NORTHEASTERN UNIVERSITY
Boston Campus

Interdisciplinary Science and Engineering Building
Project Notification Form

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

Prepared by
Northeastern University
360 Huntington Avenue
Boston, MA 02115

Mitchell L. Fischman Consulting LLC
Payette
Acentech, Inc.
Haley & Aldrich, Inc.
Howard/Stein-Hudson Associates, Inc.
Goulston and Storrs
Rowan Williams Davies & Irwin, Inc.
Soden Sustainability Consulting
Stephen Stimson Associates
Suffolk Construction Company, Inc.
Tremont Preservation Services, LLC
Vanasse Hangen Brustlin, Inc.

July 3, 2013

Northeastern

July 3, 2013

Mr. Peter Meade, Director
Boston Redevelopment Authority
One City Hall Square
Boston, Mass 02201

Attn: Mr. Gerald Autler
Senior Project Manager/Planner

Re: Project Notification Form
Northeastern University
Interdisciplinary Science and Engineering Building (ISEB)

Dear Director Meade,

Office of the Vice President
Facilities Division

140 Cullinane Hall
360 Huntington Avenue
Boston, MA 02115

617.373.2700
f 617.373.5700

On behalf of Northeastern University, I am pleased to transmit this Project Notification Form ("PNF") for Northeastern University's Interdisciplinary Science and Engineering Building (ISEB) involving the development of a new building of approximately 197,000 GSF in accordance with the Boston Zoning Code. The program consists of research and office space for new faculty, interdisciplinary research clusters / collaborative space, specialized teaching labs, classrooms, and student space ("Proposed Project"). Also included with the ISEB is the construction of pedestrian track crossings that will span the MBTA Orange Line, Commuter Rail and Mainline Amtrak thereby linking ISEB to the academic side of the campus and connecting the communities on both sides of the campus.

Northeastern's new Institutional Master Plan ("IMP"), which was submitted to the Boston Redevelopment Authority on June 14, 2013, includes this Proposed Project as one of the University's master plan projects.

The Proposed Project will require the reconfiguration of Northeastern's Columbus Avenue Garage to re-route exiting traffic away from the rear of the ISEB and more directly onto Columbus Avenue.

The Proposed Project has been discussed with the Northeastern Community Task Force at meetings earlier this year and Northeastern expects to continue these discussions with the CTF and other interested parties during the PNF public comment and review period over the next 45 days.

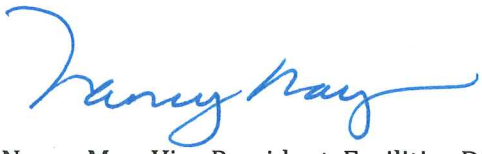
On behalf of the entire project team, we would like to thank your staff for assisting us in the scoping and preparation of this PNF, which we believe addresses all of the information and impact issues normally discussed and analyzed within a Draft Project Impact Report.

We look forward to working with you on this Project, which we believe will be a significant addition to Northeastern University and to the City of Boston.

Please contact me or Steven Spear, Northeastern's Project Manager, at (617) 373-2582 with any questions concerning the ISEB Project.

Sincerely,

NORTHEASTERN UNIVERSITY



Nancy May, Vice President, Facilities Division

Attachment:

Project Notification Form, Interdisciplinary Science and Engineering Building (ISEB), July 3, 2013

cc: Gerald Autler, Senior Planner/Institutional Project Manager, BRA
Ralph Martin, Northeastern University
Kathy Spiegelman, Northeastern University
John Tobin, Northeastern University
James Cahill, Northeastern University
Steven Spear, Northeastern University
Mitchell L. Fischman, MLF Consulting LLC

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1.0 EXECUTIVE SUMMARY

1.1 Introduction/Overview

This Expanded Project Notification Form (Expanded PNF) for Northeastern University's Interdisciplinary Science and Engineering Building (ISEB) is being submitted in accordance with the Article 80B Large Project Review requirements of the Boston Zoning Code ("Code") by Northeastern University (Northeastern or Proponent) for a new building complex within its campus institutional master plan area on a portion of Northeastern's approximately 3.44 acre surface parking area (Columbus Lot) located at 795 Columbus Avenue between the Renaissance Park Parking Garage and the Columbus Parking Garage, south of the MBTA/Amtrak rails (Project Site). See attached **Figure 1-1.** Site Locus. Proposed ISEB Project and **Figure 1-2.** Regional Context).

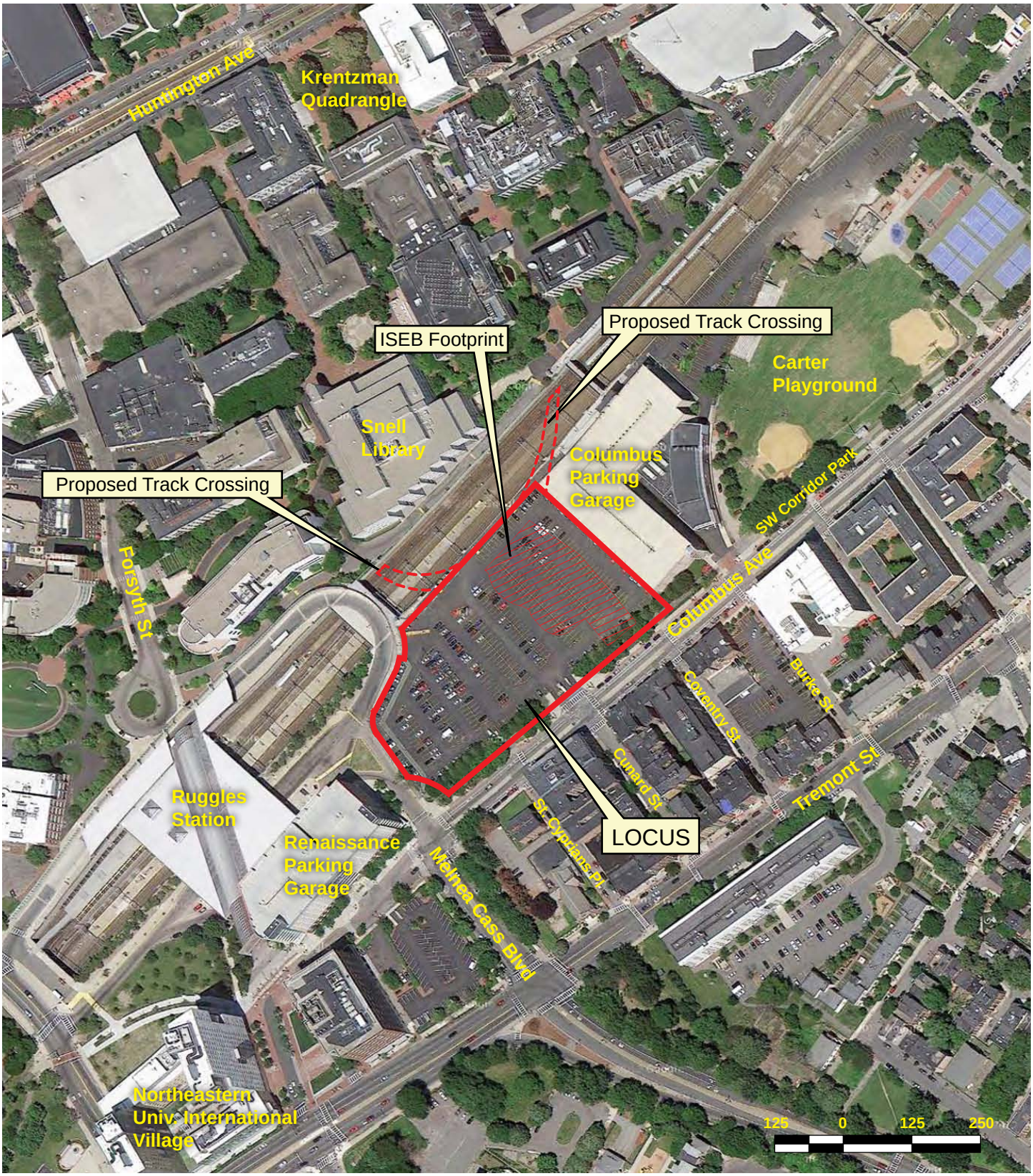
The Expanded PNF approach is intended to identify and resolve possible critical project impact issues and includes detailed analyses of possible impacts in the filing that are normally presented in the later Draft Project Impact Report. In addition, appropriate content or scope of the Expanded PNF has been developed in consultation with the BRA and City Department staffs.

The proposed ISEB involves development of a new building of approximately 197,000 FAR gross square feet (GSF) consisting of research and office space for new faculty, interdisciplinary research clusters / collaborative space, specialized teaching labs, classrooms, and student space. Also included in the project is the construction of pedestrian track crossings that will span the MBTA Orange Line, Commuter Rail, and Mainline Amtrak (all referred to as the railroad tracks), thereby linking the Project Site to the academic side of the campus (Proposed Project).

Northeastern's proposed Institutional Master Plan (IMP), in accordance with Article 80D of the Code, includes this Proposed Project as one of Northeastern's institutional master plan projects. The IMP has already been submitted under separate cover to the Boston Redevelopment Authority. The Proposed Project is consistent with the IMP's proposed build-out and open space configuration of Columbus Lot, which could ultimately consist of three to five buildings for academic, student experience, and event use (with some future underground parking) and linked connections.

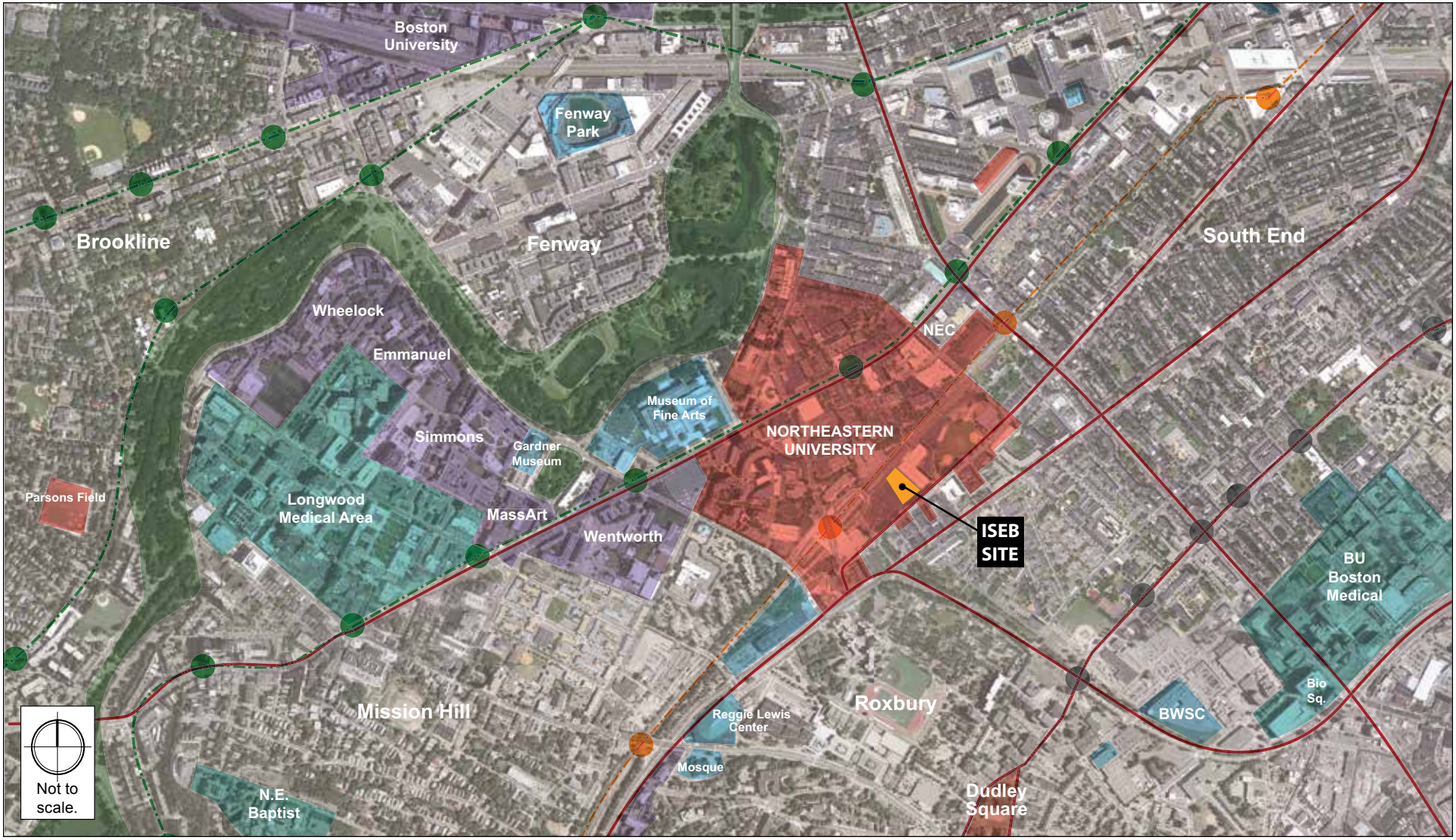
The Proposed Project has been discussed with the Northeastern Community Task Force (CTF) at meetings earlier this year, and will continue to be reviewed with the CTF during the public comment period on the Expanded PNF.

A Letter of Intent (LOI) to file a Project Notification Form was submitted to the Boston Redevelopment Authority (BRA) for the Proposed ISEB project on May 17, 2013. (See **Appendix A** for a copy of the LOI). In addition, detailed studies responding to the BRA request for both a solar glare evaluation and a pedestrian level wind tunnel assessment will be submitted as a supplemental document within two weeks of the Expanded PNF filing, with copies distributed to the BRA and the CTF, and available at neighborhood locations in accordance with the requirements of the public notice.



PAYETTE

Figure 1-1.
Locus Plan
Scale: 1” = 250’-0”



Source: Chan Kreiger NBBJ, Northeastern IMP, 2013.

Figure 1-2.
Regional Context

1.2 Detailed Project Description

The plans for the proposed ISEB include a basement, six levels above grade, and a mechanical penthouse. The first floor provides an on grade front door to the south at Columbus Avenue. The second floor provides access to the pedestrian track crossings via a new footbridge and entry from the academic campus to the north and connecting Columbus Avenue with the remainder of the Northeastern campus (See **Table 1-1.** Summary of ISEB Project Data/Dimensions).

Table 1-1: Summary of ISEB Project Data/Dimensions

Category	Proposed ISEB Project
Lot Area:	Approximately 150,000 square feet (Subject to final title and survey analysis the area of the Columbus Lot site is approximately 3.5 acres)
Ground Floor Building Footprint Area:	Approximately 32,115 gross (FAR) square feet
Total (Zoning) Gross Floor Area[1]:	Approximately 197,000 gross (FAR) square feet
Floor Area Ratio (FAR)	Approximately 1.3
Height[1]:	Approximately 87 feet
Maximum Number of Stories (not including penthouse):	6-stories
Parking Spaces:	0

[1]Gross Floor Area and Height as defined by the Boston Zoning Code.

The development of the Columbus Lot provides an opportunity to strengthen Columbus Avenue as a campus corridor and continues the established momentum of expanding the Northeastern campus south across the MBTA tracks (See **Figure 1-3.** Northeastern University Campus Plan). An increased University presence on Columbus Avenue also creates an opportunity to improve pedestrian connections, open space, and streetscape amenities shared with the surrounding community.

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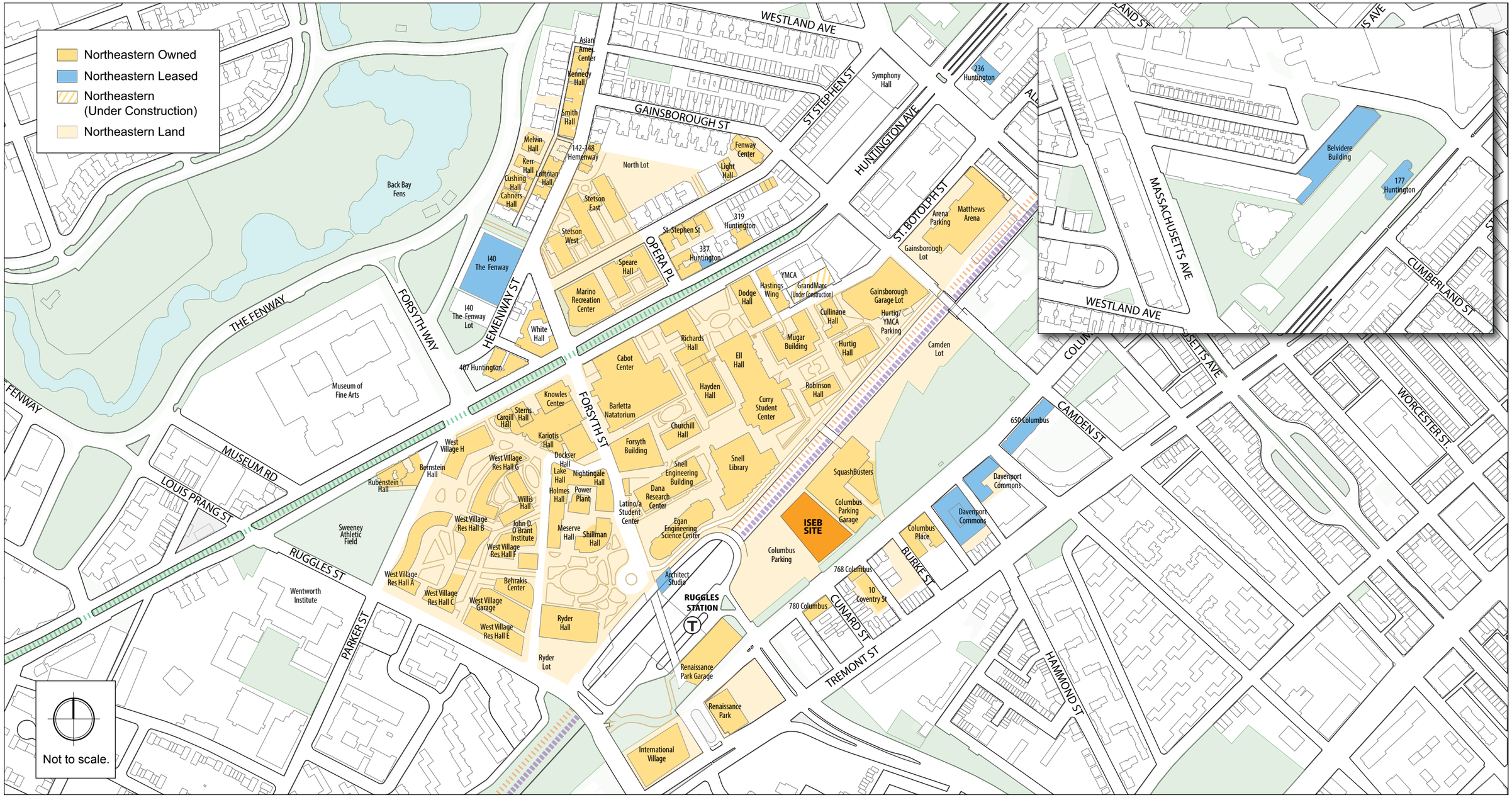

Mitchell L. Fischman CONSULTING LLC

Figure 1-3.
Northeastern University Boston Campus

In addition, the MBTA is proposing to construct a new platform at Ruggles Station to improve inbound service on the MBCR lines. Portions of the new platform will be immediately adjacent to the ISEB site. It is expected that construction of the Ruggles Station platform may be coincident with the ISEB project. The project team has engaged the MBTA to begin discussion of the coordination of the two projects. As the projects progress, the project team will continue to coordinate with the MBTA to ensure the successful construction of the two projects.

The MBTA has an existing utility and maintenance easement within the ISEB site to service its right-of-way, and the platform project is anticipated to require relocation of this easement, to be done in coordination with the ISEB project team.

1.3 Site Context

The Project Site is an ideal location for the Proposed Project because of its proximity to the Northeastern University campus and its close proximity to other University-controlled properties on the Core Campus side of the track right-of-way and the Proposed Project's ability to join with other Northeastern uses along Columbus Avenue and into Lower Roxbury.

