Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	19	+12%	Walking	27		Acceptable
		Winter	21	+17%	Uncomfortable	30		Acceptable
		Annual	19	+12%	Walking	28		Acceptable
6	A	Spring	14		Standing	23		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	13		Standing	23		Acceptable
		Annual	13		Standing	22		Acceptable
	B	Spring	17	+21%	Walking	25		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15	+15%	Standing	23		Acceptable
		Winter	17	+31%	Walking	26	+13%	Acceptable
		Annual	16	+23%	Walking	24		Acceptable
7	A	Spring	14		Standing	22		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	14		Standing	22		Acceptable
	B	Spring	17	+21%	Walking	24		Acceptable
		Summer	14	+17%	Standing	19		Acceptable
		Fall	16	+23%	Walking	23		Acceptable
		Winter	18	+29%	Walking	25		Acceptable
		Annual	16	+14%	Walking	24		Acceptable
8	A	Spring	12		Sitting	21		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	13		Standing	23		Acceptable
		Annual	12		Sitting	21		Acceptable
	B	Spring	16	+33%	Walking	23		Acceptable
		Summer	14	+40%	Standing	19	+12%	Acceptable
		Fall	15	+25%	Standing	22		Acceptable
		Winter	16	+23%	Walking	24		Acceptable
		Annual	15	+25%	Standing	23		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
9	A	Spring	12		Sitting	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	12		Sitting	21		Acceptable
		Annual	11		Sitting	19		Acceptable
	B	Spring	17	+42%	Walking	25	+25%	Acceptable
		Summer	15	+50%	Standing	21	+31%	Acceptable
		Fall	16	+45%	Walking	23	+28%	Acceptable
		Winter	16	+33%	Walking	25	+19%	Acceptable
		Annual	16	+45%	Walking	24	+26%	Acceptable
10	A	Spring	13		Standing	21		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	23		Acceptable
		Annual	12		Sitting	21		Acceptable
	B	Spring	17	+31%	Walking	24	+14%	Acceptable
		Summer	14	+40%	Standing	20	+18%	Acceptable
		Fall	16	+33%	Walking	23	+21%	Acceptable
		Winter	16	+23%	Walking	24		Acceptable
		Annual	16	+33%	Walking	23		Acceptable
11	A	Spring	13		Standing	17		Acceptable
		Summer	10		Sitting	13		Acceptable
		Fall	12		Sitting	16		Acceptable
		Winter	13		Standing	18		Acceptable
		Annual	12		Sitting	17		Acceptable
	B	Spring	20	+54%	Uncomfortable	27	+59%	Acceptable
		Summer	17	+70%	Walking	23	+77%	Acceptable
		Fall	19	+58%	Walking	26	+62%	Acceptable
		Winter	20	+54%	Uncomfortable	27	+50%	Acceptable
		Annual	19	+58%	Walking	26	+53%	Acceptable
12	A	Spring	9		Sitting	15		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	14		Acceptable
		Winter	9		Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	13	+44%	Standing	18	+20%	Acceptable
		Summer	10	+43%	Sitting	14	+17%	Acceptable
		Fall	12	+50%	Sitting	16	+14%	Acceptable
		Winter	13	+44%	Standing	18	+12%	Acceptable
		Annual	12	+33%	Sitting	17	+13%	Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
13	A	Spring	8		Sitting	13		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	7		Sitting	12		Acceptable
		Winter	8		Sitting	14		Acceptable
		Annual	7		Sitting	13		Acceptable
	B	Spring	11	+38%	Sitting	17	+31%	Acceptable
		Summer	9	+50%	Sitting	13	+30%	Acceptable
		Fall	10	+43%	Sitting	16	+33%	Acceptable
		Winter	11	+38%	Sitting	17	+21%	Acceptable
		Annual	11	+57%	Sitting	16	+23%	Acceptable
14	A	Spring	7		Sitting	12		Acceptable
		Summer	6		Sitting	9		Acceptable
		Fall	7		Sitting	11		Acceptable
		Winter	7		Sitting	12		Acceptable
		Annual	7		Sitting	11		Acceptable
	B	Spring	16	+129%	Walking	24	+100%	Acceptable
		Summer	12	+100%	Sitting	18	+100%	Acceptable
		Fall	15	+114%	Standing	23	+109%	Acceptable
		Winter	18	+157%	Walking	27	+125%	Acceptable
		Annual	16	+129%	Walking	24	+118%	Acceptable
15	A	Spring	10		Sitting	17		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	15	+50%	Standing	22	+29%	Acceptable
		Summer	12	+50%	Sitting	19	+46%	Acceptable
		Fall	14	+40%	Standing	22	+38%	Acceptable
		Winter	15	+36%	Standing	23	+28%	Acceptable
		Annual	14	+40%	Standing	22	+38%	Acceptable
16	A	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	12		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	17	+70%	Walking	24	+50%	Acceptable
		Summer	14	+75%	Standing	19	+58%	Acceptable
		Fall	15	+50%	Standing	22	+38%	Acceptable
		Winter	16	+60%	Walking	24	+41%	Acceptable
		Annual	16	+60%	Walking	22	+38%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
17	A	Spring	10		Sitting	16		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	26	+160%	Uncomfortable	37	+131%	Unacceptable
		Summer	20	+186%	Uncomfortable	28	+133%	Acceptable
		Fall	24	+167%	Uncomfortable	34	+127%	Unacceptable
		Winter	28	+180%	Dangerous	40	+150%	Unacceptable
		Annual	25	+178%	Uncomfortable	36	+140%	Unacceptable
18	A	Spring	10		Sitting	15		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	10		Sitting	15		Acceptable
	B	Spring	16	+60%	Walking	25	+67%	Acceptable
		Summer	13	+62%	Standing	20	+54%	Acceptable
		Fall	15	+67%	Standing	23	+53%	Acceptable
		Winter	18	+80%	Walking	27	+69%	Acceptable
		Annual	16	+60%	Walking	25	+67%	Acceptable
19	A	Spring	7		Sitting	12		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	7		Sitting	12		Acceptable
		Winter	7		Sitting	13		Acceptable
		Annual	7		Sitting	12		Acceptable
	B	Spring	19	+171%	Walking	27	+125%	Acceptable
		Summer	17	+183%	Walking	23	+130%	Acceptable
		Fall	18	+157%	Walking	26	+117%	Acceptable
		Winter	19	+171%	Walking	28	+115%	Acceptable
		Annual	18	+157%	Walking	26	+117%	Acceptable
20	A	Spring	9		Sitting	13		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	12		Acceptable
		Winter	9		Sitting	13		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	20	+122%	Uncomfortable	28	+115%	Acceptable
		Summer	17	+143%	Walking	24	+118%	Acceptable
		Fall	18	+125%	Walking	26	+117%	Acceptable
		Winter	18	+100%	Walking	26	+100%	Acceptable
		Annual	18	+125%	Walking	26	+100%	Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
21	A	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	14		Standing	19		Acceptable
		Summer	12	+20%	Sitting	16		Acceptable
		Fall	13		Standing	18		Acceptable
		Winter	15	+15%	Standing	21		Acceptable
		Annual	14	+17%	Standing	19		Acceptable
22	A	Spring	11		Sitting	17		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	11		Sitting	16		Acceptable
	B	Spring	15	+36%	Standing	23	+35%	Acceptable
		Summer	13	+62%	Standing	19	+46%	Acceptable
		Fall	14	+40%	Standing	22	+38%	Acceptable
		Winter	15	+36%	Standing	24	+41%	Acceptable
		Annual	14	+27%	Standing	22	+38%	Acceptable
23	A	Spring	8		Sitting	13		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	12		Acceptable
		Winter	9		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	14	+75%	Standing	20	+54%	Acceptable
		Summer	11	+57%	Sitting	17	+55%	Acceptable
		Fall	13	+62%	Standing	19	+58%	Acceptable
		Winter	14	+56%	Standing	21	+50%	Acceptable
		Annual	13	+62%	Standing	20	+54%	Acceptable
24	A	Spring	12		Sitting	21		Acceptable
		Summer	9		Sitting	16		Acceptable
		Fall	11		Sitting	19		Acceptable
		Winter	12		Sitting	22		Acceptable
		Annual	11		Sitting	20		Acceptable
	B	Spring	13		Standing	21		Acceptable
		Summer	10	+11%	Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
25	A	Spring	11		Sitting	19		Acceptable
		Summer	8		Sitting	14		Acceptable
		Fall	10		Sitting	17		Acceptable
		Winter	12		Sitting	21		Acceptable
		Annual	11		Sitting	19		Acceptable
	B	Spring	14	+27%	Standing	22	+16%	Acceptable
		Summer	11	+38%	Sitting	17	+21%	Acceptable
		Fall	13	+30%	Standing	21	+24%	Acceptable
		Winter	14	+17%	Standing	22		Acceptable
		Annual	14	+27%	Standing	21	+11%	Acceptable
26	A	Spring	10		Sitting	17		Acceptable
		Summer	8		Sitting	12		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	16	+60%	Walking	25	+47%	Acceptable
		Summer	12	+50%	Sitting	19	+58%	Acceptable
		Fall	15	+50%	Standing	24	+50%	Acceptable
		Winter	16	+60%	Walking	25	+56%	Acceptable
		Annual	15	+50%	Standing	24	+50%	Acceptable
27	A	Spring	12		Sitting	19		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	11		Sitting	19		Acceptable
	B	Spring	22	+83%	Uncomfortable	32	+68%	Unacceptable