1.4 Public Process and Coordination

The Proposed Project has been discussed with the Northeastern Community Task Force at meetings earlier this year and the University will continue discussions with the CTF, elected officials, and interested parties during the public comment period.

1.5 Public Benefits of the ISEB Project

The new ISEB Project will provide a number of benefits to the City and its residents including:

- In addition to connecting ISEB with the main Northeastern Campus, the pedestrian track crossings, subject to receipt of necessary permits and approvals, will serve as a public benefit linking the Fenway and Lower Roxbury communities through the campus;
- Increasing community access to the Ruggles MBTA and Commuter Rail station;
- Constructing new open space and sidewalks/pathways with enhanced landscaping adjacent to the Project site along the north side of Columbus Avenue;
- Enhancing the quality of the building design and vitality of Columbus Avenue with a well-designed building that will animate the Columbus Avenue streetscape;
- Seeking sustainable design and green building features to promote energy conservation and to comply with the provisions of Article 37 of the Boston Zoning Code; and
- Projected to create an estimated 630 new construction jobs and 700 full-time (faculty, staff, other) jobs.

1.6 Compliance with Boston Zoning Code

1.6.1 Current Northeastern Zoning

Northeastern's current leased and owned facilities are located within a large area on both sides of the MBTA/ Amtrak/ Commuter Rail tracks generally bounded by Ruggles and Gainsborough Streets, and both sides of Huntington and Columbus Avenue. The campus area north of the tracks is within the Fenway Neighborhood District (Article 66); a small area of the campus north of Parker Street is within the Mission Hill Neighborhood District (Article 59); and the campus area south of the tracks is within the Roxbury Neighborhood District (Article 50).

In the Fenway Neighborhood District, Northeastern's facilities and land fall within an Institutional Subdistrict (IS), an Institutional Master Plan Overlay District and the Groundwater Protection District. In the Mission Hill Neighborhood District, Northeastern's Burstein Rubenstein parcels fall within an Institutional Master Plan Area. In the Roxbury Neighborhood District, Northeastern's facilities and land fall within the Greater Roxbury Economic Development Area (EDA) and Institutional Master Plan Area.

1.6.2 Future Zoning Controls

ISEB Project

The proposal for the ISEB project includes a new mixed-use building of approximately 228,000 GSF consisting of research and office space for new faculty, interdisciplinary research clusters / collaborative space, specialized teaching labs, classrooms, and student space. Also included in the project is the construction of pedestrian track crossings that will span the MBTA Orange Line, Commuter Rail, and Mainline Amtrak rails. The building plans show a basement, six levels above grade, and a mechanical penthouse. The first floor provides an on grade front door to the south at Columbus Avenue. The second floor provides access to the pedestrian track crossings and entry from the academic campus to the north. The second level of the ISEB will connect to the proposed pedestrian bridge to the academic buildings on the northern side of the railroad tracks, which connects Columbus Avenue and the South Campus Precinct with the main Northeastern Core Campus Precinct.

Effect of Zoning Approval

The ISEB Project will be developed in accordance with Northeastern's IMP and is located within the Greater Roxbury Economic Development Area (EDA) and Institutional Master Plan Area.

Accordingly, provided the ISEB receives a Certification of Consistency with the IMP and a Certification of Compliance under Large Project Review, the Project 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" (Zoning Code, §80D-11).

1.7 Regulatory Review

1.7.1 BRA Review

The Proponent initiated the Article 80 Large Project Review process by submitting a Letter of Intent ("LOI") to file a Project Notification Form with the BRA on May 17, 2013 (See **Appendix A**).

1.7.2 Boston Civic Design Commission (BCDC) Review

As the ISEB project exceeds 100,000 square feet of gross floor area, BCDC review is required for new construction or substantial rehabilitation.

1.7.3 Other Required Permits, Reviews and Approvals

Groundwater Conservation Overlay District (GCOD)

Being south of the railroad tracks, the ISEB is not within the Groundwater Conservation Overlay District but the pedestrian track crossing structure spanning the tracks will require foundations and extension into Northeastern's Campus Precinct to the north of the tracks which is within the GCOD. But for its inclusion in the Northeastern IMP Area, this limited extension into the GCOD would require a conditional use permit under Article 32. However, in accordance with Article 32 where jurisdiction exists, the ISEB Project will incorporate systems that meet groundwater conservation standards set forth in Article 32. Northeastern will obtain written determination from the Boston Water and Sewer Commission as to whether said standards are met and will provide a copy of this letter to the BRA and the Boston Groundwater Trust prior to issuance of a Certificate of Consistency for the ISEB Project. Accordingly, Northeastern will not be required to obtain a GCOD conditional permit from the Board of Appeal for the proposed ISEB Project.

MEPA Review

On June 24, 2013, the Proponent filed a Request for Advisory Opinion with the Executive Office of Energy and Environmental Affairs, Massachusetts Environmental Policy Act ("MEPA") office stating that despite the need for the Project to receive a land transfer (air-rights transfer from the MBTA) for the proposed pedestrian crossings over the railroad tracks used by the MBTA and others as well as likely Commonwealth of Massachusetts permits from the Department of Recreation and Conservation (DCR), the Proponent does not believe that the project will exceed any of the review thresholds set forth in 310 CMR 11.03 and therefore not require the preparation of an Environmental Notification Form.

Massachusetts Historical Commission Review

It is understood that there is likely to be state agency involvement in the ISEB related to obtaining an easement or right-of-way approval over the MBTA railroad tracks. ISEB is thus subject to

review by the Massachusetts Historical Commission in compliance with M.G.L. Chapter 9, sections 26-27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00).

Other Permits and Approvals

A detailed list of required permits and approvals is provided in **Section 2.4.**

1.8 Summary of Project Impacts and Mitigation

1.8.1 Urban Design and Sustainable Design Component

Urban Design

Northeastern University's proposed Interdisciplinary Science and Engineering Building (ISEB) is a new building of approximately 197,000 (FAR) GSF to support the University's long-range academic plan providing improved state-of-the-science research facilities for new faculty. The new facility will support teaching and interdisciplinary research programs in four University Colleges:

- College of Science
- College of Engineering
- Bouvé College of Health Science
- College of Computer and Information Science

The building provides new open, efficient, flexible, and adaptable research laboratories arranged to support the needs of proposed interdisciplinary research clusters. Office space and formal and informal meeting spaces essential to collaborative work are organized around a central atrium space defining a robust research community on the upper floors (2-6). Academic teaching space including specialized teaching labs, classrooms, and a 280-seat auditorium animate the lower floors (1-2).

The main concept for the development of the site is one of integration, connecting communities across the existing rail corridor; the Roxbury Community connecting to the Fenway Community and the Northeastern South Campus connecting to the Core Campus. Development of the ISEB and its landscaped open space brings campus activity directly to Columbus Avenue and supports the Master Plan improvements for the Columbus Avenue streetscape and Southwest Corridor Park. The increased University presence on Columbus Avenue also creates an opportunity to improve pedestrian connections, open space and streetscape amenity shared with the surrounding community.

The design does not turn its back on the tracks, instead the design of both site and building open up to and are integrated into the surrounding area with a new pedestrian track crossing. The construction of this pedestrian track crossing spanning the tracks provides an accessible landscape integrated with the campus open space network, linking the communities.

The Project brings an aggressive sustainable approach both to the building's exterior envelope design, energy efficiency in support of the demanding laboratory programs, and features integrated within the development of the site and landscape.

Sustainable Design

The Project team will implement sustainable design and energy conservation measures, which will be further developed as the design process continues. The current target is LEED Gold. The project will be pursuing formal LEED certification through the Green Building Certification Institute (GBCI).

Careful review and evaluation of the requirements of Article 37 of the Boston Zoning Code will be undertaken relative to the City's Green Building policies and procedures. The City is actively promoting measures to encourage buildings to decrease energy and water use and cost, improve the efficiency and useful life of building systems and infrastructure, and reduce the burdens imposed by buildings on City services, the environment, and public health.

The Project architectural/engineering/construction team includes several LEED Accredited Professionals. All sustainable strategies will continue to be discussed at length to determine feasible cost-effective and schedule-wise solutions.

An updated LEED-NC Version 3.0 Checklist is provided in Figure 3-28 to identify sustainability design objectives for this Project.

System design solutions will be developed in an effort to achieve the targeted LEED credits. The final design and construction of the Project will result in a sustainable building to promote the internal building environmental quality for the occupants, enhance the surrounding neighborhood locally, and reduce environmental impacts globally

1.8.2 Environmental Impact Component

Pedestrian-Wind Comfort Assessment

A quantitative pedestrian level wind analysis is being completed for the ISEB project. In addition to the wind tunnel results from the ISEB project alone on the Columbus Lot site, a separate wind tunnel evaluation is being completed for the full possible Institutional Master Plan (IMP) build-out for the complete site which includes the completion of at least two other mixed-use academic buildings in accordance with the recently filed IMP. The results of these evaluations will be submitted by July 15, 2013 to the BRA as a supplemental filing.

Shadow Analysis

For much of the year, most of the new shadows cast by the Proposed Project will affect mainly the pedestrian track crossing across the MBTA tracks and west façade of the Columbus Parking Garage in the afternoon. At the apex of the summer season, new shadows will extend across the MBTA tracks to the north and reach the foot of the Snell Library.

Daylight Analysis

The Proposed Project will alter the view of the skydome from the adjacent streets and areas. This effect cannot be avoided. Replacing the existing parking lot with any building development on this site will necessarily create some skydome impacts. The ISEB will, by design, increase substantially the foot traffic between Columbus Avenue to the remainder of the Northeastern campus. Pedestrian enjoyment of the urban experience in this area will be improved. Given the general lack of activity generated by the existing uses the net effect of the project will be a substantial enhancement of the public realm in this area.

Solar Glare Analysis

An analysis of the potential solar glare impacts is being prepared by the project team's solar glare consultant, Rowan Williams Davies & Irwin Inc**.** (RWDI). A number of design features have been implemented to avoid reflection issues. The building height is below 100 feet, facade materials have been selected to be low-reflectivity glass windows as opposed to highly reflective "mirror-type" glass, and exterior shading devices envelope the southern facade. For these reasons it is not anticipated that the project will significantly impact any major public way or trains within the MBTA, Commuter and Amtrak rail corridor. The Solar Glare Analysis will be submitted as a supplemental evaluation to the BRA by July 15, 2013.

Air Quality Analysis

RWDI has completed an analysis to evaluate air quality impacts from the project's proposed exhausts at proposed and existing sensitive receptor locations. Re-entrainment of emergency generators, laboratory fume hoods, specialty hoods, and atrium smoke fumes was quantified using physical dispersion modeling. Our preliminary results are included in **Section 4.5** with **Figure 4.5-1**, Location of Exhausts Sources and Receptors, illustrating the location of the sources and receptors that were evaluated in the wind tunnel. The final results of these evaluations will be submitted by July 15, 2013 to the BRA as a supplemental filing.

The Project will result in a negligible increase in motor vehicle trips; therefore a microscale air quality analysis of motor vehicles is not warranted for the Proposed Project.

Noise Analysis

Acentech Inc. has performed noise studies to confirm that the operation of the completed Project will comply with the City of Boston Noise Regulations and the Massachusetts Department of Environmental Protection ("DEP") Noise Policy. The most sensitive neighbors are residences in buildings across Columbus Avenue to the southeast of the site. The other nearby receptors are occupants in Northeastern buildings, the train tracks, and a parking garage. There is a public park (Carter Playground) on the other side of the parking garage, but this is quite distant and with the treatments planned to meet community noise standards at the adjacent residences, the noise level reaching the park is expected to be much lower.

Compliance with the Boston regulation is going to require noise from the building with all equipment operating to be below 50 dBA at the critical residential receiver. To be in compliance with the state requirement the noise emission needs to be lower than 61 dBA (10 dBA over the quietest hourly L90 level). For compliance with both requirements the noise emissions must not be tonal, but with the attenuation treatments planned, noise emissions from the equipment are not expected to be perceived as being tonal.

The noise level at the critical neighbors is expected to be below 50 dBA, which is below the most stringent nighttime noise requirement. Acentech will be working with the design team to assure that the mechanical equipment and generators for the project will produce no more noise than the required State and Boston limits. Calculations will be done for the sound propagation from each significant project source to predict the sound level at the critical receivers and the noise of all the sources will be summed to determine compliance.

Solid and Hazardous Waste

Solid Waste

Northeastern recycles more than 255 tons of paper, 295 tons of corrugated cardboard, 71 tons of bottles and cans, and 58 tons of computers and electronics each year. Nearly 38 percent of its waste is recycled. Recycling bins are located throughout the campus to encourage members of the Northeastern community to recycle. The University even recycles many of the canvas banners that appear around campus, turning them into useful items that are given to students and alumni.

Hazardous Waste

Previous environmental studies conducted at the site between 1987 and 2004 identified concentrations of chemical constituents exceeding reporting thresholds. A Response Action Outcome Statement (RAO) submitted by Northeastern University to DEP in July 2004 concluded that a condition of No Significant Risk exists at the Site under 310 CMR 40.0900, and therefore no remedial actions were necessary. It was determined that an Activity and Use Limitation (AUL) was not necessary to ensure the existence or maintenance of a level of "No Significant Risk". Additional investigations will be undertaken during project design to evaluate environmental conditions relative to project construction.

Regulated material, if any, leaving the site will be required to be legally transported in accordance with local, state and federal requirements. All work will be conducted in accordance with Massachusetts Department of Environmental Protection regulatory requirements.

No buildings are present at the property requiring demolition. Construction debris encountered during excavation is expected to include asphalt, and remnants of former building foundations, which will remain in place and buried such as brick, concrete, wood and granite block. The Proponent will ensure that waste removal and disposal during construction and operation will be in conformance with the City and the Massachusetts Department of Environmental Protection ("DEP") Regulations for Solid Waste.

Flood Hazard Zone/Wetlands

Federal Emergency Management Agency's ("FEMA") Flood Insurance Rate Maps for the City of Boston (Community Panel 25025C0079G, Effective Date September 25, 2009) were reviewed to determine if the Project Site lies within the 100-year flood plain. The Project Site does not fall within an area of the 100-year flood, as defined by FEMA.

No Areas of Critical Environmental Concern or State Certified Vernal Pools exist within the Project Site. Likewise, the Project Site is not included on the list of either Priority Habitats for State-Listed Rare Species or the list of Estimated Habitats for Rare Wildlife.

Water Quality Resources/Stormwater Management

The quality of stormwater runoff from the Project Site is expected to improve as a result of the Project because of the replacement of outdated catch basins with deep sump catch basins. The new building will cover the majority of the Project Site. Runoff from both of these areas is generally considered clean and does not typically require treatment.

The stormwater management system will be designed in accordance with BWSC's design standards and the BWSC "Requirements for Site Plans." A Site Plan will be submitted for BWSC approval and a General Service Application will be completed prior to any off-site drain work. Any drain connections that are terminated as a result of construction will be cut and capped at the main storm drain in the street in accordance with the BWSC standards. A pollution prevention plan will be prepared for use during construction including during demolition activity.

Geotechnical/Groundwater Impacts

Existing subsurface conditions and geotechnical impacts of the Project are discussed in **Section 4.10.** The general subsurface profile consists of about 5 to 10.5 feet of fill over a thick layer of marine sand and clay, glacial till and bedrock at depths exceeding 100 feet.

Construction Impacts

The Proponent will comply with applicable state and local regulations governing construction of the Project. The Proponent will require that the construction contractor comply with the Construction Management Plan ("CMP") developed in consultation with and approved by the Boston Transportation Department ("BTD"), prior to the commencement of construction. The construction manager will be engaged to ensure that the construction of the Project complies with the CMP, which will establish the construction guidelines for the duration of the Project and will include specific mitigation measures and staging plans to minimize impacts.

Suffolk Construction, as the Construction Manager, will be responsible for developing a construction phasing and staging plan and for coordinating construction activities with the appropriate regulatory agencies and abutting properties. The Project's geotechnical consultant will provide consulting services associated with foundation design recommendations, prepare geotechnical specifications, and review the Construction Contractor's proposed procedures.

The project will be constructed on a portion of Northeastern's 3.43 acre open parking lot at 795 Columbus Avenue. Sensitivity to abutters and pedestrians is a critical element of the project that will be paramount to the development of the CMP.

Construction methodologies to address safety concerns will be employed and signage will include Construction Manager contact information with emergency contact numbers.

The Proponent will also coordinate construction with other ongoing projects, if applicable, in the vicinity.

1.8.3 Transportation Component

Section 5.0 of this PNF presents the comprehensive transportation study completed for the proposed Project based on preliminary discussions with the Boston Transportation Department ("BTD") and Boston Redevelopment Authority ("BRA"), and in conformance with the BTD *Transportation Access Plan Guidelines* (2001). The study analyzes existing conditions within the Project study area, as well as conditions forecast to be in place with the Proposed Project.

The new building will displace approximately 317 existing surface parking spaces and incorporate new pedestrian connections over the Southwest Corridor tracks, linking the north and south campuses. No new parking would be provided with the project and vehicles that currently park in the displaced parking spaces would in the future park in the Columbus Garage, which has adequate available supply to accommodate this demand. All service and loading activity for the ISEB would be provided within a dedicated loading area located behind the building.

The existing curb cut serving the Columbus Lot, opposite Cunard Street, would be relocated approximately 200 feet east of its current location to serve as the Project's two-way service driveway. Access to the remaining approximately 165 surface parking spaces in the Columbus Lot would then be provided via the existing, but currently inactive, driveway located opposite St. Cyprians Place. In order to accommodate the construction of the ISEB building, the Columbus Garage exit driveway located at the northwest corner of the parking structure would be closed and the entrance driveway on Columbus Avenue would be converted to a two-way driveway.

The Project proposes to provide a dedicated bicycle storage room and shower facilities within the building for students and employees as well as outdoor bicycle racks for visitors and guests.

1.8.4 Infrastructure Systems Component

The infrastructure section of this EPNF addresses the capacity and adequacy of existing water, sewage, stormwater, energy and electrical communications utility systems to the extent that information is available to assess these systems. It also addresses the coordination of construction with these utilities and other public agencies. The design team has contacted various City's Departments and utility agencies to inquire the available of public utilities that serves the project site. Based on our initial investigation, we have determined that there is enough capacity within the existing electric, natural gas, telecommunication, water, storm drain and sanitary

systems to support this project. The project will increase pervious coverage on site and to promote on-site groundwater recharge. The stormwater runoff from the site will greatly reduce with the new site stormwater design. Although the site is not within the Groundwater Conservation Overlay District (GCOD), the recharge volume proposed will meets the GCOD requirements.

The Proponent and its consultants has initiated contact with the Boston Water and Sewer Commission ("BWSC") to understand and evaluate the water, storm drain, and sanitary sewer systems, and to design the Project to prevent disruption of utility services. Further meetings and discussions will be scheduled as detailed building design and progresses.

The proposed connections to the water, storm drain, and sanitary sewer systems will be designed to conform to the BWSC's design standards, Water Distribution System and Sewer Use Regulations, Requirements for Site Plans. Separate sanitary sewer and storm drain connections will be provided. The Proponent will submit a Site Plan to the BWSC's Engineering Services Division for review and approval when the design of the Project is 50% complete. A General Service Application will be obtained prior to construction. The Site Plan will show the location of water, storm drain, and sanitary sewer systems, which serve the Project Site, and the location of existing and proposed water, storm drain, sanitary sewer connections and groundwater recharge/stormwater infiltration facilities.

The ISEB team will coordinate with the Massachusetts Bay Transportation Authority (MBTA), Massachusetts Bay Commuter Rail (MBCR) and Amtrak on the review of the design for the ISEB and proposed air rights (pedestrian track crossing) construction. The ISEB team will work closely with the MBTA, MBCR, and Amtrak to ensure that the ISEB project to minimize impact on the existing railroad infrastructure and operation and the future MBTA planned improvement within the project area.

1.8.5 Historic Resources Component

Section 7.0 of this PNF describes the existing Project Site and identifies the significant historic resources within one-quarter mile of the ISEB and assesses potential impacts of the Project on these resources. Thorough and comprehensive historic resources surveys of the Mission Hill/Parker Hill Neighborhood and of the Fenway Neighborhood were completed in 1983 and 1984 under the supervision of the Boston Landmarks Commission and the BRA. They identified numerous historic individual properties and districts. While some of these are not yet listed as Local Landmarks or in the State or National Registers of Historic Places, those that fall within the one-quarter mile radius and were recommended for listing in the 1980s surveys are listed here to provide an accurate context of the historic resources in the vicinity of ISEB. Properties listed in the State and National Registers of Historic Places are included in the Historic Resources Section.

The design for the ISEB is included in **Section 3.3** of this PNF. Contemporary in design, the proposed building will be seen in the context of some of Northeastern University's other recent buildings and will encourage a pedestrian connection between the Lower Roxbury neighborhood

on the south side of Columbus Avenue with this site, with the MBTA Ruggles Station, and with the Huntington Avenue portion of the Northeastern campus.

Measures will be proposed, if needed, to address potential impacts to historic resources from the ISEB. Geotechnical instrumentation programs will be implemented for adjacent structures to monitor and limit the potential for construction period impacts from vibration, limited dewatering, and settlement. Limited shadow impacts are anticipated from the ISEB and would affect two buildings in the Lower Roxbury Historic District. The pedestrian level wind analysis will be submitted to the BRA as a supplemental filing by July 15, 2013.

2.0 GENERAL INFORMATION

2.1 Applicant Information

2.1.1 Northeastern University

Founded in 1898, Northeastern University is a private urban research university located on both sides of Huntington Avenue on the edges of the Fenway, South End, Mission Hill and Roxbury neighborhoods of Boston. Northeastern has approximately 15,000 full-time undergraduate students.

The University's mission is to educate students for a life of fulfillment and accomplishment, and to create and translate knowledge to meet global and societal needs.

Northeastern's specific objectives, as reflected in its Institutional Master Plan ("IMP") include:

- Development of superior academic facilities to serve the University's increasingly sophisticated teaching environment;
- Development of superior research facilities to support the University's growing research programs, including those in the fields of health, security and sustainability;
- Continued enhancement of the University's student residential facilities, to help attract and retain qualified students; and
- Consolidation of administrative and other non-academic uses, so as to maximize the availability of space and resources in the central campus area to better serve the University's academic priorities.

The numerous projects completed under the University's prior IMP over the past ten years have substantially advanced these above objectives, including additional student housing, enhanced technology, replacement of outdated buildings, and long term preventative maintenance.

2.2 ISEB Project Team

Table 2-1: Northeastern ISEB Project Team	
Project Proponent	**Northeastern University** 360 Huntington Avenue Boston, MA 02115 Nancy May, n.may@neu.edu, (617) 373-2700 Kathy Spiegelman, k.spiegelman@neu.edu, (617) 373-6194 John Tobin, j.tobin@neu.edu, (617) 373-3168 David Navick, d.navick@neu.edu, 617-373-3848 Jim Cahill, j.cahill@neu.edu, (617) 373-3415 Stephen Spear, s.spear@neu.edu, (617) 373-2582
Environmental and Permitting Consultant:	**Mitchell L. Fischman Consulting LLC** 41 Brush Hill Road Newton, MA 02461 Mitch Fischman, mitch.fischman@tetratech.com, (781) 760-1726 Margit Liander, liander.margit@gmail.com, (617) 899-5462
Architect:	**Payette Associates** 290 Congress Street Fifth Floor Boston, MA 02210-1005 Robert Schaeffner, AIA, LEED rschaeffner@payette.com, (617) 895-1030 Kevin Sullivan, FAIA, ksullivan@payette.com, (617) 895-1048 Barry Shiel, AIA, bshiel@payette.com, (617) 895-1040 Christopher Baylow, AIA, cbaylow@payette.com, (617) 895-1202
Landscape Architect:	**Stephen Stimson Associates** 288 Norfolk Street Cambridge, MA 02139 Stephen Stimson,FASLA, sstimson@stephenstimson.com, 508-548-8119 Edward Marshall, emarshall@stephenstimson.com, 617-876-8960 Bernice Wahler, bwahler@stephenstimson.com, (617) 876-8960 Milee Shrestha, LEED AP BD+C, mshrestha@stimson.com, (617) 876-8960

Project Counsel:	**Goulston and Storrs** 400 Atlantic Avenue Boston, MA 02110-333 Adam R. Hundley, ahundley@goulstonstorrs.com, (617) 574-3540 Matthew Kiefer, mkiefer@goulstonstorrs.com, (617) 574-6597
Transportation Planner/Engineer:	**Howard/Stein-Hudson Associates, Inc.** 38 Chauncy Street, 9th Floor Boston, MA 02111 Joseph SanClemente, P.E., AICP, js@hshassoc.com, (617) 348-3334 Guy D. Busa, Jr., gbusa@hshassoc.com, (617) 348-3314
Historic Preservation Consultant:	**Tremont Preservation Services LLC** 374 Congress Street, Suite 301B Boston, MA 02210 Leslie Donovan, donovanl@erols.com, (617) 482-0910
Laboratory Planning:	**Jacobs Consultancy** 303 S. Broadway, #G20 Tarrytown, NY 10591-5444 Josh Meyer, AIA, Josh.Meyer@jacobs.com, (914) 333-1116 Rick Honeywell, rick.honeywell@jacobs.com, (732) 635-2210
Pre-Construction Advisor:	**Suffolk Construction Company, Inc.** 65 Allerton Street Boston, MA 02119 Tel: (617) 445-3500 Frank Craemer, fcraemer@suffolkconstruction.com Tim Galvin, tgalvin@suffolkconstruction.com
Civil Engineer:	**Vanasse Hangen Brustlin, Inc.** 99 High Street 10th Floor Boston, MA 02110 Mark Junghans, P.E., mjunghans@vhb.com, (617) 607-2916 Chi Man, P.E. cman@vhb.com, (617) 607-2929 David Roache, P.E., droache@vhb.com, (617) 607-2928

Structural Engineering Consultant:	**LeMessurier Consultants Inc.** 1380 Soldiers Field Road Boston, MA 02135 Peter J. Cheever, P.E., pcheever@lemessurier.com, (617) 868-1200 Eric Hines, Ph.D., P.E., ehines@lemessurier.com, (617) 868-1200
Mechanical, Electrical, Plumbing and Fire Protection Engineers	**ARUP** 77 Water Street New York, NY 10005 **ARUP** 955 Massachusetts Avenue Cambridge, MA 02139 Fiona Cousins fiona.cousin@arup.com, (212) 897-1315 Mark Walsh-Cooke, P.E., LEED AP mark.walsh-cooke@arup.com, (617) 349-9228 Julian Astbury, P.E. julian.astbury@arup.com, (617) 349-9230
Code Consultant:	**Sullivan Code Group** 302 Union Street Boston, MA 02109 Kevin Hastings, ksh@rwsullivan.com, (617) 523-8227
Cost Estimating Consultant:	**Vermeulens** 9835 Leslie Street Toronto, ON L48 3Y4 James Vermeulens, jvermeulens@vermeulens.com, (617) 835-6823 Riv Manning, rmanning@vermeulens.com, (905) 787-1880 x 117
Geotechnical and Hazardous Waste Consultant:	**Haley & Aldrich, Inc.** 465 Medford Street, Suite 2200 Boston, MA 02129 Marya. Gorczyca, P.E., mgorczyca@haleyaldrich.com (617) 886-7408 Katelyn Tripp, ktripp@haleyaldrich.com, (617) 886-7482

Noise, Vibration and Acoustics Consultant:	**Acentech, Inc.** 33 Moultoin Street Cambridge, MA 02138 Douglas Sturz, dsturz@acentech.com, (617) 499-8000
Wind, Air Quality, and Solar Glare Engineer:	**Rowan Williams Davies & Irwin Inc.** 650 Woodlawn Road West Guelph, Ontario, Canada N1K 1B8 Ray Sinclair, Ph.D., ray.sinclair@rwdi.com, (519) 823-1311 x2243 Sonia Beaulieu, M.Sc., P.Engineering., sonia.beaulieu@rwdi.com, (519) 823-1311 x 2429
Daylight Consultant:	**Vanasse Hangen Brustlin, Inc.** 99 High Street 10th Floor Boston, MA 02110 Chris Gervais, cgervais@vhb.com, (617) 728-7777
Sustainability Consultant:	**Soden Sustainability Consultant** 19 Richardson Street Winchester, MA 01890 Colleen Ryan Soden, colleen@sodensustainability.com, (617) 372-7857

2.3 Legal Information

2.3.1 Legal Judgments or Actions Pending Concerning the Project or Project Site

The Proponent is not aware of any legal judgments or actions pending which involve the Project or Project Site.

2.3.2 History of Tax Arrears on Property Owned in Boston by the Applicant

Northeastern owns no real estate in Boston on which real estate tax payments are in arrears.

2.3.3 Evidence of Site Control over the Project Area

Northeastern University owns the Project Site.

2.3.4 Nature and Extent of Any and All Public Easements

The MBTA has an existing utility and maintenance easement within the ISEB site to service the right-of-way. The platform project is anticipated to require relocation of this easement. The project team will work with the MBTA to establish a new easement location as the design progresses.

The Southwest Corridor Park extends along the southern boundary of the property and the Proponent believes an easement runs along this area in favor of the MBTA and/or Massachusetts Department of Conservation and Recreation (DCR). Confirmation will be established during the public review and comment period for this PNF filing.

2.4 Preliminary List of Permits or Other Approvals Which May Be Sought

The construction of the Project is subject to Large Project Review under Article 80 of the Boston Zoning Code. The table below provides a list of permits or actions based on Project information currently available. It is expected that the schedule for receiving needed permits will extend at least into the first or second quarter of 2014.

Table 2-2. Anticipated Permits or Actions

AGENCY NAME	ANTICIPATED PERMIT OR ACTION
FEDERAL AGENCIES	
Federal Aviation Administration	Determination of No Hazard to Air Navigation (Crane Determination To Be Made if over 200 feet)
U.S. Environmental Protection Agency	National Pollutant Discharge Elimination System (NPDES) with associated SWPPP; General Stormwater Permit During Construction; and Temporary Construction dewatering Permit.
Amtrak	Design Review and Approval
STATE AGENCIES	
Massachusetts Department of Transportation (MDOT); MBTA/TRA	Access to Tracks; Land Transfer for the pedestrian crossings; curb-cut permit or modification, if required

STATE AGENCIES (continued)	
Massachusetts DOT	Review of Former Railroad Right of Way Land pursuant to G.L. Ch.40, Section 54 A of the MA code. (Former Railroad Land); Curb-cut permit or modification, if required
Massachusetts Department of Conservation and Recreation (DCR)	Curb-cut permit or modification, if required
Massachusetts Department of Environmental Protection, Division of Water Pollution Control	Sewer Connection Self Certification
Massachusetts Department of Environmental Protection, Division of Air Quality Control	Fossil Fuel Utilization Permit – MGL c111 section 142A-E; Notice of Commencement of Construction WBP-AQ06
Massachusetts Historical Commission	State Register Review under 950 CMR 71.00 (may include consultation with Boston Landmarks Commission)
Massachusetts Bay Commuter Rail	Design Review and Approval
Massachusetts Water Resource Authority	Industrial Wastewater Discharge Permit
LOCAL AGENCIES	
Boston Redevelopment Authority	Article 80 Large Project Review and Certificate of Compliance/Consistency; Cooperation Agreement, DIP Agreement and Ancillary Article 80 Agreements; Green Building Certification; Approval of 2012-2022 Northeastern University Institutional Master Plan and submission to the Boston Zoning Commission with Map Amendment to modify the IMP Area.
Boston Civic Design Commission	Schematic Design Review in accordance with Article 28 of the Boston Zoning Code.

LOCAL AGENCIES (continued)	
Boston Parks Commission	Review under City of Boston Ordinance 7-4.11 (for proximity to Southwest Corridor Park)
Boston Transportation Department	Transportation Access Plan Agreement; Construction Management Plan.
Boston Water and Sewer Commission	Approval for Sewer and Water Connections; Construction Site Dewatering; and Stormwater Drainage.
Boston Department of Public Works; Public Improvements Commission	Permits for curb cuts and work in streets; specific repair plan and subsurface or vertical discontinuances, if and as required; and Site Plan Approval
Boston Public Safety Commission, Committee on Licenses	Permit for Storage of Fuel in (emergency storage) tanks, if required
Boston Fire Department	Approval of Fire Safety Equipment.
Boston Department of Inspectional Services	Building Permits; Certificates of Occupancy; other Construction-Related Permits.

*This is a preliminary list based on project information currently available. It is possible that not all of these permits or actions will be required, or that approval of additional permits or actions may be needed.

2.5 Project Cost and Schedule

The total estimated construction cost is approximately $165 million, with site preparation to commence in early 2014 and completion and occupancy in September 2016.

2.6 Development Impact Payment ("DIP") Status

Based on current design plans, it is anticipated there will be Development Impact Payments ("DIP"), in accordance with Article 80B-7 of the Code, of approximately $765,000 for Housing (based upon 197,000 FAR GSF minus exclusion for the initial 100,000 GSF) and approximately $152,000 for Jobs.

3.0 URBAN AND SUSTAINABLE DESIGN COMPONENT

3.1 Introduction

The following sections describe and illustrate the Project's urban and sustainable design component.

3.2 Project Concept

Northeastern University's proposed Interdisciplinary Science and Engineering Building (ISEB) is a new building of approximately 197,000 (FAR) GSF to support the University's long-range academic plan providing improved state-of-the-science research facilities for new faculty. The new facility will support teaching and interdisciplinary research programs in four University Colleges:

- College of Science
- College of Engineering
- Bouvé College of Health Science
- College of Computer and Information Science

The building provides new open, efficient, flexible, and adaptable research laboratories arranged to support the needs of proposed interdisciplinary research clusters. Office space and formal and informal meeting spaces essential to collaborative work are organized around a central atrium space defining a robust research community on the upper floors (2-6). Academic teaching space including specialized teaching labs, classrooms, and a 280-seat auditorium animate the lower floors (1-2). A café open to the public will be provided at the ground floor level.

The main concept for the development of the site is one of integration, connecting communities across the existing rail corridor; the Roxbury Community connecting to the Fenway Community and the Northeastern South Campus connecting to the Core Campus. Development of the ISEB and its landscaped open space brings campus activity directly to Columbus Avenue and supports the Master Plan improvements for the Columbus Avenue streetscape and Southwest Corridor Park. The increased University presence on Columbus Avenue also creates an opportunity to improve pedestrian connections, open space and streetscape amenity shared with the surrounding community.

The design does not turn its back on the tracks, instead the design of both site and building open up to and are integrated with a new pedestrian track crossing. The construction of this pedestrian track crossing spanning the tracks provides an accessible landscape integrated with the campus open space network, linking the communities.

The Project brings an aggressive sustainable approach both to the building's exterior envelope design, energy efficiency in support of the demanding laboratory programs, and features integrated within the development of the site and landscape.

3.3 Building Design

3.3.1 Height and Massing

The building is 6 stories (plus mechanical penthouse) with a maximum height to the roof of the highest occupied floor of 87 feet as measured from grade to the top of highest occupied floor as defined by the Boston Zoning Code, and approximately 128 feet at the highest point of the mechanical enclosure. The 228,000 GSF building has a Total Zoning Gross Floor Area of approximately 197,000 square feet. The height and area of the ISEB is consistent with the guidelines established for the Columbus Lot within the Institutional Master Plan.

The building extends from Columbus Avenue toward the tracks along the length of the existing Columbus Avenue Parking Garage. The building massing has been organized in two main volumes; an east facing laboratory bar and a west facing office form wrapped around a central open atrium space. The east laboratory bar is a taller height structure, which includes a mechanical penthouse level. The west facing office mass is approximately 30 feet lower facing the central open landscape space.

The first floor provides an on grade front door to the south facing Columbus Avenue. Active academic teaching and conference programs on this level surround the ground floor of the atrium. This space includes a café supporting both indoor and outdoor seating. Both the site and interior atrium step up to the second floor and provide direct access to/from the pedestrian track crossing.

3.3.2 Exterior Building Materials and Architectural Expression

The architectural expression responds to this site's unique forces of connectivity and integration that extend the connected landscape of the campus across the tracks, gathering multiple campus paths together with the street patterns to the south. This collection and channeling of tributaries (similar to a watercourse) has been visually interpreted in the organic forms of the building, the design of the pedestrian track crossing, and the landscape development.

The building will be clad with a fully glazed curtainwall consistent with the intent to have a visually open design placing science on display. This will also bring the active visual presence of the 24/7 research laboratory operations to the site. The high performance curtainwall envelope will balance the openness with insulating spandrels to achieve the thermal performance requirements of the skin. The curtainwall will be wrapped with an outer skin of fixed solar shading responding to the building orientation. Primarily in response to the south and southwest exposure, the building is shrouded with shading devices tuned to the building exposure configured to create the expressive soft building forms. Careful integration of the curtainwall with the shading systems will minimize thermal bridging to maintain peak performance of the systems.

3.4 Site Design

3.4.1 Vehicular Access and Egress

Vehicular access to campus and the site along Columbus Avenue will remain largely unchanged. Reduction of on-site parking associated with the development of this project is consistent with current demand profile of the University. Access to the remaining on-site parking will be accomplished through minor modifications to the existing curb cut. Access to the Columbus Avenue Garage will be maintained through the existing curb cut. The third existing curb cut will be relocated to support the proposed service access drive. This drive located east of the new building adjacent to the existing garage will provide access to the building's loading dock facility adjacent to the tracks and well concealed below the track crossing structure.

3.4.2 Pedestrian Environment

The potential for the Columbus Avenue Lot as Northeastern's largest future academic precinct is recognized through the integration of significant open space and the introduction of critical elevated track crossings to improve public connections and to integrate the campus and community on either side of the MBTA rail corridor.

Careful consideration has been given to the arrangement of the new gateway entry to the campus. Consistent with the goals of the IMP for the Columbus Lot, the proposed project provides a new open space along Columbus Avenue, which can serve as an amenity for the both the University and the broader community. This extensive urban plaza extends into the site from Columbus Ave. It creates a visual identity point for the University along the south edge of campus and a very visible entrance to the building set back from the sidewalk. This large multi-purpose space is able to accommodate a wide variety of events and is well activated by programs of the adjacent atrium. This space has the potential to be highly used by students and the community.

The open plaza together with the development of a new sloped landscape walk becomes an extension of the network of open north/south paths leading from the neighborhood streets south of Columbus Avenue to the network of landscaped walks internal to the campus and to the neighborhood streets north of Huntington Avenue beyond.

The sloped landscape creates an accessible path for pedestrians and bicycles from Columbus Avenue up approximately 14 feet to the new landscaped pedestrian track crossing level. The shape of the track crossing structure creates a generous extension of the campus landscape and an identifiable signature from the rail corridor below. The southern sweep of the pedestrian track crossing integrates directly with the new landscape. The two northern landings of the track crossing are positioned to link with steps to the existing paths of the campus, along with an accessible path extending to Forsyth Street completing the accessible route for pedestrians and bicycles.

3.4.3 Other Landscaping Features/Amenities/Open Space

The Proposed Project will enhance the quality of the streetscape and neighborhood by way of a visually open building design, integrated landscape design details, and a durable palette of materials. The Project will further animate Columbus Avenue through lighting and hard and soft landscaping and lighting.

The building's "24/7" occupancy will help create a safer street environment and vibrant local community. Combined with the open space design this helps to create a welcoming urban environment and safe pedestrian experience—a significant upgrade from the current parking lot.

The frontage of the site along Columbus Avenue includes an upgrade of the existing infrastructure of Columbus Avenue and Southwest Corridor Park. This parkway serves multiple modes of transportation (i.e. walking, bicycling, etc.), and is integrated into the design of the adjacent open space design.

The landscape is designed for a high level of biodiversity and sustainability. Control of stormwater is achieved by channeling water within the sloped site as a feature terminating in a bioswale rain garden. The existing mature linden trees lining the street will be supplemented with additional trees, contributing to the environment of the streetscape and providing additional carbon sequestration.