		Summer	17	+89%	Walking	25	+79%	Acceptable
		Fall	20	+82%	Uncomfortable	30	+67%	Acceptable
		Winter	24	+85%	Uncomfortable	35	+75%	Unacceptable
		Annual	22	+100%	Uncomfortable	32	+68%	Unacceptable
28	A	Spring	8		Sitting	14		Acceptable
		Summer	6		Sitting	11		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	8		Sitting	14		Acceptable
	B	Spring	18	+125%	Walking	26	+86%	Acceptable
		Summer	16	+167%	Walking	22	+100%	Acceptable
		Fall	17	+112%	Walking	25	+92%	Acceptable
		Winter	19	+111%	Walking	27	+80%	Acceptable
		Annual	18	+125%	Walking	25	+79%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
29	A	Spring	8		Sitting	14		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	7		Sitting	13		Acceptable
		Winter	8		Sitting	13		Acceptable
		Annual	7		Sitting	13		Acceptable
	B	Spring	20	+150%	Uncomfortable	28	+100%	Acceptable
		Summer	16	+167%	Walking	22	+120%	Acceptable
		Fall	18	+157%	Walking	26	+100%	Acceptable
		Winter	20	+150%	Uncomfortable	29	+123%	Acceptable
		Annual	19	+171%	Walking	27	+108%	Acceptable
30	A	Spring	10		Sitting	16		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	22	+120%	Uncomfortable	32	+100%	Unacceptable
		Summer	17	+143%	Walking	24	+100%	Acceptable
		Fall	21	+133%	Uncomfortable	30	+100%	Acceptable
		Winter	24	+140%	Uncomfortable	35	+119%	Unacceptable
		Annual	22	+144%	Uncomfortable	32	+113%	Unacceptable
31	A	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	15		Standing	22		Acceptable
	B	Spring	16		Walking	26	+13%	Acceptable
		Summer	11	-15%	Sitting	18		Acceptable
		Fall	15		Standing	24		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	23		Acceptable
32	A	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	17	+21%	Walking	27	+29%	Acceptable
		Summer	13		Standing	20	+11%	Acceptable
		Fall	16	+14%	Walking	25	+25%	Acceptable
		Winter	17	+21%	Walking	26	+24%	Acceptable
		Annual	16	+14%	Walking	25	+25%	Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
33	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	21	+62%	Uncomfortable	32	+60%	Unacceptable
		Summer	15	+36%	Standing	23	+35%	Acceptable
		Fall	19	+58%	Walking	29	+53%	Acceptable
		Winter	19	+46%	Walking	28	+40%	Acceptable
		Annual	19	+58%	Walking	28	+47%	Acceptable
34	A	Spring	12		Sitting	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	28	+133%	Dangerous	36	+80%	Unacceptable
		Summer	20	+82%	Uncomfortable	26	+62%	Acceptable
		Fall	26	+117%	Uncomfortable	33	+83%	Unacceptable
		Winter	25	+108%	Uncomfortable	33	+65%	Unacceptable
		Annual	25	+108%	Uncomfortable	33	+83%	Unacceptable
35	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	19		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	13		Standing	19		Acceptable
36	A	Spring	11		Sitting	19		Acceptable
		Summer	8		Sitting	14		Acceptable
		Fall	10		Sitting	17		Acceptable
		Winter	12		Sitting	21		Acceptable
		Annual	11		Sitting	19		Acceptable
	B	Spring	22	+100%	Uncomfortable	29	+53%	Acceptable
		Summer	15	+88%	Standing	21	+50%	Acceptable
		Fall	20	+100%	Uncomfortable	27	+59%	Acceptable
		Winter	20	+67%	Uncomfortable	28	+33%	Acceptable
		Annual	20	+82%	Uncomfortable	27	+42%	Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
37	A	Spring	13		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	13		Standing	21		Acceptable
	B	Spring	19	+46%	Walking	28	+27%	Acceptable
		Summer	16	+45%	Walking	22	+29%	Acceptable
		Fall	18	+50%	Walking	26	+30%	Acceptable
		Winter	19	+36%	Walking	28	+22%	Acceptable
		Annual	18	+38%	Walking	27	+29%	Acceptable
38	A	Spring	9		Sitting	15		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	14		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	14	+56%	Standing	22	+47%	Acceptable
		Summer	11	+57%	Sitting	17	+42%	Acceptable
		Fall	13	+62%	Standing	20	+43%	Acceptable
		Winter	15	+50%	Standing	24	+41%	Acceptable
		Annual	13	+44%	Standing	22	+47%	Acceptable
39	A	Spring	20		Uncomfortable	29		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	19		Walking	29		Acceptable
		Annual	19		Walking	28		Acceptable
	B	Spring	13	-35%	Standing	22	-24%	Acceptable
		Summer	10	-41%	Sitting	17	-29%	Acceptable
		Fall	12	-37%	Sitting	20	-26%	Acceptable
		Winter	14	-26%	Standing	23	-21%	Acceptable
		Annual	13	-32%	Standing	21	-25%	Acceptable
40	A	Spring	12		Sitting	19		Acceptable
		Summer	8		Sitting	14		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	11		Sitting	20		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	10	-17%	Sitting	17	-11%	Acceptable
		Summer	8		Sitting	14		Acceptable
		Fall	9	-18%	Sitting	16	-11%	Acceptable
		Winter	10		Sitting	18		Acceptable
		Annual	10		Sitting	17		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
41	A	Spring	14		Standing	22		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	14		Standing	22		Acceptable
	B	Spring	14		Standing	22		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	13		Standing	22		Acceptable
42	A	Spring	18		Walking	26		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	16		Walking	25		Acceptable
		Winter	18		Walking	28		Acceptable
		Annual	17		Walking	26		Acceptable
	B	Spring	17		Walking	26		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	24		Acceptable
		Winter	17		Walking	27		Acceptable
		Annual	16		Walking	25		Acceptable
43	A	Spring	16		Walking	25		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	28		Acceptable
		Annual	16		Walking	25		Acceptable
	B	Spring	15		Standing	25		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	17		Walking	27		Acceptable
		Annual	15		Standing	24		Acceptable
44	A	Spring	14		Standing	23		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	22		Acceptable
		Winter	15		Standing	25		Acceptable
		Annual	14		Standing	23		Acceptable
	B	Spring	14		Standing	23		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	15		Standing	25		Acceptable
		Annual	14		Standing	22		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
45	A	Spring	11		Sitting	19		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	12		Sitting	21		Acceptable
		Annual	11		Sitting	19		Acceptable
	B	Spring	13	+18%	Standing	20		Acceptable
		Summer	10	+11%	Sitting	15		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14	+17%	Standing	22		Acceptable
		Annual	13	+18%	Standing	20		Acceptable
46	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	13		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	12		Sitting	18		Acceptable
		Summer	10	+11%	Sitting	15	+15%	Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	11		Sitting	17		Acceptable
47	A	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	11	-15%	Sitting	18		Acceptable
		Summer	8	-20%	Sitting	13	-13%	Acceptable
		Fall	11		Sitting	17	-11%	Acceptable
		Winter	11	-15%	Sitting	18		Acceptable
		Annual	11		Sitting	17	-11%	Acceptable
48	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	10		Sitting	16		Acceptable
		Summer	8	-11%	Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	16	-11%	Acceptable
		Annual	9	-18%	Sitting	15	-12%	Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Speed**			**Effective Gust**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
49	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
50	A	Spring	15		Standing	22		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	12	-20%	Sitting	20		Acceptable
		Summer	11	-15%	Sitting	17	-11%	Acceptable
		Fall	12	-14%	Sitting	19		Acceptable
		Winter	12	-20%	Sitting	19	-17%	Acceptable
		Annual	12	-14%	Sitting	19		Acceptable
51	A	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	13	-13%	Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12	-14%	Sitting	19		Acceptable
		Winter	12	-20%	Sitting	20	-13%	Acceptable
		Annual	12	-14%	Sitting	19		Acceptable
52	A	Spring	19		Walking	28		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	18		Walking	26		Acceptable
	B	Spring	18		Walking	27		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	16	-11%	Walking	25		Acceptable
		Winter	17		Walking	26		Acceptable
		Annual	17		Walking	25		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