3.5 Urban Design Submission and Project Drawings

Design drawings depicting the Project and photographs of existing conditions are illustrated in **Figures 3-1 through 3-30.**

Figure 3-1. **Site Context: Satellite Imagery**

Figure 3-2. **Site Context Aerial: Photography**

Figure 3-3. **Context Photograph: Site from West across Parking Lot**

Figure 3-4. **Context Photograph: Site from Southeast along Columbus Avenue from Corner of Melnea Cass Blvd.**

Figure 3-5. **Context Photograph: Site from Southwest along Columbus Avenue from Corner of Cunard Street**

Figure 3-6. **Context Photograph: Site from Southeast along Columbus Avenue from Corner of Benton Street**

Figure 3-7. **Context Photograph: Site from Southeast along Columbus Avenue from Corner of Benton Street**

Figure 3-8. **Context Photograph: Site from Northeast at Forsyth Circle**

Figure 3-9. **Landscape Plan**

Figure 3-10. **Lower Level Plan**

Figure 3-11. **Level One Plan**

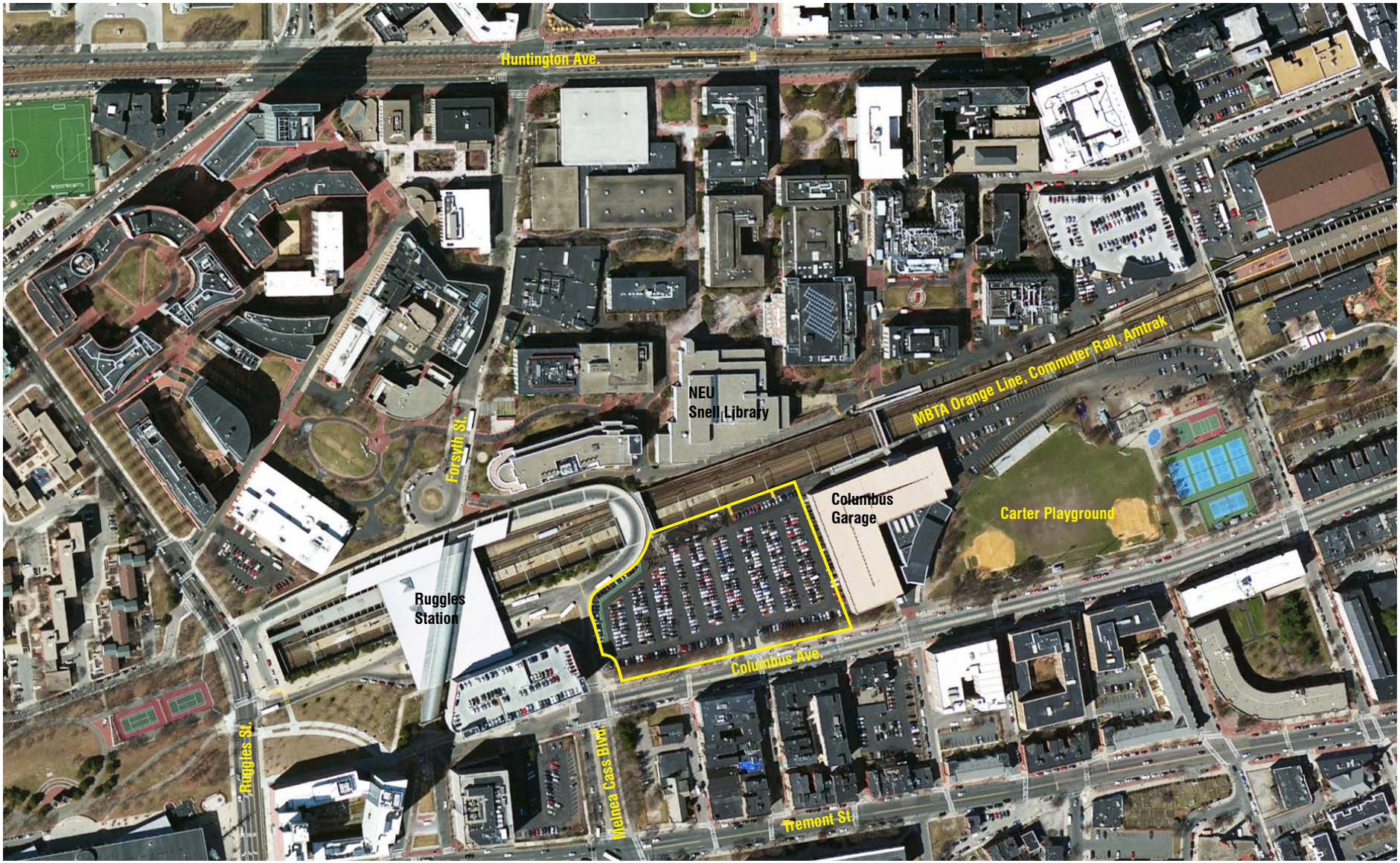

Figure 3-1.
Site Context: Satellite Imagery

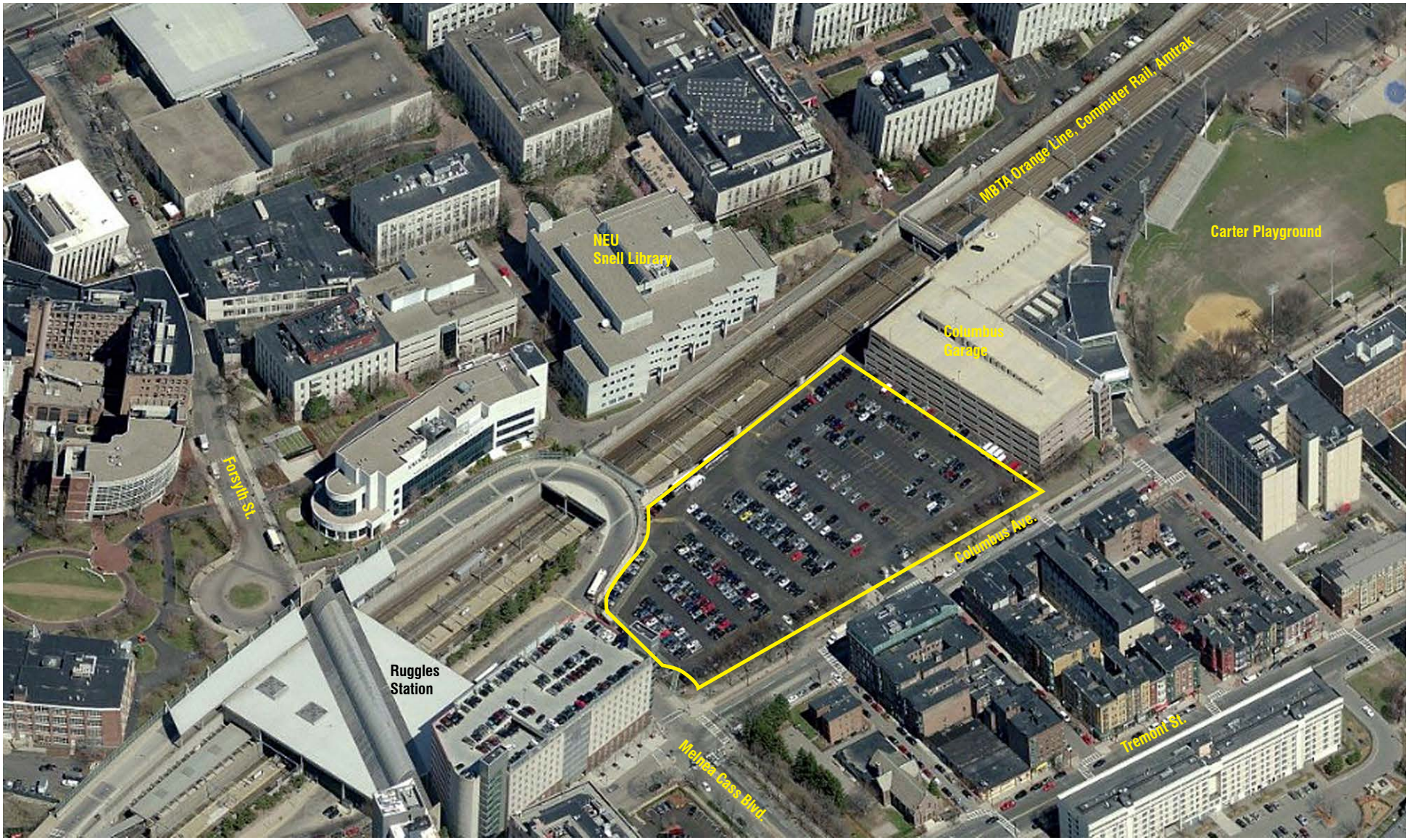

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Figure 3-2.
Site Context: Aerial Photography

PAYETTE

Figure 3-3.
Context Photograph
Site From West Across Parking Lot

No Build

Build

Figure 3-4.
Context Photograph: Site from Southwest along Columbus Avenue from corner of Melnea Cass Blvd.

No Build

Build

Figure 3-5.
Context Photograph: Site from Southwest along Columbus Avenue from corner of Cunard St.

No Build

Build

Figure 3-6.
Context Photograph: Site from Southeast along Columbus Avenue from corner of Burke St.

No Build

Build

Figure 3-7.
Context Photograph: Site from Southeast along Columbus Avenue from corner of Benton St.

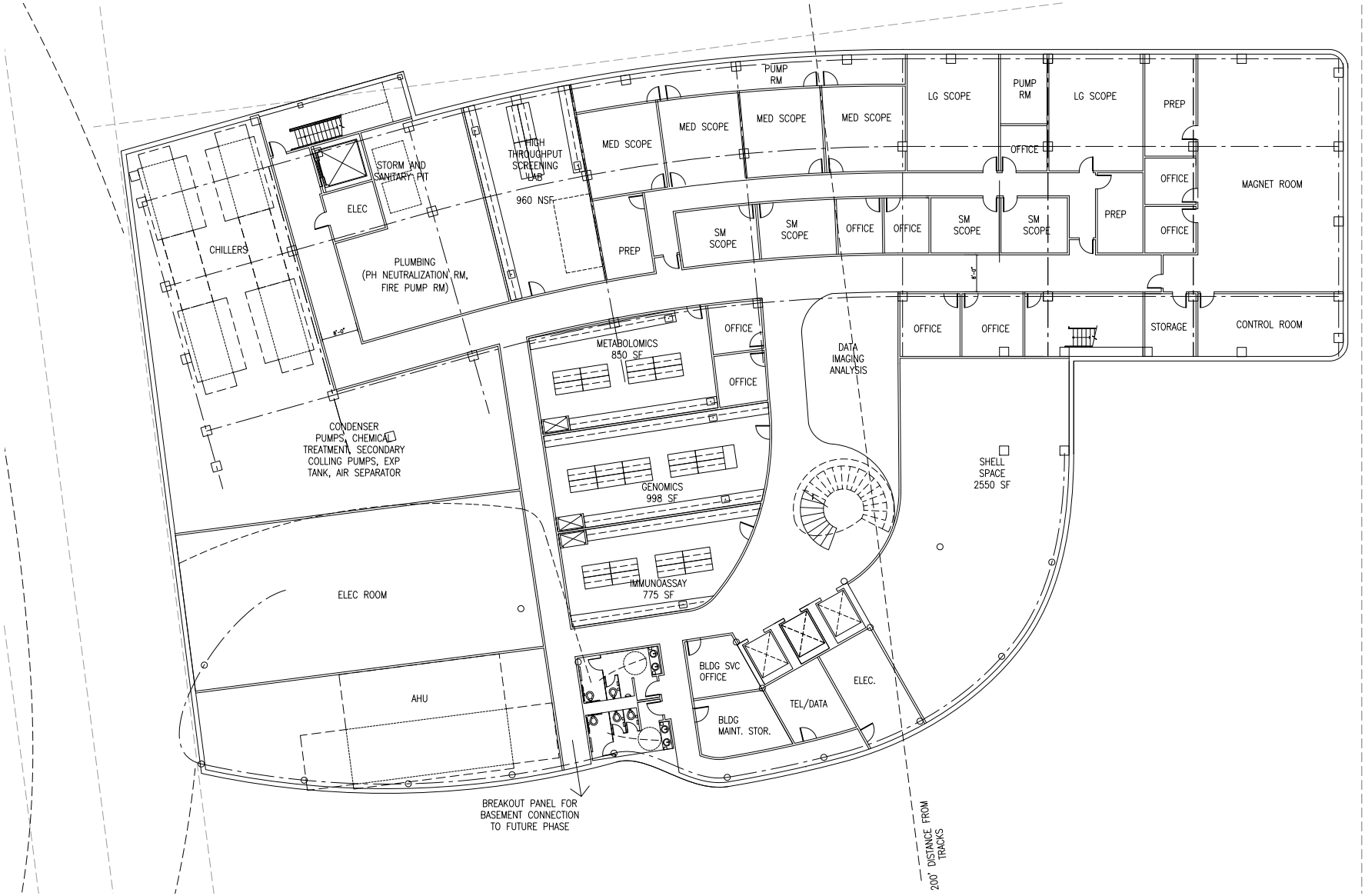
No Build

Build

Figure 3-8.
Context Photograph: Site from Northeast at Forsyth Circle

PAYETTE

Figure 3-9.
Landscape Plan



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0 20 40 80

Figure 3-10.
Lower Level Plan - Core Labs / Mechanical
Scale: 1/32” = 1’-0”

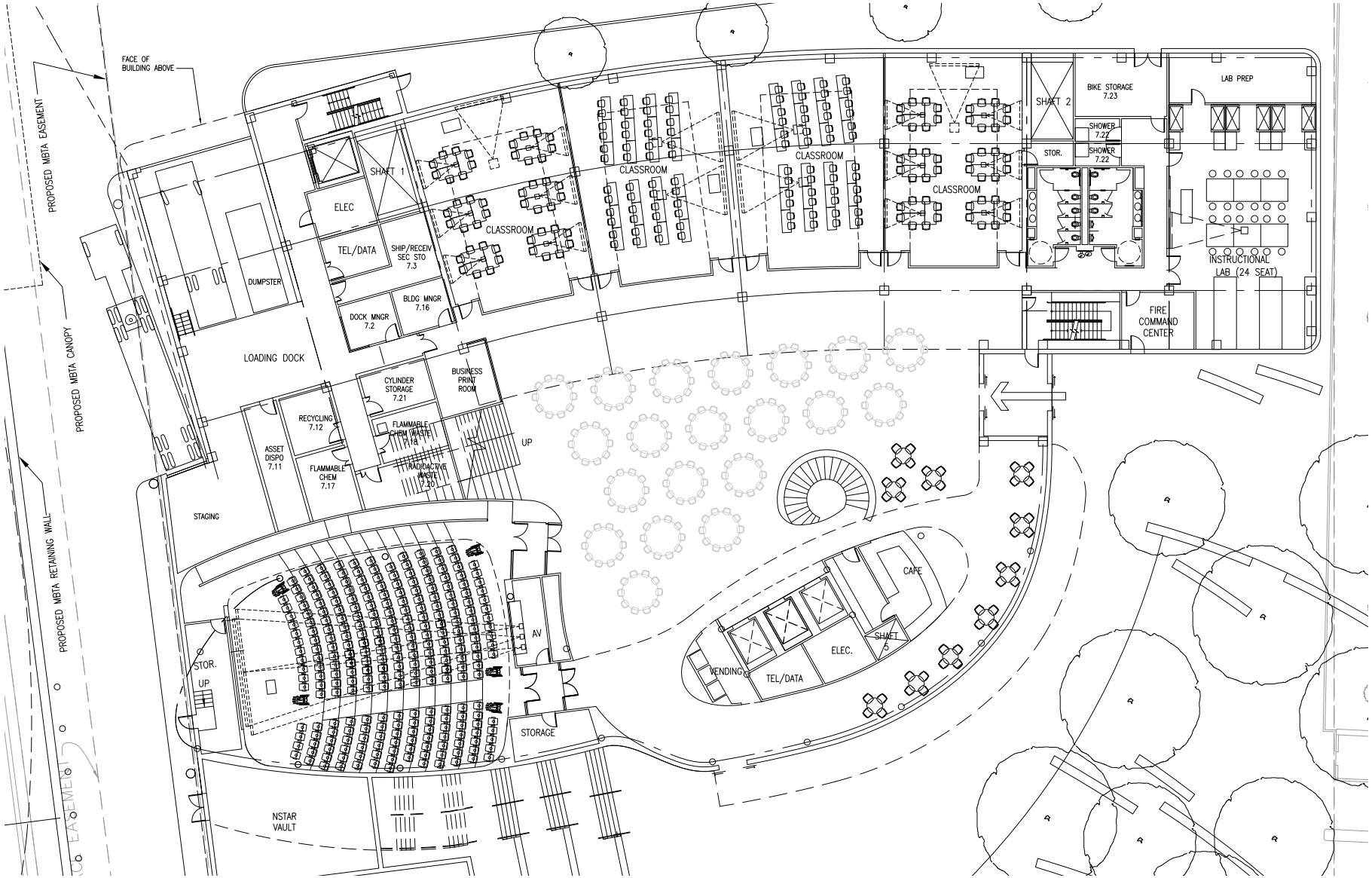

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Figure 3-11.
Level One Plan - Teaching / Bldg Support
Scale: 1/32” = 1’-0”

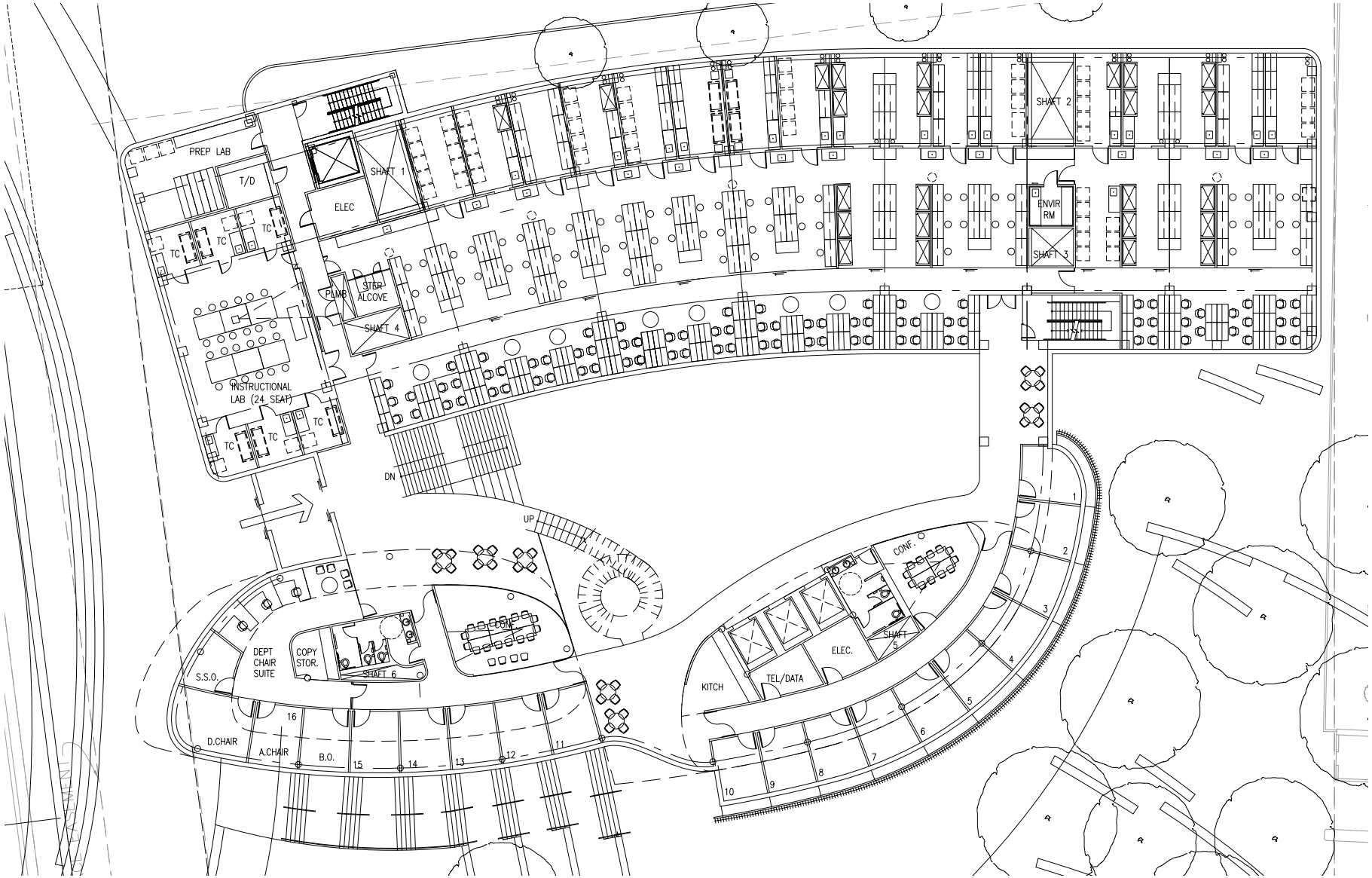

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Figure 3-12.
Level Two Plan - Admin / Teaching / Research
Scale: 1/32” = 1’-0”

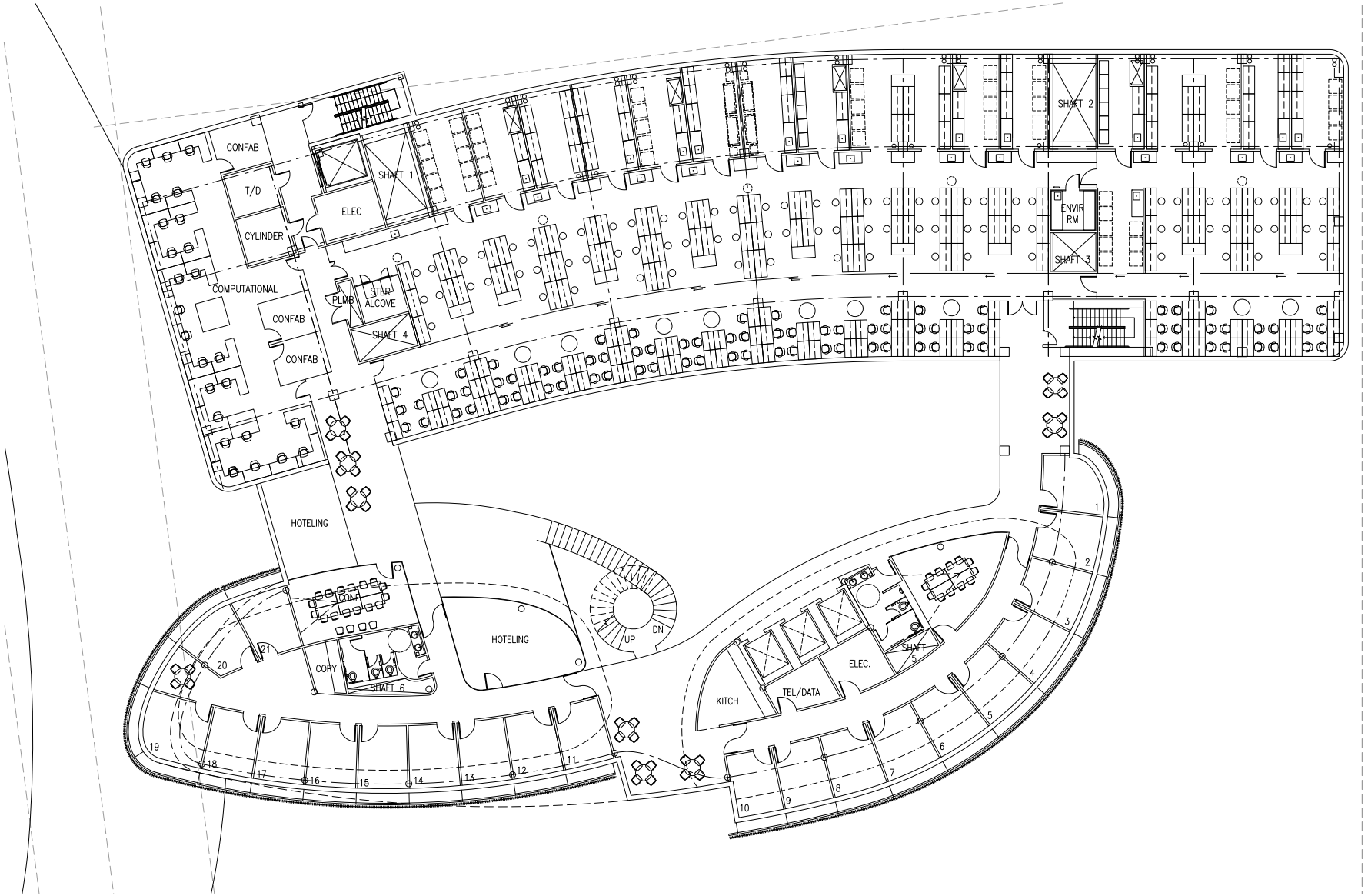

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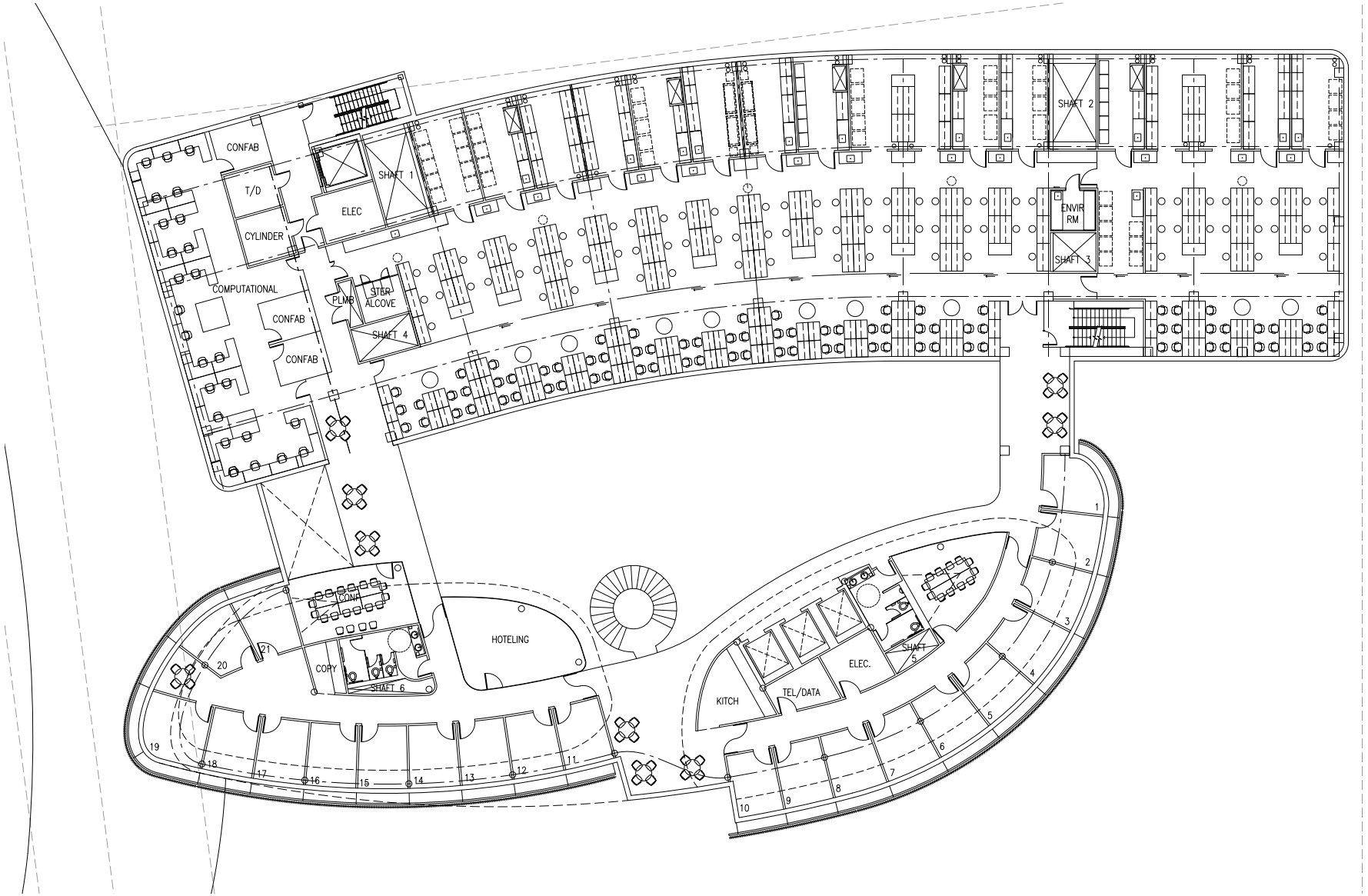
Figure 3-13.
Level Three Plan - Research
Scale: 1/32” = 1’-0”



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0 20 40 80

Figure 3-14.
Level Four Plan - Research
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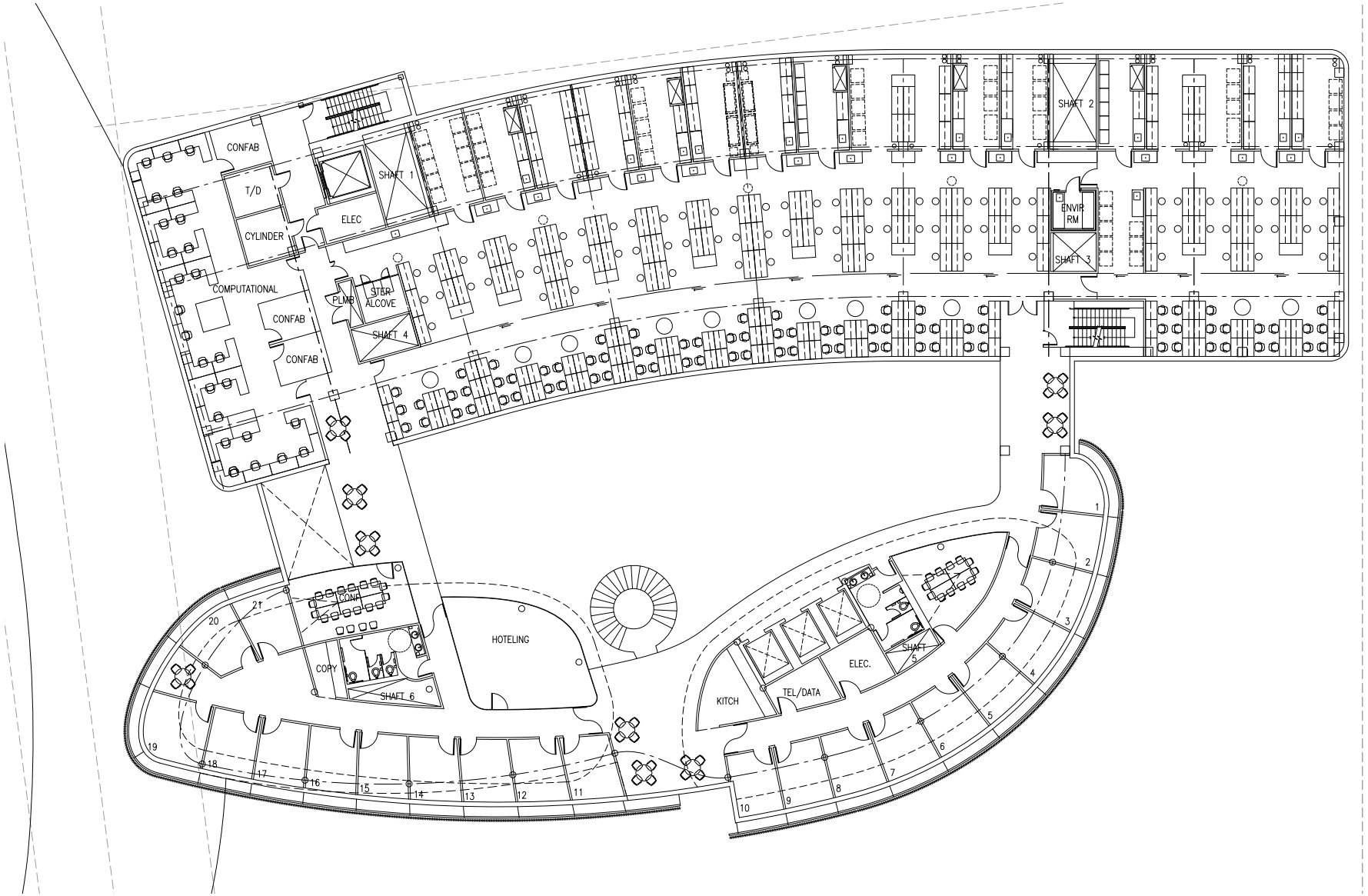

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Figure 3-15.
Level Five Plan - Research
Scale: 1/32” = 1’-0”

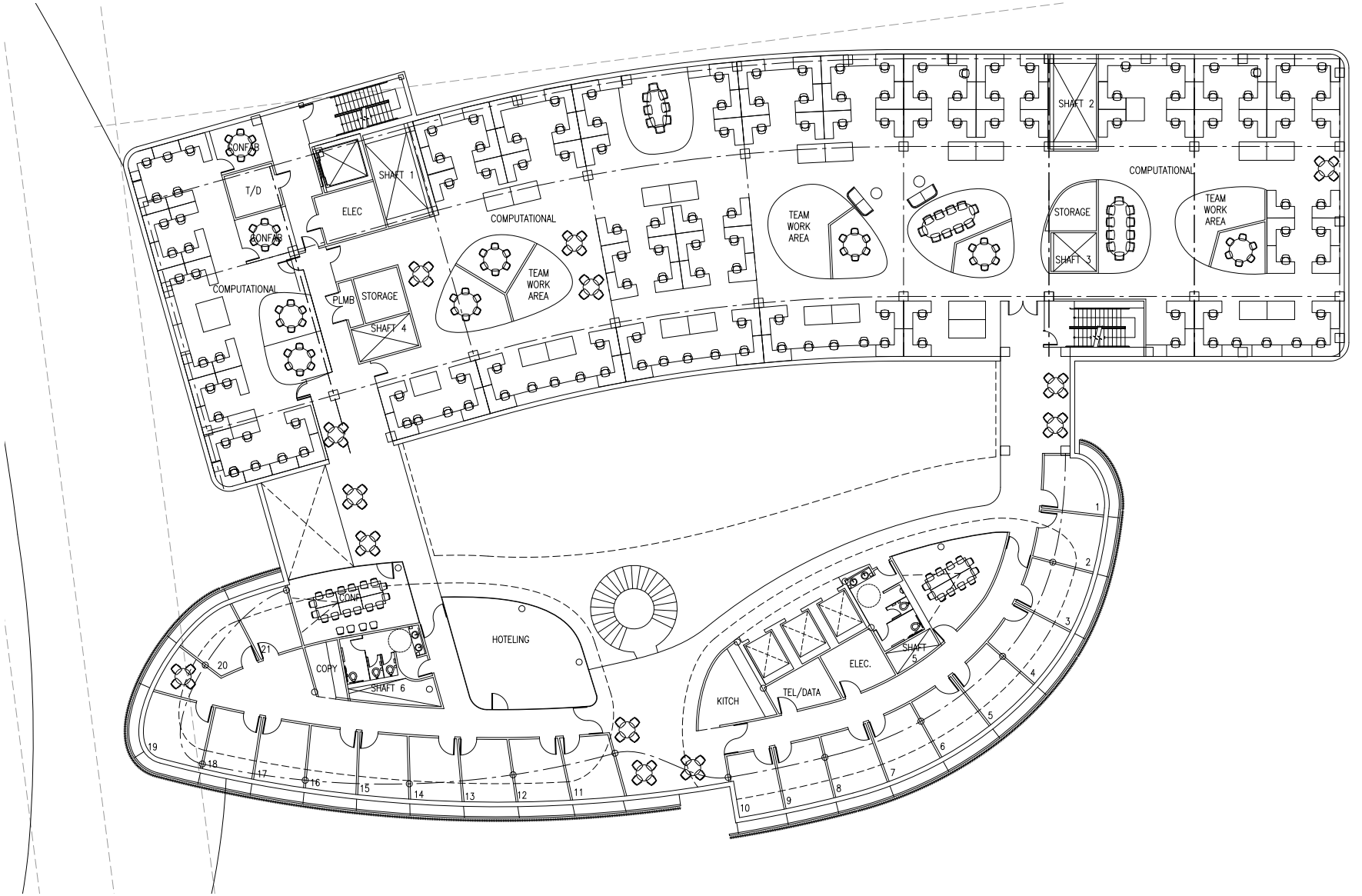

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Figure 3-16.
Level Six Plan - Research
Scale: 1/32” = 1’-0”

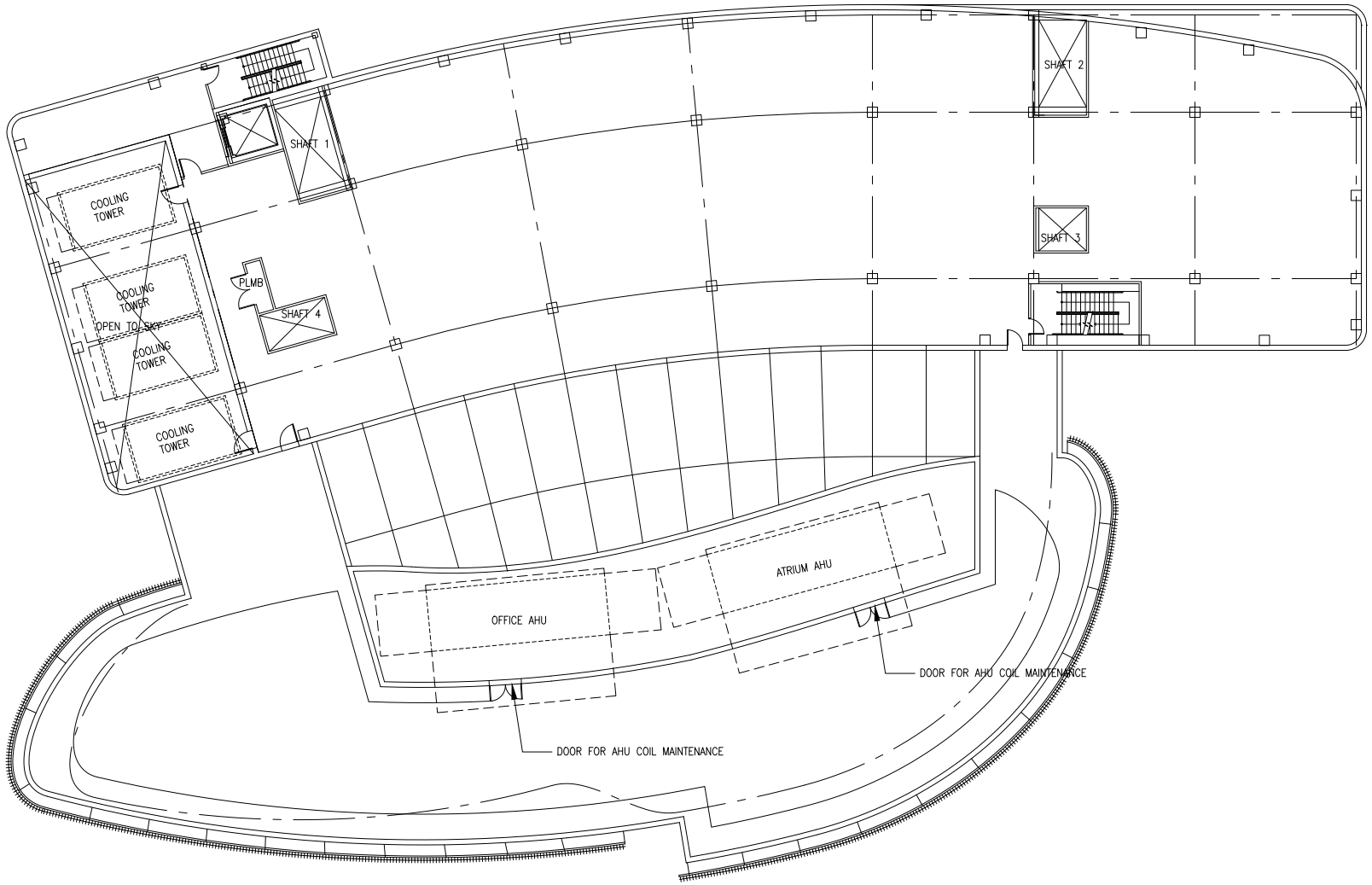

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Figure 3-17.
Penthouse Level Plan - Mechanical
Scale: 1/32” = 1’-0”