CONSULTING ENGINEERS
& SCIENTISTS

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Speed**			**Effective Gust**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
53	A	Spring	14		Standing	22		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	13		Standing	21		Acceptable
	B	Spring	15		Standing	24		Acceptable
		Summer	12	+20%	Sitting	19	+12%	Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	14		Standing	23		Acceptable
54	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	16	+14%	Walking	24	+14%	Acceptable
		Summer	13	+18%	Standing	20	+18%	Acceptable
		Fall	15	+15%	Standing	23	+15%	Acceptable
		Winter	16	+23%	Walking	25	+19%	Acceptable
		Annual	15	+15%	Standing	23	+15%	Acceptable
55	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	19	+73%	Walking	28	+65%	Acceptable
		Summer	14	+56%	Standing	21	+40%	Acceptable
		Fall	17	+70%	Walking	26	+62%	Acceptable
		Winter	17	+70%	Walking	26	+53%	Acceptable
		Annual	17	+70%	Walking	26	+62%	Acceptable
56	A	Spring	14		Standing	22		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	15		Standing	25		Acceptable
		Annual	13		Standing	22		Acceptable
	B	Spring	20	+43%	Uncomfortable	28	+27%	Acceptable
		Summer	14	+40%	Standing	20	+18%	Acceptable
		Fall	18	+50%	Walking	26	+30%	Acceptable
		Winter	17	+13%	Walking	26		Acceptable
		Annual	17	+31%	Walking	26	+18%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
57	A	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	17	+31%	Walking	23	+21%	Acceptable
		Summer	15	+50%	Standing	20	+25%	Acceptable
		Fall	15	+25%	Standing	22	+22%	Acceptable
		Winter	16	+23%	Walking	23	+15%	Acceptable
		Annual	16	+33%	Walking	22	+22%	Acceptable
58	A	Spring	12		Sitting	19		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	16	+33%	Walking	22	+16%	Acceptable
		Summer	14	+40%	Standing	19	+19%	Acceptable
		Fall	14	+27%	Standing	20	+11%	Acceptable
		Winter	15	+25%	Standing	21	+11%	Acceptable
		Annual	15	+25%	Standing	21	+17%	Acceptable
59	A	Spring	12		Sitting	19		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	13		Standing	21	+11%	Acceptable
		Summer	11	+22%	Sitting	18	+20%	Acceptable
		Fall	12		Sitting	20	+11%	Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	12		Sitting	20	+11%	Acceptable
60	A	Spring	9		Sitting	14		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	14		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	10	+11%	Sitting	15		Acceptable
		Summer	8	+14%	Sitting	12		Acceptable
		Fall	9	+12%	Sitting	14		Acceptable
		Winter	10	+11%	Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Speed**			**Effective Gust**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
61	A	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
62	A	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	23		Acceptable
63	A	Spring	10		Sitting	18		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	17		Acceptable
		Winter	11		Sitting	19		Acceptable
		Annual	10		Sitting	17		Acceptable
	B	Spring	12	+20%	Sitting	22	+22%	Acceptable
		Summer	9	+12%	Sitting	16	+23%	Acceptable
		Fall	11		Sitting	20	+18%	Acceptable
		Winter	12		Sitting	21	+11%	Acceptable
		Annual	12	+20%	Sitting	20	+18%	Acceptable
64	A	Spring	11		Sitting	20		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	12		Sitting	21		Acceptable
		Annual	11		Sitting	19		Acceptable
	B	Spring	13	+18%	Standing	22		Acceptable
		Summer	9		Sitting	16		Acceptable
		Fall	12		Sitting	20	+11%	Acceptable
		Winter	13		Standing	23		Acceptable
		Annual	12		Sitting	21	+11%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