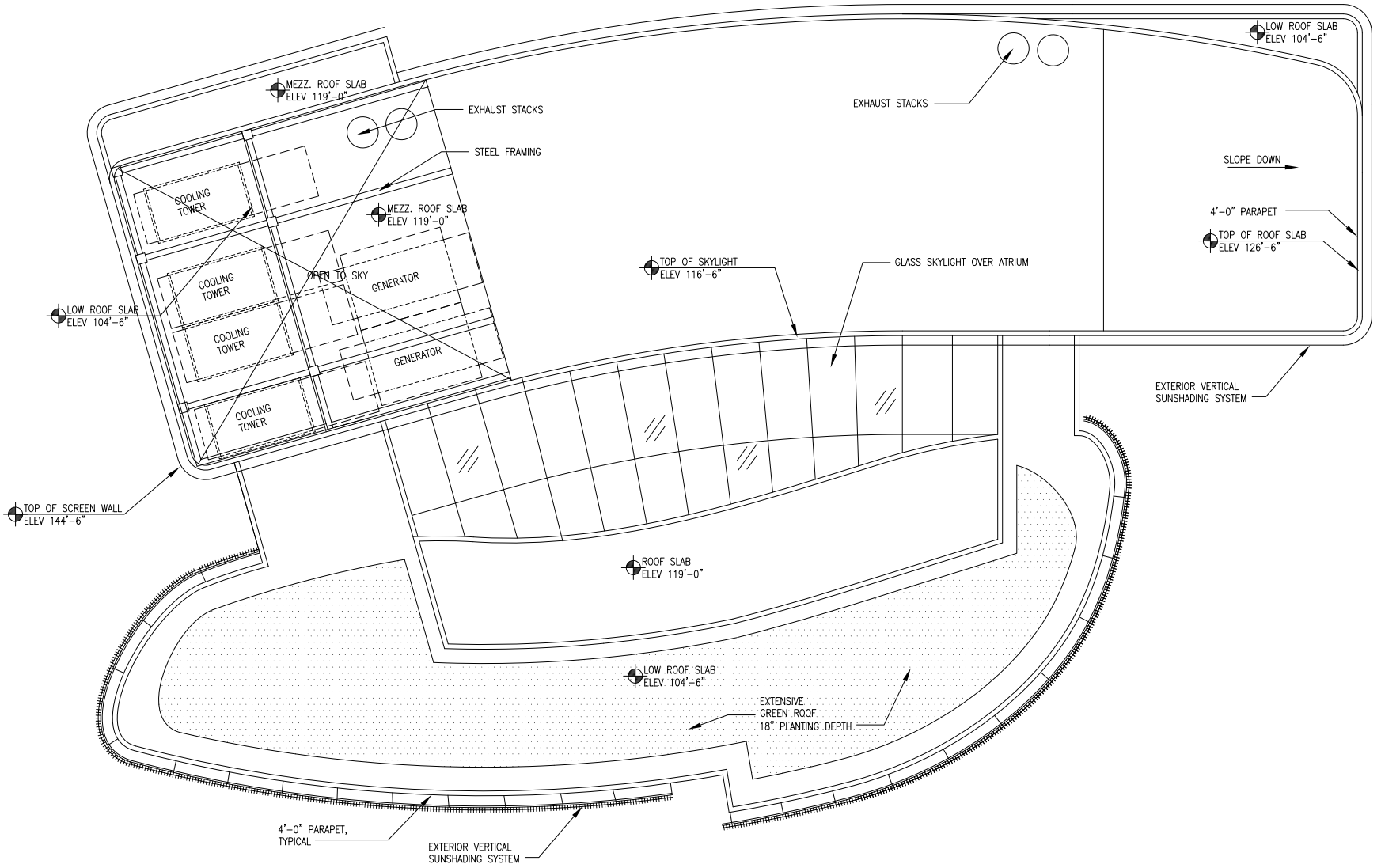

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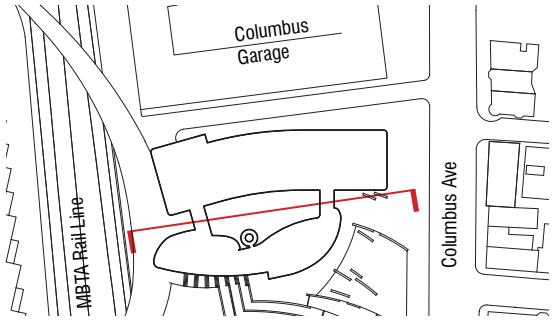
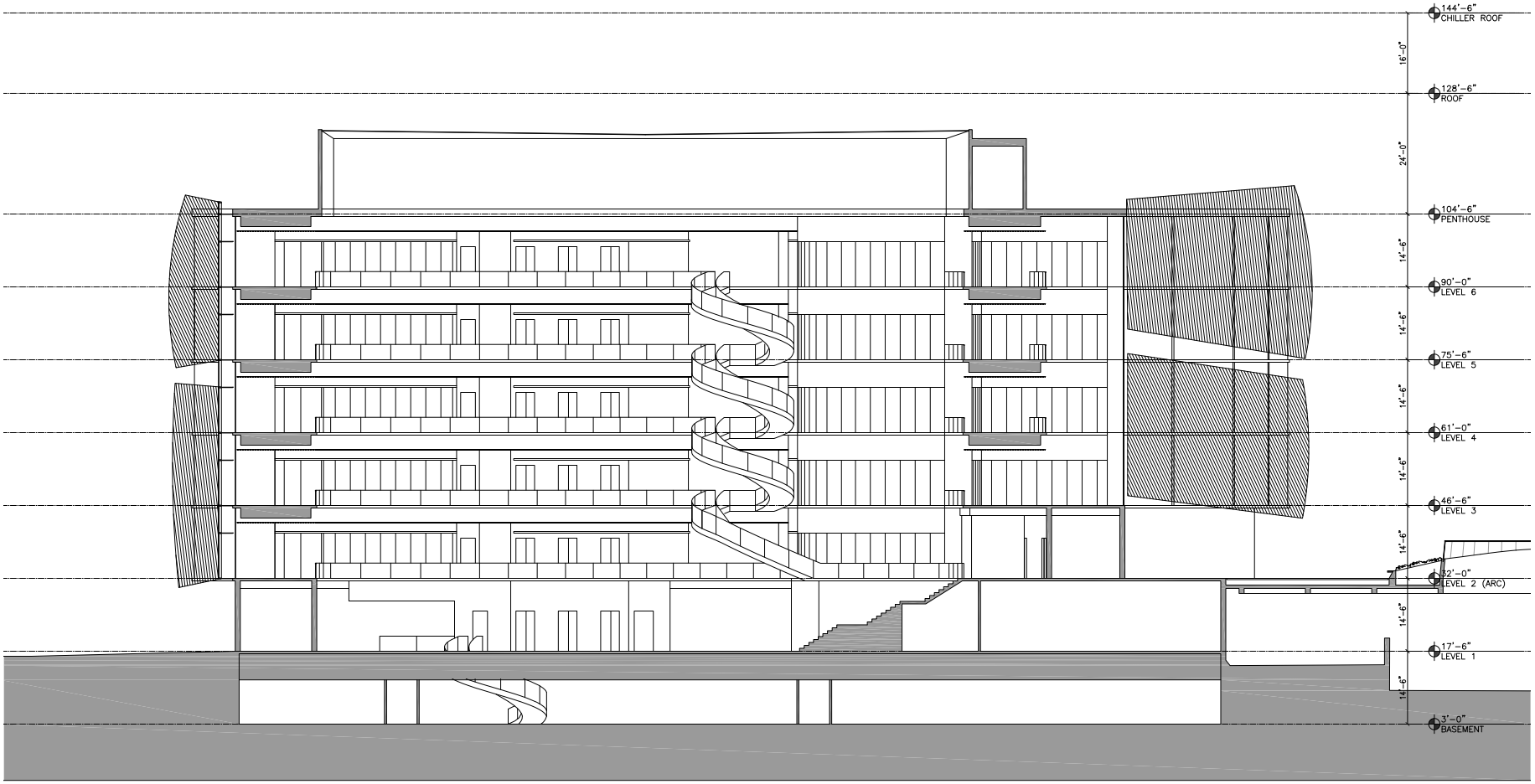
Figure 3-18.
Roof Plan
Scale: 1/32" = 1'-0"





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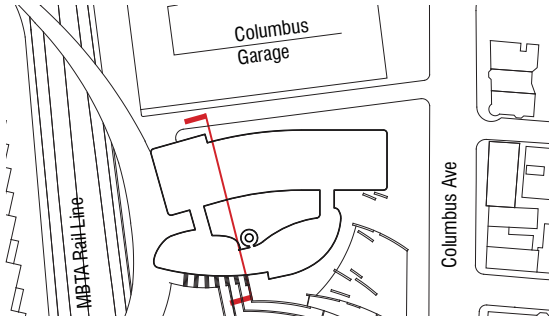
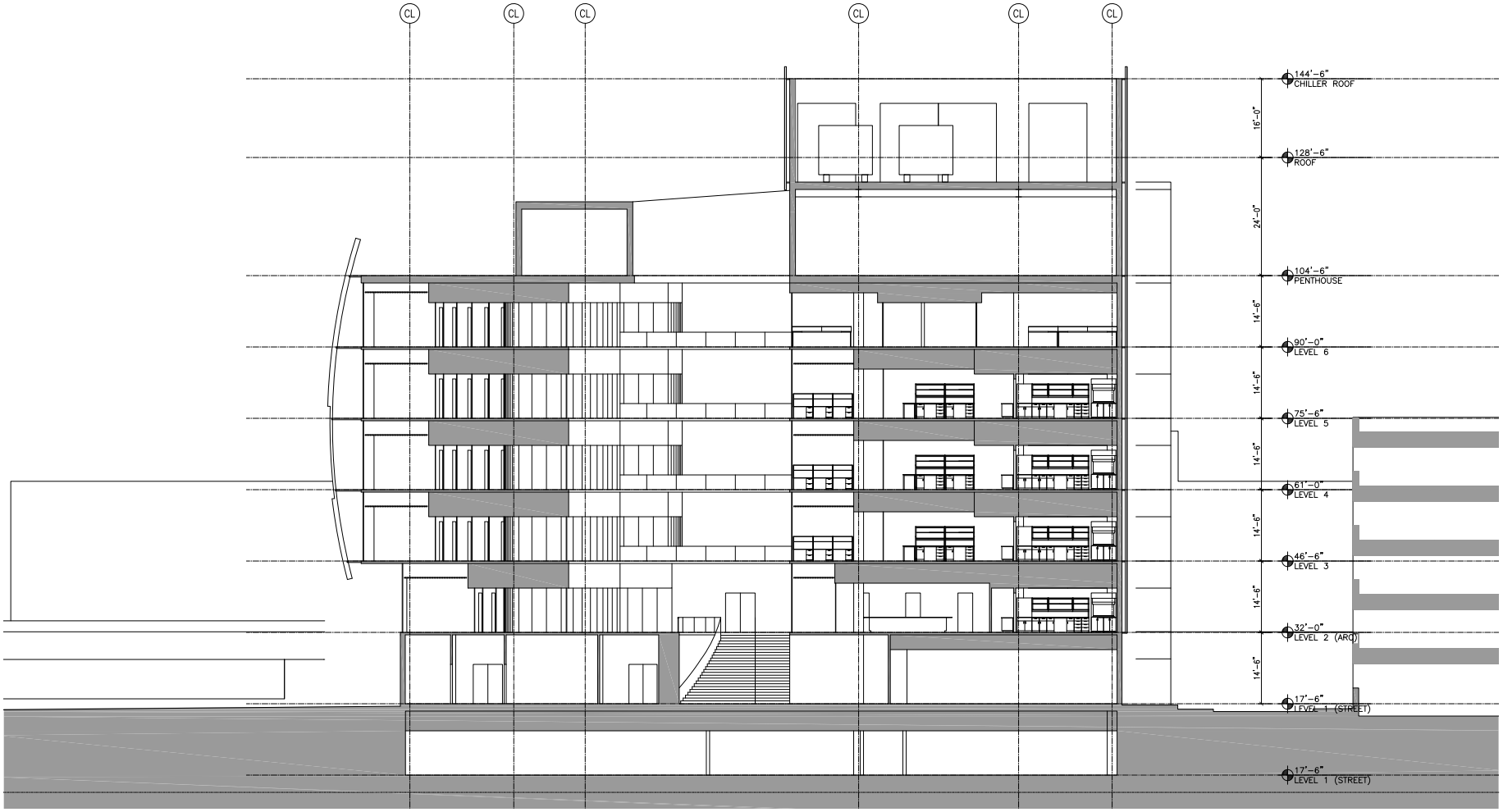
0 20 40 80

Figure 3-19.
Building Section
Scale: 1/32” = 1’-0”

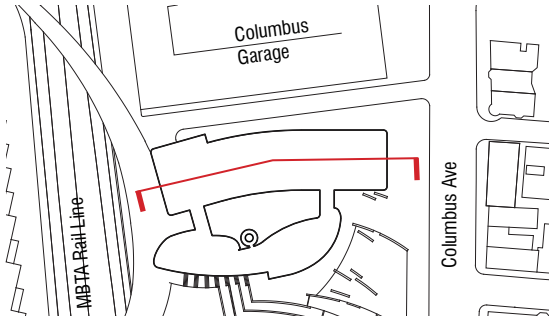


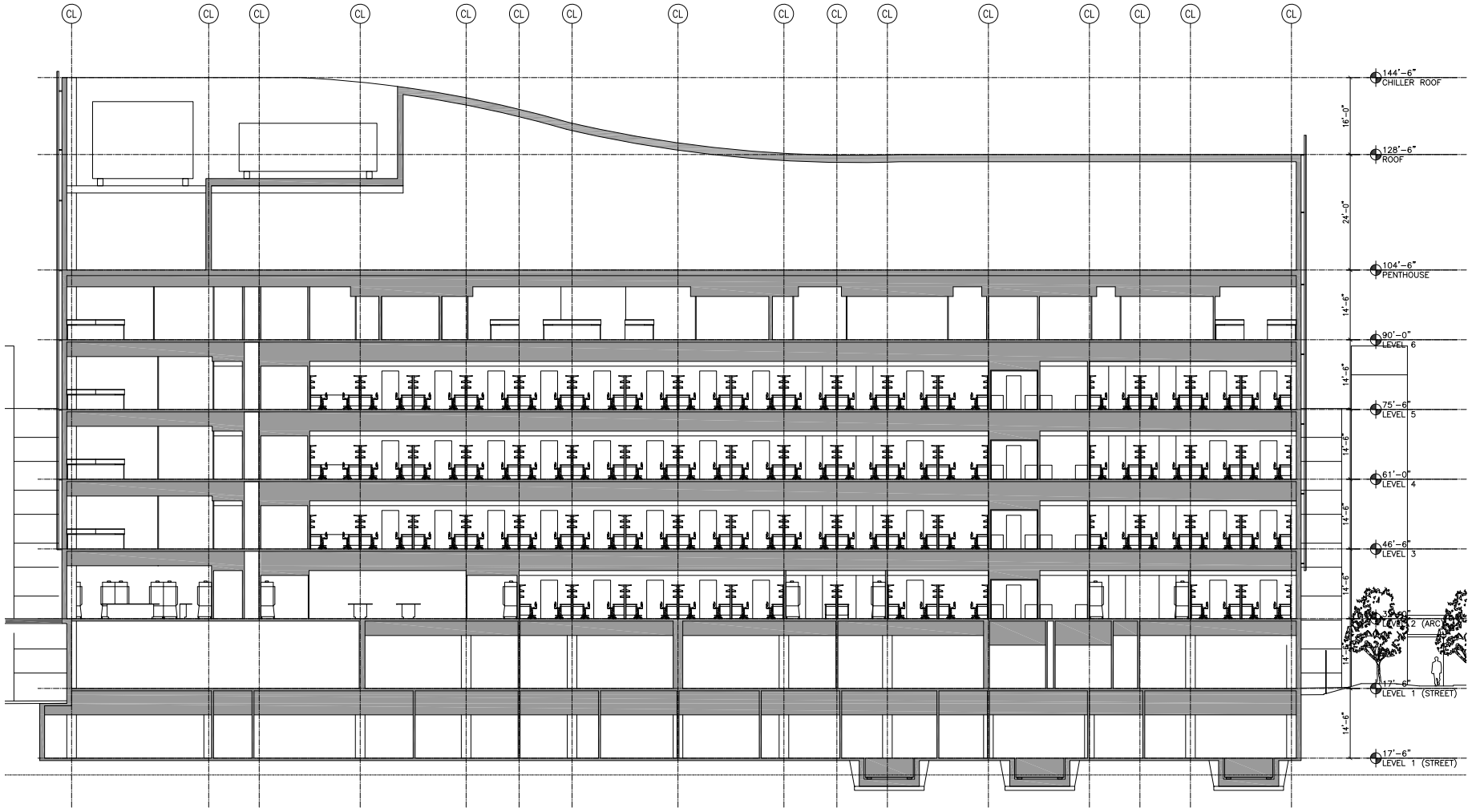


PAYETTE

0 20 40 80

Figure 3-20.
Building Section
Scale: 1/32" = 1'-0"

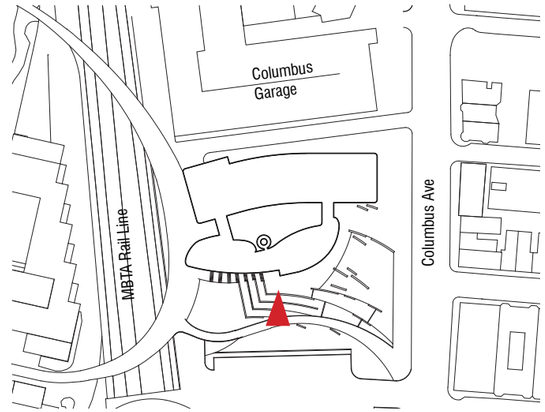


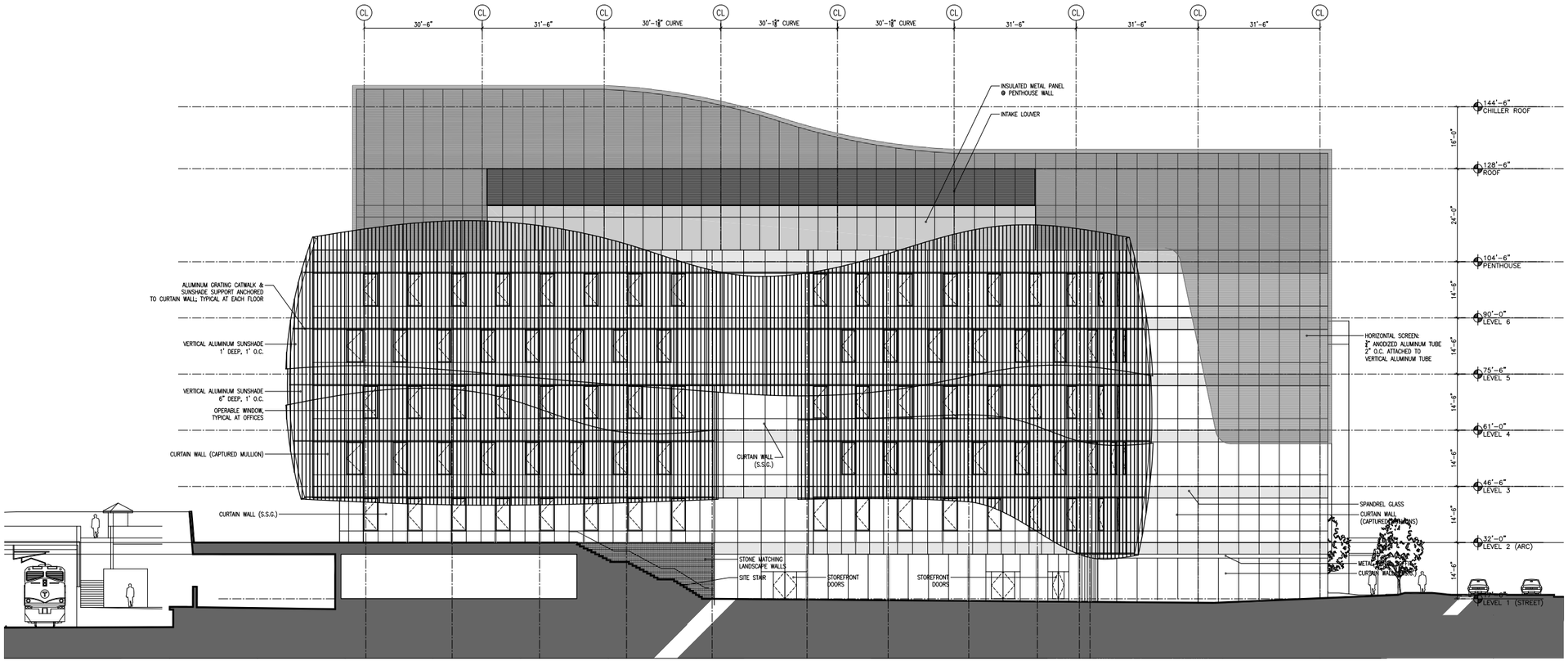


PAYETTE

0 20 40 80

Figure 3-21.
Building Section
Scale: 1/32" = 1'-0"