CONSULTING ENGINEERS
& SCIENTISTS

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Speed**			**Effective Gust**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
65	A	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	13		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	21	+62%	Uncomfortable	31	+48%	Acceptable
		Summer	16	+45%	Walking	22	+29%	Acceptable
		Fall	20	+67%	Uncomfortable	28	+40%	Acceptable
		Winter	20	+54%	Uncomfortable	29	+32%	Acceptable
		Annual	19	+46%	Walking	28	+40%	Acceptable
66	A	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	21	+31%	Uncomfortable	30	+25%	Acceptable
		Summer	16	+23%	Walking	22	+16%	Acceptable
		Fall	19	+27%	Walking	28	+27%	Acceptable
		Winter	20	+25%	Uncomfortable	30	+20%	Acceptable
		Annual	19	+27%	Walking	28	+22%	Acceptable
67	A	Spring	17		Walking	27		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	16		Walking	25		Acceptable
		Winter	18		Walking	28		Acceptable
		Annual	17		Walking	26		Acceptable
	B	Spring	21	+24%	Uncomfortable	32	+19%	Unacceptable
		Summer	15		Standing	23		Acceptable
		Fall	19	+19%	Walking	29	+16%	Acceptable
		Winter	21	+17%	Uncomfortable	32	+14%	Unacceptable
		Annual	20	+18%	Uncomfortable	30	+15%	Acceptable
68	A	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	13		Standing	22		Acceptable
	B	Spring	15		Standing	25	+14%	Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	14		Standing	23		Acceptable
		Winter	15		Standing	25		Acceptable
		Annual	14		Standing	23		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
69	A	Spring	17		Walking	26		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	16		Walking	25		Acceptable
		Winter	18		Walking	28		Acceptable
		Annual	16		Walking	25		Acceptable
	B	Spring	18		Walking	28		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	17		Walking	26		Acceptable
		Winter	18		Walking	29		Acceptable
		Annual	17		Walking	27		Acceptable
70	A	Spring	21		Uncomfortable	30		Acceptable
		Summer	18		Walking	25		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	21		Uncomfortable	31		Acceptable
		Annual	20		Uncomfortable	29		Acceptable
	B	Spring	19		Walking	28		Acceptable
		Summer	16	-11%	Walking	24		Acceptable
		Fall	18		Walking	27		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	18		Walking	27		Acceptable
71	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
72	A	Spring	12		Sitting	19		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	12		Sitting	19		Acceptable
		Summer	10	+11%	Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
73	A	Spring	17		Walking	24		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	16		Walking	23		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	23		Acceptable
74	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable
	B	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	21	+11%	Acceptable
75	A	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
76	A	Spring	9		Sitting	14		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	8		Sitting	14		Acceptable
	B	Spring	11	+22%	Sitting	18	+29%	Acceptable
		Summer	9	+29%	Sitting	14	+17%	Acceptable
		Fall	10	+25%	Sitting	16	+23%	Acceptable
		Winter	10	+11%	Sitting	18	+20%	Acceptable
		Annual	10	+25%	Sitting	17	+21%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Speed**			**Effective Gust**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
77	A	Spring	9		Sitting	14		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	14		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	8		Sitting	14		Acceptable
	B	Spring	11	+22%	Sitting	18	+29%	Acceptable
		Summer	9	+29%	Sitting	14	+17%	Acceptable
		Fall	11	+38%	Sitting	16	+14%	Acceptable
		Winter	12	+33%	Sitting	18	+20%	Acceptable
		Annual	11	+38%	Sitting	17	+21%	Acceptable
78	A	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	12	+20%	Sitting	19	+19%	Acceptable
		Summer	10	+25%	Sitting	16	+23%	Acceptable
		Fall	11	+22%	Sitting	17	+13%	Acceptable
		Winter	12	+20%	Sitting	19	+19%	Acceptable
		Annual	11	+22%	Sitting	18	+20%	Acceptable
79	A	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	12		Sitting	20	+11%	Acceptable
		Summer	10	+11%	Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13	+18%	Standing	20	+11%	Acceptable
		Annual	12		Sitting	19		Acceptable
80	A	Spring	12		Sitting	20		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	19		Acceptable
		Winter	13		Standing	22		Acceptable
		Annual	12		Sitting	20		Acceptable
	B	Spring	13		Standing	21		Acceptable
		Summer	10	+11%	Sitting	15		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Speed**			**Effective Gust**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
81	A	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	17		Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	19		Acceptable
		Annual	10		Sitting	17		Acceptable
82	A	Spring	12		Sitting	20		Acceptable
		Summer	9		Sitting	16		Acceptable
		Fall	11		Sitting	19		Acceptable
		Winter	13		Standing	23		Acceptable
		Annual	11		Sitting	20		Acceptable
	B	Spring	12		Sitting	20		Acceptable
		Summer	10	+11%	Sitting	16		Acceptable
		Fall	11		Sitting	19		Acceptable
		Winter	13		Standing	22		Acceptable
		Annual	12		Sitting	20		Acceptable
83	A	Spring	21		Uncomfortable	29		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	22		Uncomfortable	31		Acceptable
		Annual	20		Uncomfortable	28		Acceptable
	B	Spring	21		Uncomfortable	29		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	22		Uncomfortable	31		Acceptable
		Annual	20		Uncomfortable	28		Acceptable
84	A	Spring	13		Standing	22		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	14		Standing	25		Acceptable
		Annual	13		Standing	22		Acceptable
	B	Spring	12		Sitting	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	13		Standing	22	-12%	Acceptable
		Annual	12		Sitting	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
85	A	Spring	9		Sitting	15		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	9		Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	10	+11%	Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10	+11%	Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
86	A	Spring	12		Sitting	20		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	22		Acceptable
		Annual	12		Sitting	20		Acceptable
	B	Spring	13		Standing	21		Acceptable
		Summer	10	+11%	Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	20		Acceptable
87	A	Spring	11		Sitting	18		Acceptable
		Summer	8		Sitting	14		Acceptable
		Fall	10		Sitting	17		Acceptable
		Winter	11		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	12		Sitting	20	+11%	Acceptable
		Summer	9	+12%	Sitting	15		Acceptable
		Fall	11		Sitting	19	+12%	Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	11		Sitting	19		Acceptable
88	A	Spring	16		Walking	25		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	16		Walking	25		Acceptable
		Summer	13		Standing	21		Acceptable
		Fall	15		Standing	24		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	24		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
89	A	Spring	16		Walking	25		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	19	+19%	Walking	28	+12%	Acceptable
		Summer	15	+25%	Standing	21	+17%	Acceptable
		Fall	18	+20%	Walking	26	+13%	Acceptable
		Winter	19	+27%	Walking	28	+17%	Acceptable
		Annual	18	+20%	Walking	26	+13%	Acceptable
90	A	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	22		Acceptable
	B	Spring	14		Standing	22		Acceptable
		Summer	12		Sitting	19	+12%	Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
91	A	Spring	18		Walking	26		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	16	-11%	Walking	23	-12%	Acceptable
		Summer	12		Sitting	17	-11%	Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	17	-15%	Walking	26		Acceptable
		Annual	16	-11%	Walking	23		Acceptable
92	A	Spring	19		Walking	27		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	17		Walking	25		Acceptable
		Winter	21		Uncomfortable	30		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	16	-16%	Walking	25		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18	-14%	Walking	27		Acceptable
		Annual	16	-16%	Walking	25		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
93	A	Spring	14		Standing	21		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
94	A	Spring	11		Sitting	19		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	11		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	17	+55%	Walking	25	+32%	Acceptable
		Summer	14	+56%	Standing	20	+33%	Acceptable
		Fall	16	+45%	Walking	24	+33%	Acceptable
		Winter	17	+55%	Walking	26	+37%	Acceptable
		Annual	16	+45%	Walking	24	+33%	Acceptable
95	A	Spring	9		Sitting	15		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	9		Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	14	+56%	Standing	22	+47%	Acceptable
		Summer	12	+50%	Sitting	18	+38%	Acceptable
		Fall	13	+44%	Standing	21	+40%	Acceptable
		Winter	15	+67%	Standing	23	+44%	Acceptable
		Annual	13	+44%	Standing	21	+40%	Acceptable
96	A	Spring	15		Standing	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	14		Standing	23		Acceptable
		Winter	16		Walking	26		Acceptable
		Annual	15		Standing	24		Acceptable
	B	Spring	21	+40%	Uncomfortable	29	+16%	Acceptable
		Summer	17	+31%	Walking	23	+15%	Acceptable
		Fall	20	+43%	Uncomfortable	28	+22%	Acceptable
		Winter	21	+31%	Uncomfortable	30	+15%	Acceptable
		Annual	20	+33%	Uncomfortable	28	+17%	Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
97	A	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	17	+21%	Walking	24	+14%	Acceptable
		Summer	15	+25%	Standing	21	+24%	Acceptable
		Fall	17	+31%	Walking	24	+20%	Acceptable
		Winter	17	+21%	Walking	25	+19%	Acceptable
		Annual	17	+31%	Walking	24	+20%	Acceptable
98	A	Spring	20		Uncomfortable	29		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	19		Walking	29		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	19		Walking	27		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	18		Walking	26		Acceptable
		Winter	18		Walking	27		Acceptable
		Annual	18		Walking	26		Acceptable
99	A	Spring	16		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
100	A	Spring	8		Sitting	14		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	8		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	8		Sitting	13		Acceptable
		Summer	6	-14%	Sitting	10	-17%	Acceptable
		Fall	7	-12%	Sitting	12		Acceptable
		Winter	8		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A – No Build
B – Full Build

Mean Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Conditions – Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Speed			Effective Gust		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
101	A	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	20		Acceptable
	B	Spring	12		Sitting	20		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	20		Acceptable
102	A	Spring	14		Standing	23		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	14		Standing	24		Acceptable
		Annual	13		Standing	22		Acceptable
	B	Spring	14		Standing	23		Acceptable
		Summer	12	+20%	Sitting	19	+12%	Acceptable
		Fall	13		Standing	22		Acceptable
		Winter	14		Standing	24		Acceptable
		Annual	14		Standing	22		Acceptable
103	A	Spring	14		Standing	22		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	13		Standing	22		Acceptable
	B	Spring	13		Standing	21		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	13		Standing	22		Acceptable
		Annual	12		Sitting	21		Acceptable
104	A	Spring	14		Standing	22		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	13		Standing	21		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	20		Acceptable

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A – No Build
B – Full Build

<u>Mean Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Appendix D

Air Quality Appendix

AIR QUALITY APPENDIX

Introduction

This Air Quality Appendix provides modeling assumptions and backup for results presented in Section 4.5 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 2012 and 2022 for speed limits of idle, 10, 15, and 30 mph for use in the microscale analyses.

MOVES CO Emission Factor Summary

Carbon Monoxide Only

		2012	2022
Free Flow	30 mph	3.843	2.039
Right Turns	10 mph	6.481	3.281
Left Turns	15 mph	5.454	2.852
Queues	Idle	21.705	5.446

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 370 cm was used for the intersection. Idle emission rates for queue links were based on 0 mph emission rates derived in MOVES. Emission rates for speeds of 10, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

American Campus - Northeastern University - 10 Burke St, Boston

Heating Boilers

						Notes
Source Name		DWH1-2	DWH3-4	BLR1	BLR2	
Make		Unknown	Unknown	Unknown	Unknown	From client
Model		Unknown	Unknown	Unknown	Unknown	From client
Qty.		2	2	1	1	From client
Boiler Heat Input	MMBTU/hr (ea.):	1.000	1.000	6.000	6.000	From client
Boiler Emission Rates	lb/MMBTU	g/s	g/s	g/s	g/s	
NOx	0.035	0.00441	0.00441	0.02646	0.02646	ERP
CO	0.080	0.01008	0.01008	0.06048	0.06048	ERP
VOC	0.030	0.00378	0.00378	0.02268	0.02268	ERP
PM-2.5	0.010	0.00126	0.00126	0.00756	0.00756	ERP
PM-10	0.010	0.00126	0.00126	0.00756	0.00756	ERP
SO2	0.0006	0.00007	0.00007	0.00044	0.00044	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
CO2	115.385	14.53814	14.53814	87.22885	87.22885	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
Gas Exit Temp	°F	170	170	170	170	assumed
Gas Exit Temp	°K	349.8	349.8	349.8	349.8	calculated
Exhaust air (CFM)	CFM	418.22	418.22	2509.34	2509.34	assumed (1400 cfm/100hp)
Gas Exit Velocity	fps	35.50	35.50	53.25	53.25	calculated, should be 40 fps minimum per DEP
Gas Exit Velocity	mps	10.82	10.82	16.23	16.23	calculated
Roof Height	feet	234.00	174.00	234.00	174.00	from site plans
Stack height	feet above roofline	3	3	3	3	from email 2/16/16
Stack height	feet	237	15	15	15	15 ft based on Email. 2/24/16
Stack height	meters	72.238	4.572	4.572	4.572	calculated
Stack Diameter	feet	0.500	0.500	1.000	1.000	assumed
Stack Diameter	meters	0.152	0.152	0.305	0.305	calculated

Cooling Towers

			Notes
Designation		CT1-2	
Make		Evapco	
Model		UT-29-628	
Cooling Tower Rate	tons	750	from mfg
Tower Overall Dimensions	Length feet	28.167	from mfg
	Width feet	8.458	from mfg
	Height feet	15.313	from mfg
CT Stack Height (above roofline)	feet	15.313	from mfg
Primary Building Height (ft)	feet	234.00	from site plans
CT Stack Height	feet	249.3	calculated
CT Stack Height	meters	75.99	calculated
Number of cells (per tower)	#	2	from mfg
Cooling Tower Specs			
Cooling Tower Exhaust Flow	CFM	161600	from mfg
Cooling Tower Cell Exhaust Flov	CFM	80800	calculated (per cell)
Cooling Tower Cell Exhaust Flov	kg/s	42.5	calculated
Cooling Tower Exhaust Temp	°F	78	assumed
Cooling Tower Exhaust Temp	K	298.7	calculated
Cooling Tower Cell Diameter	feet	8.5	assumed essentially same 0.5xL
Cooling Tower Cell Diameter	meters	2.58	calculated
Cooling Tower Stack Velocity	fps	23.97	calculated
Cooling Tower Stack Velocity	mps	7.30	calculated
Cooling Tower Drift			
Drift Rate	% of circ water	0.001	assumed
Circulating Water Rate	gpm	2,250	from mfg
Circulating Water Rate	gph	135,000	calculated
TDS+TSS concentration in drift	mg/L	1,500	assumed
PM emission rate in drift (per ce	lb/hr	0.008	calculated
PM emission rate in drift (per cel	g/s	0.00107	calculated