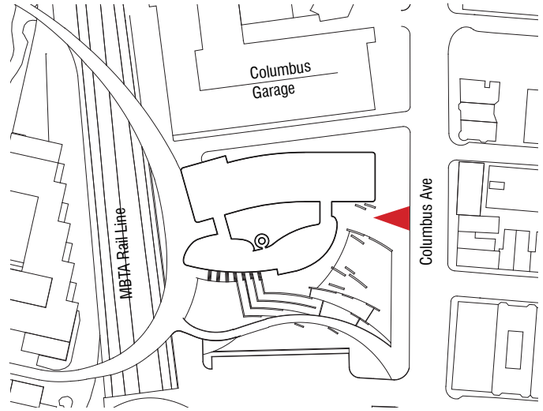


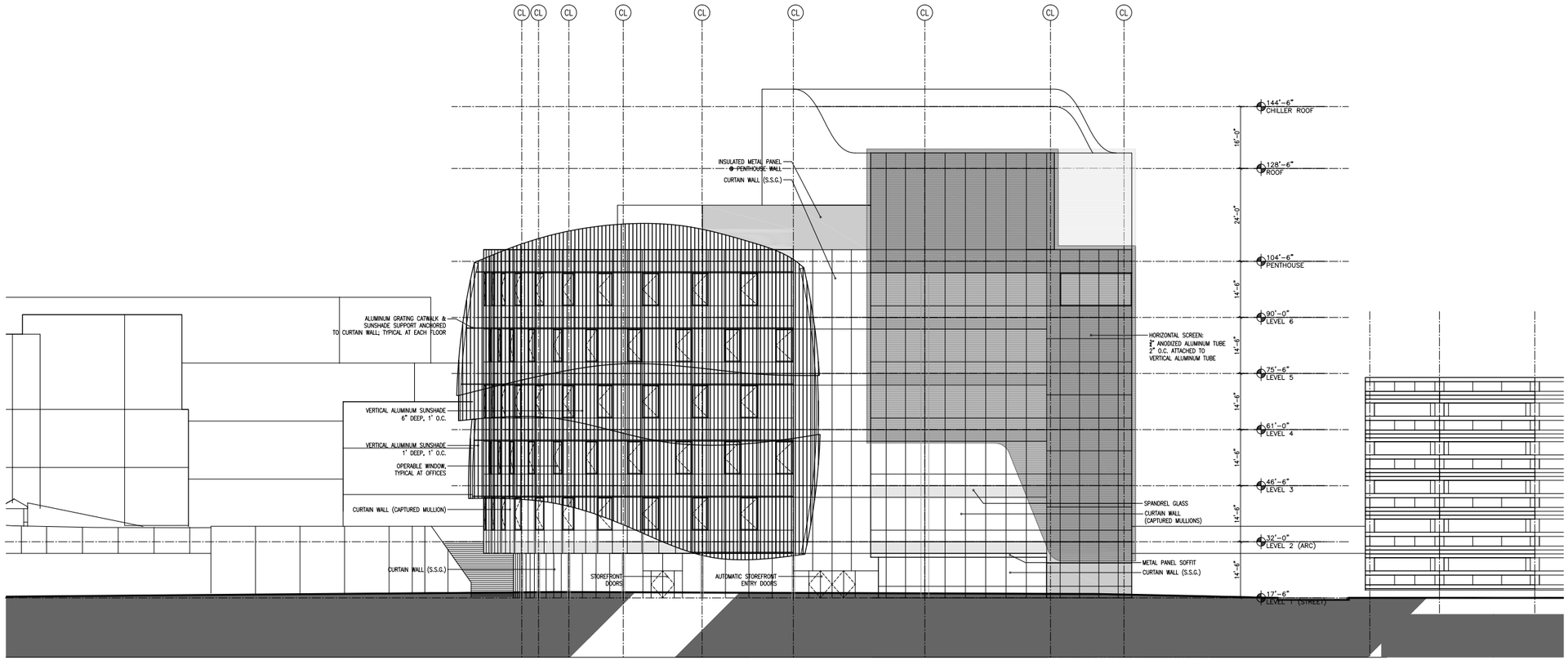


PAYETTE

0 20 40 80

Figure 3-22.
Building Elevation - South
Scale: 1/32" = 1'-0"

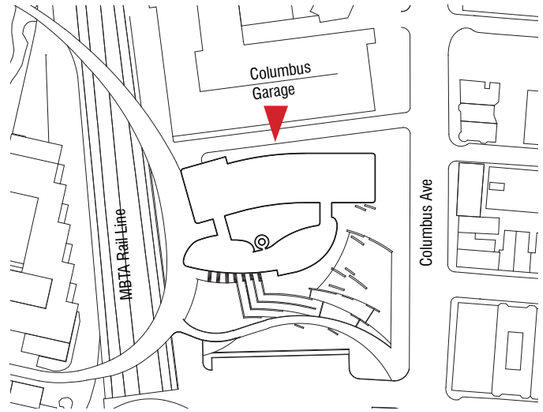


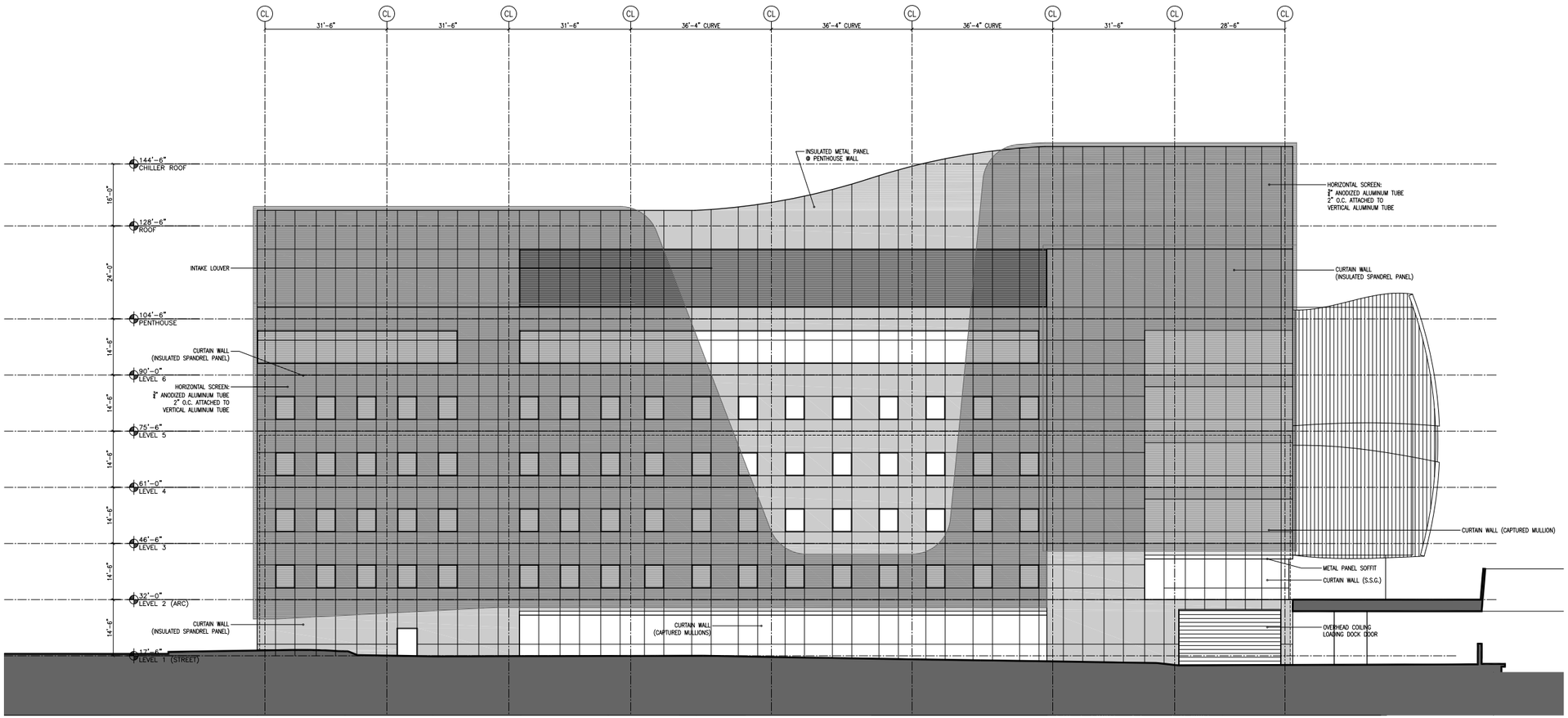


PAYETTE

0 20 40 80

Figure 3-23.
Building Elevation - East
Scale: 1/32” = 1’-0”

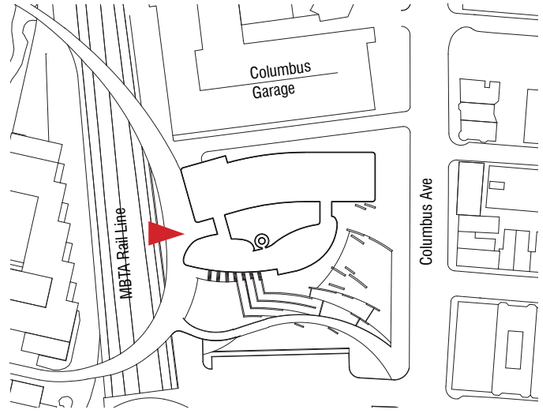


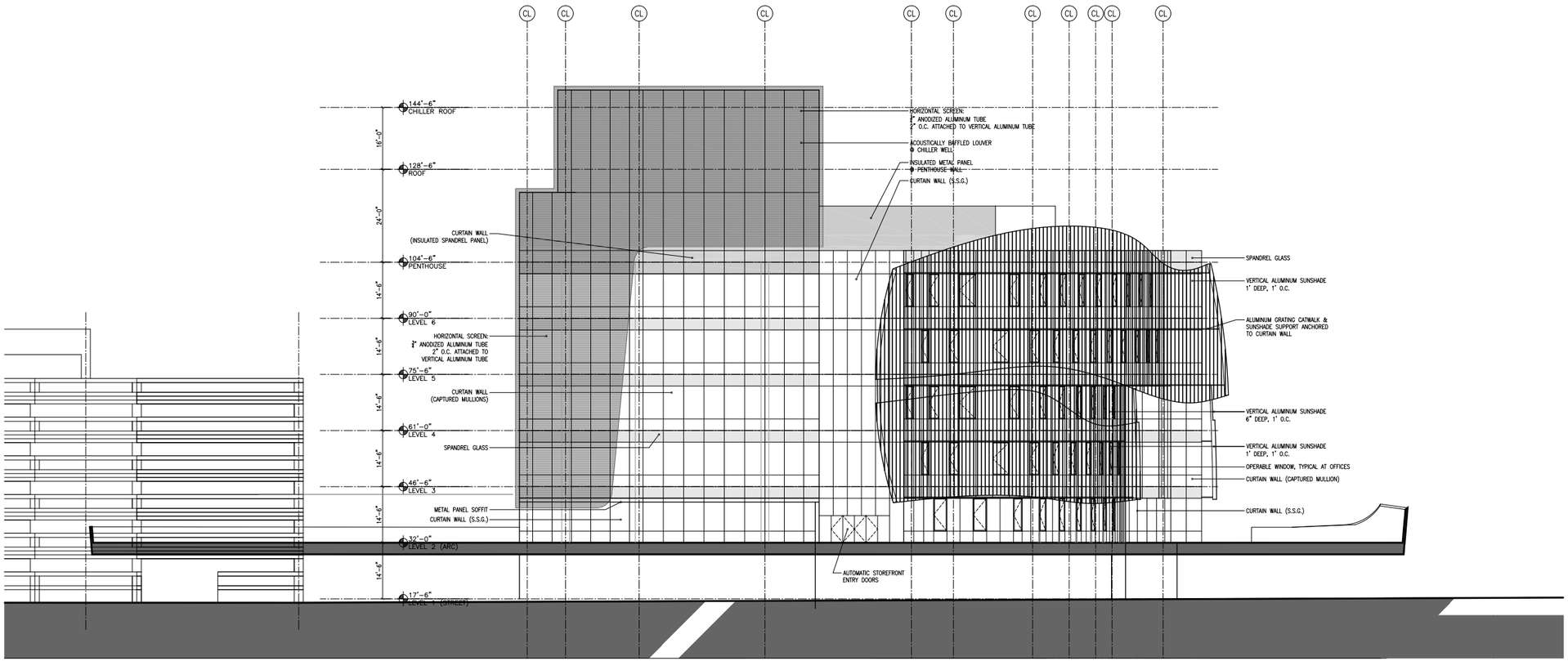


PAYETTE

0 20 40 80

Figure 3-24.
Building Elevation - North
Scale: 1/32” = 1’-0”





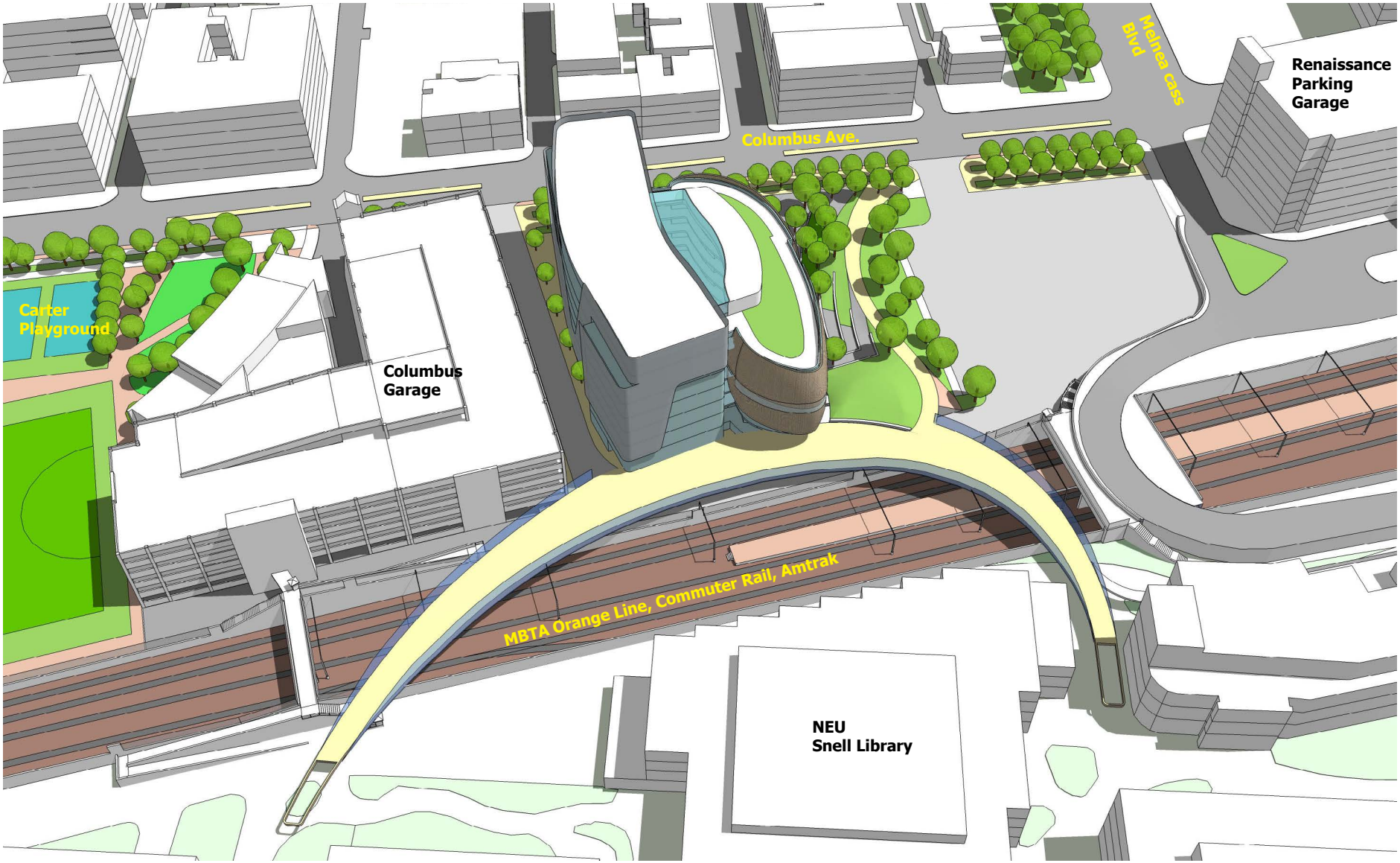
PAYETTE

0 20 40 80

Figure 3-25.
Building Elevation - West
Scale: 1/32” = 1’-0”

PAYETTE

Figure 3-26.
Aerial View from South



PAYETTE

Figure 3-27.
Aerial View from North

PAYETTE

Figure 3-28.
Rendered View from Southwest along Columbus Ave at corner of Melnea Cass Blvd.

PAYETTE

Figure 3-29.
Rendered View from Southwest along Columbus Ave at corner of Cunard St.

PAYETTE

Figure 3-30.
Rendered View from Northwest on Proposed Track Crossing

3.6 Sustainable Design

3.6.1 Introduction

The Project team will implement sustainable design and energy conservation measures, which will be further developed as the design process continues. The current target is LEED Gold. The Project will be pursuing formal LEED certification through the Green Building Certification Institute (GBCI).

Careful review and evaluation of the requirements of Article 37 of the Boston Zoning Code will be undertaken relative to the City's Green Building policies and procedures. The City is actively promoting measures to encourage buildings to decrease energy and water use and cost, improve the efficiency and useful life of building systems and infrastructure, and reduce the burdens imposed by buildings on City services, the environment, and public health.

The Project architectural/engineering/construction team includes several LEED Accredited Professionals. All sustainable strategies will continue to be discussed at length to determine feasible cost-effective and schedule-wise solutions.

An updated LEED 2009 for New Construction and Renovations checklist is provided in **Figure 3-31** to identify sustainability design objectives for this Project.

System design solutions will be developed in an effort to achieve the targeted LEED credits. The final design and construction of the Project will result in a sustainable building to promote the internal building environmental quality for the occupants, enhance the surrounding neighborhood locally, and reduce environmental impacts globally.

3.6.2 Article 37 of the Boston Zoning Code

During construction, retrofitted diesel vehicles, or vehicles that use alternate fuels, will be used. The Project will implement an outdoor construction management plan that includes provisions for wheel washing, site vacuuming, truck covers, and anti-idling signage. The Project will also implement a comprehensive integrated pest management plan.

The following LEED Prerequisites and Credits are also targeted for investigation. Credits stating *Anticipated* are those in which the design has progressed enough or the team has enough data to determine feasibility. Those indicated as *In Progress* require further study. Those listed as *Not Possible* are those credits that the project cannot pursue and reasons are given for these credits.