American Campus - Northeastern University - 10 Burke St, Boston

Emergency Generators

			Notes
Designation		EG1	
Number		1	
Electrical output	kilowatts	600	
Make		Kohler	
model		600REOZVB	
Engine Horsepower	BHP	903.00	Mfg data
Engine power	kilowatts	673.37	calculated
Fuel consumption @full load	gph	40.80	Mfg data
Heat Input	MMBTU/hr:	5.5896	calculated
Stack Parameters			
Exhaust Temperature	°F	862	Mfg data
Exhaust Temperature	°K	734.3	calculated
Total Exhaust Flow	ACFM	4594	Mfg data
Flange Diameter	in.	4.59	Mfg data
Maximum Backpressure	in. H2O	40.1055	Mfg data
Maximum velocity	fpm	19545.99	calculated
Flow area required	sq. ft	0.235	calculated
Number of exhausts (typ. 1 or 2)	#	1	Assumed
Selected silencer diameter	in	8	Assumed
Actual silencer opening area	sq. ft each	0.349	calculated
Actual velocity	fpm each	13160.841	calculated
Actual velocity	fps each	219.347	calculated
Single Stack Effective Diameter	ft	0.667	calculated
Single Stack Effective Diameter	m	0.203	calculated
Single Stack Effective Velocity	fps	219.347	calculated
Single Stack Effective Velocity	mps	66.857	calculated
Primary Building Height	ft	234.00	from site plans
Stack Height (10' above roofline)	ft	*244.00*	Per DEP
Stack Height	m	*74.37*	calculated
Pollutant	Emission factor unit	Emission factor	
NOx	g/BHP-hr	4.50	Tier 2 Limit
CO	g/BHP-hr	2.60	Tier 2 Limit
VOC	g/BHP-hr	0.30	Tier 2 Limit
PM10	g/BHP-hr	0.15	Tier 2 Limit
PM2.5	g/BHP-hr	0.15	Tier 2 Limit
SO2	g/BHP-hr	1.0914E-03	15 ppm S mass conserved
HAPs	lb/MMBTU	0.00149	AP42 Table 3.4-4 & 3.3-2
CO2	lb/MMBTU	165	AP42 Table 3.4-1 & 3.3-1
Short Term Emission Rate			
NOx	g/s	0.0387	uses EPA 'intermittent" factor (300 hrs/yr)
CO	g/s	0.6522	calculated
VOC	g/s	0.0753	calculated
PM10	g/s	0.0376	calculated
PM2.5	g/s	0.0376	calculated
SO2	g/s	0.0003	calculated
Long Term (300 hr/yr) Emission Rate			
NOx	g/s	0.0387	calculated
CO	g/s	0.0223	calculated
VOC	g/s	0.0026	calculated
PM10	g/s	0.0013	calculated
PM2.5	g/s	0.0013	calculated
SO2	g/s	0.00001	calculated

Columbus Avenue Student Housing
Background Concentrations

POLLUTANT	AVERAGING TIME	Form	2012	2013	2014	Units	ppm/ppb to $\mu g/m^3$ Conversion Factor	2012-2014 Background Concentration ($\mu g/m^3$)	Location
SO_2 (1)(6)	1-Hour (5)	99th %	12.1	10.9	12.3	ppb	2.62	30.8	Harrison Ave., Boston
	3-Hour	H2H	11.8	9.7	21.5	ppb	2.62	56.3	Harrison Ave., Boston
	24-Hour	H2H	5	5	5.1	ppb	2.62	13.4	Harrison Ave., Boston
	Annual	H	1.1	1.1	1.1	ppb	2.62	2.9	Harrison Ave., Boston
PM-10	24-Hour	H2H	32.0	34	61	$\mu g/m^3$	1	61	Harrison Ave., Boston
	Annual	H	14.2	15.1	13.9	$\mu g/m^3$	1	15.1	Harrison Ave., Boston
PM-2.5	24-Hour (5)	98th %	20.6	15.9	12.7	$\mu g/m^3$	1	16.4	Harrison Ave., Boston
	Annual (5)	H	8.3	7.3	6.0	$\mu g/m^3$	1	7.2	Harrison Ave., Boston
NO_2 (3)	1-Hour (5)	98th %	44	50	51	ppb	1.88	90.9	Harrison Ave., Boston
	Annual	H	15.8	17.4	15.8	ppb	1.88	32.8	Harrison Ave., Boston
CO (2)	1-Hour	H2H	2.2	1.9	1.7	ppm	1146	2474.2	Harrison Ave., Boston
	8-Hour	H2H	1.9	1.2	1.3	ppm	1146	2177.4	Harrison Ave., Boston
Ozone (4)	8-Hour	H4H	0.062	0.059	0.054	ppm	1963	121.7	Harrison Ave., Boston
Lead	Rolling 3-Month	H	0.014	0.006	0.014	$\mu g/m^3$	1	0.014	Harrison Ave., Boston

Notes:
From 2012-2014 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.

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

Appendix E

Climate Change Preparedness Checklist

Climate Change Preparedness and Resiliency Checklist for New Construction

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

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

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

Climate Change Analysis and Information Sources:

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

Checklist

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

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

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

A.1 - Project Information

Project Name:	Columbus Avenue Student Housing
Project Address Primary:	10 Burke Street
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	

A.2 - Team Description

Owner / Developer:	American Campus Communities/ Northeastern University
Architect:	Cube 3 Studio LLC/ Elkus Manfredi Architects
Engineer (building systems):	AKF Engineers
Sustainability / LEED:	Price Sustainability Associates
Permitting:	Epsilon Associates
Construction Management:	John Moriarty & Associates
Climate Change Expert:	

A.3 - Project Permitting and Phase

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

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

A.4 - Building Classification and Description

List the principal Building Uses:	Residential
List the First Floor Uses:	*Retail, residential lobby, fitness and recreation space*

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

☐ Wood Frame	☐ Masonry	☑ Steel Frame	☑ Concrete

Describe the building?

Site Area:	*23,424 SF*	Building Area:	*310,000 SF*
Building Height:	*230 Ft.*	Number of Stories:	*20 Flrs.*
First Floor Elevation (reference Boston City Base):	*18.50 Elev.*	Are there below grade spaces/levels, if yes how many:	*No*

A.5 - Green Building

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

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

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

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

A.6 - Building Energy- TBD

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

Electric:	*Base 690 (kW) Peak 880 (kW) summer cooling*	Heating:	*12,000 (MMBtu/hr)*
What is the planned building Energy Use Intensity:	*TBD (kWh/SF)*	Cooling:	*750 tons*

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

Electric:	*600 (kW)*	Heating:	*0 (MMBtu/hr)*
		Cooling:	*0 (Tons/hr)*

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

Electrical Generation:	*600 (kW)*		Fuel Source:	*Diesel*
System Type and Number of Units:	☑ Combustion Engine	☐ Gas Turbine	☐ Combine Heat and Power	*1 (Units)*

B - Extreme Weather and Heat Events

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

B.1 - Analysis

What is the full expected life of the project?

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

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

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

What time span of future Climate Conditions was considered?

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

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

8/91 Deg.	Based on ASHRAE Fundamentals 2013 99.6% heating; 0.4% cooling

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

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

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

30-90 Days	*0.2 Events / yr.*

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

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

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

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

B.2 - Mitigation Strategies

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

Building energy use below code:	*25% Target*
How is performance determined:	Energy model

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

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

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

Roof:	*R = 25*	Walls / Curtain Wall Assembly:	*R = 13BATTS + R8 continuous insulation*
Foundation:	*R = 15*	Basement / Slab:	*R =10*
Windows:	*R = / U =0.4*	Doors:	*R = / U =0.7*

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

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

Describe any added measures:	Common area lighting will be dimmed when unoccupied

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

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

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

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

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

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

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

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

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

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

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

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

C - Sea-Level Rise and Storms

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

C.1 - Location Description and Classification:

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

	No

Describe site conditions?

Site Elevation – Low/High Points:	*18.0/18.5 Boston City Base Elev.(Ft.)*
Building Proximity to Water:	*2,400 Ft.*

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

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

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

2013 FEMA Prelim. FIRMs:	*No*	Future floodplain delineation updates:	*No*

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

	2,300 Ft.

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

C - Sea-Level Rise and Storms

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

C.2 - Analysis

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

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

C.3 - Building Flood Proofing

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

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

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

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

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

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

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

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

	Yes / No

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

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

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

	Yes / No
If Yes, describe:	

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

	Yes / No	If Yes, for how long:	*days*

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

C.4 - Building Resilience and Adaptability

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

Will the building be able to withstand severe storm impacts and endure temporary inundation?

Select appropriate:	*Yes / No*	☐ Hardened / Resilient Ground Floor Construction	☐ Temporary shutters and or barricades	☐ Resilient site design, materials and construction

Can the site and building be reasonably modified to increase Building Flood Proof Elevation?

Select appropriate:	*Yes / No*	☐ Surrounding site elevation can be raised	☐ Building ground floor can be raised	☐ Construction been engineered
Describe additional strategies:				

Has the building been planned and designed to accommodate future resiliency enhancements?

Select appropriate:	*Yes / No*	☐ Solar PV	☐ Solar Thermal	☐ Clean Energy / CHP System(s)
		☐ Potable water storage	☐ Wastewater storage	☐ Back up energy systems & fuel
Describe any specific or additional strategies:				

Thank you for completing the Boston Climate Change Resilience and Preparedness Checklist!

For questions or comments about this checklist or Climate Change Resiliency and Preparedness best practices, please contact: John.Dalzell.BRA@cityofboston.gov

Appendix F

Accessibility Checklist

Accessibility Checklist

(to be added to the BRA Development Review Guidelines)

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

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

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

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

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

Accessibility Analysis Information Sources:

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

Article 80 | ACCESSIBILTY CHECKLIST

Project Information

Project Name:	Columbus Avenue Student Housing
Project Address Primary:	10 Burke Street
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	

Team Description

Owner / Developer:	American Campus Communities/ Northeastern University
Architect:	Cube 3 Studio LLC/ Elkus Manfredi Architects
Engineer (building systems):	ASK Engineers
Sustainability / LEED:	Price Sustainability Associates
Permitting:	Epsilon Associates
Construction Management:	John Moriarty & Associates

Project Permitting and Phase

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

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

Building Classification and Description

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

Residential – One to Three Unit	☑Residential - Multi-unit, Four +	☑Institutional	Education
Commercial	Office	☑Retail	Assembly
Laboratory / Medical	Manufacturing / Industrial	Mercantile	Storage, Utility and Other

First Floor Uses (List): *Retail, residential lobby, fitness and recreation space*

What is the Construction Type – select most appropriate type?

Wood Frame	Masonry	Steel Frame TBD	Concrete TBD

Describe the building?

Site Area:	*23,424 SF*	Building Area:	*310,000 SF*
Building Height:	*230 Ft.*	Number of Stories:	*20 Flrs.*
First Floor Elevation:	*18.50 Elev.*	Are there below grade spaces:	

Assessment of Existing Infrastructure for Accessibility:

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

Provide a description of the development neighborhood and identifying characteristics.	The project site is located on the southern edge of the Northeastern University campus at the intersection of several Boston neighborhoods. The surrounding area, including the Fenway neighborhood, contains many educational, retail, cultural, and hospital facilities. The South Bay Harbor Trail begins at the nearby Ruggles station, running through several neighborhoods to connect to the Boston Harborwalk on Fort Point Channel.
List the surrounding ADA compliant MBTA transit lines and the proximity to the development site: Commuter rail, subway, bus, etc.	The Project site is less than a quarter mile from both the Ruggles and Massachusetts Avenue MBTA Orange Line stations, which provides access to the Commuter Rail and numerous bus lines. The Ruggles Station can also be accessed via the 43 Bus, which has a stop adjacent to the site on the corner of Tremont and Burke Streets.

List the surrounding institutions: hospitals, public housing and elderly and disabled housing developments, educational facilities, etc.	Hospitals: Boston Medical Center, Boston Children's Hospital, Brigham and Women's Hospital, and Beth Israel Deaconess Medical Center Higher Education: Northeastern University, Boston University School of Medicine, Wentworth Institute of Technology, School of the Museum of Fine Arts, Massachusetts college of Art and Design, Simmons College, Massachusetts College of Pharmacy and Health Science, Harvard Medical School, Roxbury Community College, and New England Conservatory K-12 Schools – Madison Park High School, John D. O'Bryant School of Mathematics and Science, Timilty Middle School, The Hurley K-8 School, and New England Conservatory Preparatory School Cultural Institutions – Boston Museum of Fine Arts, Isabella Stewart Gardner Museum, New England Conservatory, and Symphony Hall Public and Disable Housing Developments – Camden (136 Lenox Street, Boston, MA 02118) is State-funded Family development. Whittier Street (1158 Tremont Street, Roxbury, MA 02119) and Alice Taylor (260 Ruggles Street, Roxbury, MA 02120) are Federally-funded Family developments. Washington Manor (1701 Washington Street, Roxbury, MA 02118) is a Federally-funded Elderly/Disabled development.
Is the proposed development on a priority accessible route to a key public use facility? List the surrounding: government buildings, libraries, community centers and recreational facilities and other related facilities.	The proposed Project is located south of Northeastern University's new Interdisciplinary Science and Engineering Complex building. Other adjacent facilities include Squashbusters, the Northeastern University Alumni Center, and the Coventry Street Apartments.

Surrounding Site Conditions – Existing:

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

Are there sidewalks and pedestrian ramps existing at the development site?	Yes – any existing sidewalk and pedestrian ramps affected by new constructed will be replaced.
If yes above, list the existing sidewalk and pedestrian ramp materials and physical condition at the development site.	Sidewalks along Columbus Avenue are constructed out of concrete and in good condition. Sidewalks along Burke Street and Coventry Street are constructed of segments of masonry and asphalt and show signs of aging.
Are the sidewalks and pedestrian ramps existing-to-remain? If yes,	Sidewalks and ramps providing access to the new building will be new.

have the sidewalks and pedestrian ramps been verified as compliant? If yes, please provide surveyors report.	
Is the development site within a historic district? If yes, please identify.	The development site is adjacent to the Lower Roxbury Historic District, but not within the district itself.

Surrounding Site Conditions – Proposed

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

Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? See: www.bostoncompletestreets.org	There are no plans to make modifications to the Columbus Avenue sidewalks to the north of the site.
If yes above, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, Boulevard.	Columbus Avenue is a Neighborhood Connector Burke Street and Coventry Street are local streets that connect Columbus Avenue and Tremont Street (also a Neighborhood Connector) but do not cleanly fall into the Complete Street Guideline classification system.
What is the total width of the proposed sidewalk? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone.	While the project design is not advanced enough to provide specific features, the approximate Columbus Avenue sidewalk width will be 20' and the approximate Burke Street and Coventry Street sidewalks will be 8' and 6', respectively.
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?	Proposed materials will be determined as the design advances.
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the City of Boston Public	No

Improvement Commission?	
Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way?	No
If yes above, what are the proposed dimensions of the sidewalk café or furnishings and what will the right-of-way clearance be?	No

Proposed Accessible Parking:

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

What is the total number of parking spaces provided at the development site parking lot or garage?	There will be no parking spaces provided on site.
What is the total number of accessible spaces provided at the development site?	None
Will any on street accessible parking spaces be required? If yes, has the proponent contacted the Commission for Persons with Disabilities and City of Boston Transportation Department regarding this need?	No
Where is accessible visitor parking located?	N/A
Has a drop-off area been identified? If yes, will it be accessible?	No
Include a diagram of the accessible routes to and from the accessible	N/A

parking lot/garage and drop-off areas to the development entry locations. Please include route distances.	

Circulation and Accessible Routes:

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

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

Provide a diagram of the accessible route connections through the site.	See site diagram
Describe accessibility at each entryway: Flush Condition, Stairs, Ramp Elevator.	All entryways and thresholds are accessible – flush or within acceptable level change restrictions (1/2" or less).
Are the accessible entrance and the standard entrance integrated?	Yes
If no above, what is the reason?	
Will there be a roof deck or outdoor courtyard space? If yes, include diagram of the accessible route.	TBD
Has an accessible routes way-finding and signage package been developed? If yes, please describe.	No signage package has yet been developed.

Accessible Units: (If applicable)

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

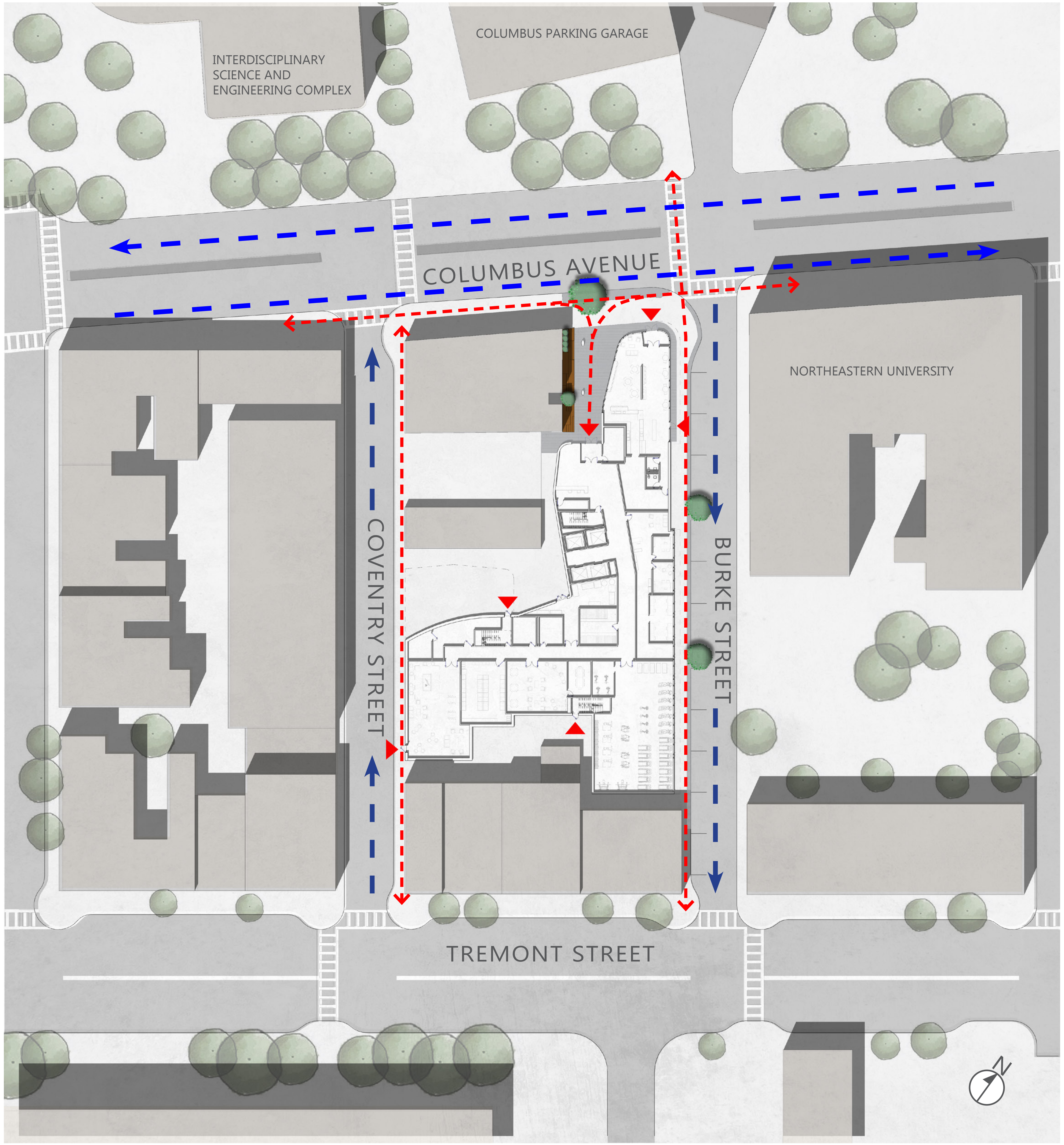
What is the total number of proposed units for the development?	207 Units
How many units are for sale; how many are for rent? What is the market value vs. affordable	All units are market rate rental units.

breakdown?	
How many accessible units are being proposed?	15
Please provide plan and diagram of the accessible units.	See attached diagram.
How many accessible units will also be affordable? If none, please describe reason.	None
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs at entry or step to balcony. **If yes,** please provide reason.	No
Has the proponent reviewed or presented the proposed plan to the City of Boston Mayor's Commission for Persons with Disabilities Advisory Board?	The proposed plan has not been presented yet.
Did the Advisory Board vote to support this project? **If no,** what recommendations did the Advisory Board give to make this project more accessible?	N/A

Thank you for completing the Accessibility Checklist!

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

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



LEGEND

- Accessible Building Entrance / Exit
- Pedestrian Circulation
- Vehicular Circulation

SITE PLAN - ACCESSIBILITY