Sustainable Sites

Construction Activity (Prerequisite) Anticipated

The design documents will contain an erosion and sedimentation plan that conforms to local codes and the EPA Construction General Permit (Phase I and Phase II) of the National Pollution Discharge Elimination System Program NPDES.

LEED 2009 for New Construction and Major Renovations

Project Checklist

Northeastern University
06.17.2013

Sustainable Sites — Possible Points: 26

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

Water Efficiency — Possible Points: 10

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

Energy and Atmosphere — Possible Points: 35

Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
5	8	6	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
	3		Credit 5	Measurement and Verification	3
	2		Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	?	N			
1	1		Credit 4	Recycled Content	1 to 2
1	1		Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
	1		Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 15

Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
		1	Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
	1		Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
		1	Credit 6.1	Controllability of Systems—Lighting	1
		1	Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
	1		Credit 7.2	Thermal Comfort—Verification	1
	1		Credit 8.1	Daylight and Views—Daylight	1
	1		Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

1			Credit 1.1	Innovation in Design: Exemplary Performance SS4.1	1
1			Credit 1.2	Innovation in Design: Exemplary Performance MR2	1
1			Credit 1.3	Innovation in Design: Education Plan	1
1			Credit 1.4	Innovation in Design: Green Housekeeping	1
	1		Credit 1.5	Innovation in Design: TBD	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

1			Credit 1.1	Regional Priority: SS7.1	1
1			Credit 1.2	Regional Priority: SS7.2	1
1			Credit 1.3	Regional Priority: SS6.1	1
	1		Credit 1.4	Regional Priority: SS3	1

Total — Possible Points: 110

51	31	28	Total

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

Figure 3-31.
LEED Checklist

Site Selection (Credit 1) Anticipated

The Project Site has previously been completely developed and is located in an urban area. This development does not violate any of the established criteria below.

- Prime farmland as defined citation in 7CFR657.5.
- Previously undeveloped land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by FEMA.
- Land that is specifically identified as habitat for any species on Federal or State threatened or endangered lists
- Within 100 feet of any wetlands as US Code of Fed. Regulations and isolated wetlands or areas of special concern identified by state or local rule, OR within setback distances from wetlands prescribed in state or local regulations, as defined by local or state rule or law, whichever is more stringent.
- Previously undeveloped land that is within 50 feet of a water body that supports or could support fish, recreation or industrial use, consistent with the terminology of the Clean Water Act.
- Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner.

Development Density and Community Connectivity (Credit 2) Anticipated

Option 2: Community Connectivity

- The project must meet the following criteria:
- Is located on a previously developed site
- Is within one-half mile of a residential area or neighborhood with an average density of 10 units per acre
- Is within one-half mile of at least 10 basic services (2 of the 10 services can be anticipated within a year; 1 of 10 can be located within the project itself)
- Has pedestrian access between the building and the services

The site has access to dozens of basic services and within a half a mile of the site are dozens of residential buildings with at least 10 units per acre, all with exceptional pedestrian access.

Brownfield Development (Credit 3) In Progress

The project is still evaluating possible contamination of urban fill at the site. More information as to meeting the Brownfield criteria will be identified as the project investigation continues.

Alternative Transportation Public Transportation Access (Credit 4.1) Anticipated

There are 23 bus lines that are within a one-quarter mile radius, in addition to 7 rail stations within a one-half mile radius.

Alternative Transportation Bicycle Storage & Changing Rooms (Credit 4.2) Anticipated

The bicycle storage and changing room requirements for the City of Boston will far exceed LEED Requirements. More information on this is also included in the Boston Green Building credits.

Alternative Transportation Public Transportation Access (Credit 4.3) Not possible

Since there is no parking provided for this project, this credit is not achievable

Alternative Transportation Parking Capacity (4.4) Anticipated

SSc4.4 Alternative Transportation, Parking Capacity (2 points).

Option 3: Provide no new parking

No parking is provided for this project.

Site Development, Maximize Open Space (5.1) In Study

Our site has been previously developed. The team needs to provide either 50% of the total area minus the building footprint, or 20% of the total site area, whichever is greater—and plant with native or adapted species. The protected or restored area can include vegetation, water bodies, soils, or other ecosystems.

It appears we do not have the square footage necessary to meet the 50% or 20% requirement with the significant amount of pedestrian hardscape. At this point this credit is likely not achievable but we will continue to evaluate this throughout the design process.

Site Development, Maximize Open Space (5.2) Anticipated

Case 3: Sites with Zoning Ordinances but No Open Space Requirements

Provide vegetated open space equal to 20% of the project's site area.

The intention of the site design is to maximize open space. For projects located in urban areas that earn SS Credit 2, pedestrian-oriented hardscape areas can contribute to credit compliance. For such projects, a minimum of 25% of the open space counted must be vegetated. We anticipate achieving this credit.

The project will be constructing new open space and sidewalks with enhanced landscaping adjacent to the project site along the north side of Columbus Avenue. This combined with pedestrian hardscape will get us to the 20% required for this credit.

Stormwater Design (Credits 6.1, 6.2) Anticipated

SSc6.1 – Stormwater Design, Quantity Control

SSc6.2 – Stormwater Design, Quality Control

We will be implementing a stormwater management plan that reduces impervious cover, promotes infiltration, and captures and treats the stormwater runoff. We are aiming to reduce the rate and quantity by 25%.

We are anticipating achieving credits 6.1 and 6.2. The CE engineer will confirm when the design is more developed.

The quality of stormwater runoff from the site is expected to improve as a result of the project because of the replacement of outdated catch basins with deep sump catch basins. The new building will cover the majority of the Project Site. When complete, the project will consist mostly of landscaped areas and the new ISEB building. This will result in a reduction of impervious area. The project will comply with the BWSC and the Lower Charles River TMDL requirements for phosphorus removal. It is anticipated that the project will also include stormwater BMPs such as infiltration systems, rainwater harvesting or advanced structural treatment to reduce phosphorus in the site stormwater effluent.

Heat Island Effect (Credit 7.1) Anticipated

Use any combination of the following strategies for 50% of the site hardscape (including roads, sidewalks, courtyards and parking lots):

- Provide shade from the existing tree canopy or within 5 years of landscape installation. Landscaping (trees) must be in place at the time of occupancy.
- Provide shade from structures covered by solar panels that produce energy used to offset some nonrenewable resource use.
- Provide shade from architectural devices or structures that have a Solar Reflectance Index of 2 (SRI) of at least 29.
- Use hardscape materials with an SRI of at least 29.
- Use an open-grid pavement system (at least 50% pervious).

The team will be carefully selecting the SRI complaint hardscape in addition to providing shade for proposed hardscape.

Heat Island Effect (Credit 7.2) Anticipated

Option 1

Use roofing materials with an SRI equal to or greater than the values in **Table 3.6-1** below for a minimum of 75% of the roof surface.

Table 3.6-1: Heat Island Effect, Roof-SRI Compliance

Roof Type	Slope	SRI
Low-sloped Roof	≤2:12	78
Steep-sloped Roof	>2:12	29

Light Pollution Reduction (Credit 8) In Progress

Reduce the input power (by automatic device) of all nonemergency interior luminaires with a direct line of sight to any openings in the envelope (translucent or transparent) by at least 50% between 11:00 p.m. and 5:00 a.m. After-hours override may be provided by a manual or occupant-sensing device provided the override lasts no more than 30 minutes.

Exterior lighting power densities shall not exceed those specified in ANSI/ASHRAE/IESNA Standard 90.1-2007

The project team is evaluating compliance with the interior lighting AND the requirement for exterior lighting. The project currently plans to use occupancy sensors to meet the interior requirement. The current credits requirements for exterior compliance make it harder for projects that have municipal lighting adjacent to the site. Our team is reviewing existing conditions and incorporating the AHSRAE standard into the proposed site design.

Water Efficiency

Water Use Reduction (Prerequisite) Anticipated

Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimated occupant usage and must include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers, kitchen sink faucets and pre-rinse spray valves.

The project will be exceeding this prerequisite of a 20% reduction in water use reduction through low flow plumbing fixtures.

Water Efficient Landscaping, Reduce by 50% (Credit 1.1) Anticipated

Reduce potable water consumption for irrigation by 50% from a calculated midsummer baseline case or using the month with the highest irrigation demand.

Easily achievable with proposed highly efficient irrigation.

Water Efficient Landscaping No Potable Use or No Irrigation (Credit 1.1) In Progress

The Project Team will evaluate potential of eliminating irrigation. Final plant selection and design will need to be completed before this can be confirmed.

Innovative Wastewater Technologies (Credit 2) Not Possible

We are not using the rainwater capture for flushing so without composting toilets this credit is not achievable.

Water Use Reduction, 30%-40 Reduction (Credit 3) In Progress

With high efficient plumbing fixtures, we anticipate a minimum of a 20% water use reduction. Final occupancy profiles and usage will determine if additional points can be achieved.

Proposed Fixtures and flow rates

Water closets: 1.1 - 1.3 GPF

Low flow urinals: 0.125 GPF

Lavatory faucets: 0.25 GPM

Showers: 1.5 GPM

Kitchen sink faucets: 1 GPM

Energy and Atmosphere

Fundamental Commissioning (Prerequisite 1) Anticipated

Commissioning of the Mechanical and Electric building systems will be performed.

Minimum Energy Performance (Prerequisite 2) Anticipated

The Project is mandated to meet the Stretch Code, which requires at minimum a 20% in energy use per ASHRAE 90.1-2007. The current goal for the project is a 30% energy reduction.

Refrigerant Management (Prerequisite 3) Anticipated

Non-CFC-based refrigerants will be evaluated for the Project.

Optimize Energy Performance (Credit 1)5-10 Points, Anticipated

The project has a minimum target of a 20% reduction in energy use. This goal will be investigated further as building systems are evaluated and selected.

On-site Renewable Energy (Credit 2) In Progress

A solar thermal study is being performed on the project by ARUP.

Enhanced Commissioning (Credit 3) Anticipated

An independent commissioning authority will be contracted to perform on-board design reviews and re-commission the building systems after occupancy.

Enhanced Refrigerant Management (Credit 4) Anticipated

All air conditioning equipment will be specified with zero CFC and HCFC type refrigerant.

Measurement and Verification (Credit 5) In Progress

The appropriate use of measurement and verification equipment will be evaluated as building systems are selected. Property management is expected to perform on-going reviews of system operation, environmental conditions and indoor air quality, energy and water use, and the potential for improvements and innovations.

Green Power (Credit 6) In Progress

Green-e certified renewable power will be investigated for purchase for building power supply.

Materials and Resources

Storage and Collection of Recyclables (Prerequisite) Anticipated

Facilities will be provided at each floor level for collection of recyclable materials. The project will have a dedicated recycling area as a part of the trash collection for the building. The project at a minimum will collect paper, corrugated cardboard, glass, plastics and metals. An independent third party service will be taking the single stream recycled material to an off-site facility.

Building Reuse, Existing Walls, Floors & Roof/ Maintain Interior Non-Structural Elements (Credit 1.1 & Credit 1.2) Not Possible

New construction cannot qualify for reuse.

Construction Waste Management (Credits 2.1, 2.2) Anticipated

The Construction Manager will implement a waste management plan that will seek to divert at least 75% of construction and demolition waste material removed from the site from landfills through recycling and salvaging.

No buildings are present at the property requiring demolition. Construction debris encountered during excavation is expected to include asphalt, and remnants of former building foundations, which remain in place and buried such as brick, concrete, wood, and granite block. The Proponent will ensure that waste removal and disposal during construction and operation will be in conformance with the City and the Massachusetts Department of Environmental Protection ("DEP") Regulations for Solid Waste.

Suffolk will take an active role relative to the processing and recycling of construction waste. Arrangements will be made for the segregation, reprocessing, reuse, and recycling of materials. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per DEP's Regulations for Solid Waste Facilities, 310 CMR 16.00.

This credit threshold of 75% diversion is achievable, and may be pursued aggressively in an opportunity to gain an exemplary performance credit of 95% construction waste recycling.

Recycled Materials (Credits 4.1, 4.2)10% , Anticipated

The project plans to use building materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% based on cost, of the total value of the materials in the project.

Regional Materials (Credits 5.1, 5.2) 10% Anticipated

The project plans to use building materials or products that have been extracted, harvested or recovered, and manufactured, within 500 miles of the project site, for 10% of the total materials value.

Rapidly Renewable Materials (Credit 6) Not Possible

The project will not have enough rapidly renewable materials to qualify for this credit.

Certified Wood (Credit 7) Anticipated

The project plans to use certified wood for at least 50% of the total cost of wood for the project. Documentation demonstrating compliance will be included in the construction submission.

Indoor Environmental Quality

Minimum IAQ Performance (Prerequisite 1) Anticipated

The project will be designed to meet the minimum requirements of ASHRAE 62-2007 Table 6-1 the "Minimum Ventilation Rates in Breathing Zone".

Environmental Tobacco Smoke Control (Prerequisite 2) Anticipated

The project will comply with Option 1- Smoking is not allowed on the property, inside or outside the building, at any time.

Outdoor Air Delivery Monitoring (Credit 1) Not possible

The project will have ventilation systems with 100% outdoor air so this credit wouldn't be effective.

Increased Ventilation (Credit 2) Anticipated

The project team will design a system that increases breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates required by ASHRAE Standard 62.1-2007 (with errata but without addenda1) as determined by IEQ Prerequisite 1

Construction IAQ Management Plan (Credit 3.1) Anticipated

- Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:
- During construction meet or exceed the recommended Control Measures of the SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd edition 2007, ANSI/SMACNA 008-2008 (chapter 3).
- Protect stored on-site or installed absorptive materials from moisture damage.
- If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all filtration media immediately prior to occupancy.

The project will follow all of the above requirements for implementing and documentation of SMACNA, and installation and replacement of filtration media prior to occupancy.

Construction IAQ Management Plan Pre-Occupancy (Credits 3.2) In Study

Option 1: Flushout: Develop an IAQ management plan and implement it after all finishes have been installed and the building has been completely cleaned before occupancy.

The project intends to perform a flush-out prior to occupancy. We need to identify how this works into the schedule.

Low-Emitting Materials Adhesives & Sealants (Credit 4.1) Anticipated

EQc4.1 Low-Emitting Materials, Adhesives & Sealants (construction credit).

Adhesives and sealants used on the interior of the building (i.e. inside of the weatherproofing system and applied on-site) must comply with the following criteria:

- Adhesives, sealants and sealant primers must comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168. VOC limits must be conforming to those listed in Reference Guide table.
- Aerosol Adhesives must comply with standards of Green Seal Standard for Commercial Adhesives, listed in Reference Guide table.

The project intends to comply with the above requirements for adhesives and sealants.

Low-Emitting Materials Paints (Credit 4.2) Anticipated

- Paints and coatings used on the interior of the building (i.e. inside of the weatherproofing system and applied on-site) must comply with the following criteria: Architectural paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard GS-11 Paints, 1st edition.
- Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd edition.
- Clear wood finishes, floor coatings, stains, primers, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 113, Architectural Coatings.

The project intends to comply with the above requirements for paints.

Low-Emitting Materials Flooring Systems (Credit 4.3) Anticipated

To comply with this credit, all interior carpet must meet the requirements of the Carpet and Rug Institute's Green Label Plus program, and all carpet cushion must meet the requirements of the Carpet and Rug Institute Green Label program. Additionally, all carpet adhesive must meet the VOC limit of 50 g/L. All hard surface flooring installed in the building interior must meet one of the requirements of the FloorScore standard.

The project to comply with the above requirements for flooring systems.

Low-Emitting Materials Composite Wood & Agrifiber Products (Credit 4.4) Anticipated

Composite products and laminating adhesives shall have no added urea-formaldehyde resins.

The project plans to use no composite wood and Agrifiber products with added UF resins. Cut sheets demonstrating compliance will be included in the construction submission.

Indoor Chemical and Pollutant Source Control (Credit 5) Anticipated

A permanent entryway system is expected to be installed at the entrance to prevent air contaminants from entering the building. Housekeeping and copy areas are expected to be separated and exhausted to outside to comply with the requirements of this credit. Air handling units are expected to be provided with MERV 13 filtration media to meet the credit.

Controllability of Systems, Lighting (Credit 6.1) Not Possible

This will not be possible due to the nature of the program.

Controllability of Systems, Thermal Comfort (Credit 6.2) Not Possible

This will not be possible due to the nature of the program.

Thermal Comfort Design (Credit 7.1) Anticipated

The project will be designed in conformance with the Massachusetts State Building Code, IECC 2009 and ASHRAE Standard 55 climate zone 5. The mechanical systems selected for the building will be designed to maintain the required thermal comfort standards as recommended by ASHRAE Standard 55.

Thermal Comfort Verification (Credit 7.2) In Progress

The project will survey occupants 6-18 months following occupancy to find out if they are satisfied with thermal conditions in the building. A corrective action plan will be designed and implemented if greater than 20% of occupants report dissatisfaction with a certain element of thermal comfort.

Daylight and Views (Credits 8.1 & 8.2)-In Progress

Option 1. Simulation

Demonstrate through computer simulations that 75% or more of all regularly occupied spaces achieve daylight illuminance levels of a minimum of 25 foot candles (fc) and a maximum of 500 fc in a clear sky condition on September 21 at 9:00 a.m. and 3:00 p.m.

The model performed in DD-CD will confirm compliance.

Innovation and Design Process

Exemplary Performance SS4.1- Public Transportation Access (Credit 1.1) Anticipated

Doubling the target for transportation access.

Exemplary Performance *Construction Waste Management (Credit 1.2) Anticipated*

As stated above, the Construction Manager will implement a waste management plan that will seek to divert at least 75% of construction and demolition waste material removed from the site from landfills through recycling and salvaging. This credit may be pursued aggressively in an opportunity to gain an exemplary performance credit of 95% construction waste recycling.

Green Housekeeping (Credit 1.3) Anticipated

Green housekeeping policy wherein all cleaners used in common areas are expected to comply with the Green Seal standard GS-37.

Education and Outreach (Credit 1.4) Anticipated

The project will install signage throughout the building and property that identifies and briefly explains the environmental qualities of certain sustainable design features.

Innovation & Design (Credit 1.5) - In Progress

Possibly a tenant manual or tenant education.

Regional Priority Credits (3 Anticipated, 1 In Progress)

Credit 1.1 SS 7.1

Credit 1.2 SS 7.2

Credit 1.3 SSc6.1

Credit 1.4 SS c3 or EA c2 (Maybe)

LEED Accredited Professional (Credit 2)

Colleen Soden is the LEED AP for the project.

The LEED checklist (**Figure 3-31)** reveals 51 points in the "yes" column and 31 "maybes". The Project goal is LEED Gold; with some additional effort, moving many of the "maybes" into the "yes" column will ensure that LEED Gold is achieved.

Sustainable design has been a topic of high importance since the onset of this Project. The entire design team is dedicated to sustainability and all aspects of this Project have been and will continue to be analyzed.

4.0 ENVIRONMENTAL PROTECTION COMPONENT

4.1 Shadow Impact Analysis

4.1.1 Introduction

The following shadow study describes and graphically depicts anticipated new shadow impacts from the ISEB (Proposed Project) compared to shadows cast from the existing buildings in the area, including the existing Columbus Parking Garage and the existing Snell Library (360 Huntington Avenue). The study presents both the No Build (existing) conditions and the 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. In addition, shadows are depicted for 6:00 p.m. during the summer solstice (see **Figures 4.1-1** through **4.1-13** at the end of this section).

Particular attention is given to sidewalks, pathways through the site from Columbus Avenue, bus stops and public open spaces/parks where pedestrians are likely to congregate, such as along the proposed pedestrian track crossing over the MBTA/Amtrak rails.

4.1.2 Vernal Equinox (March 21)

Figures 4.1-1 through **4.1-3** depict shadows on March 21.

At 9:00 a.m., new shadows from the Proposed Project will be cast in a northwesterly direction onto the pedestrian track crossing. The majority of the pedestrian track crossing remains in the sun at this time period. New shadows will be cast across the rails and reach the foot of Northeastern's Snell Library.

At 12:00 p.m., new shadows from the Proposed Project will fall in a northerly direction, primarily onto the pedestrian track crossing and on the ground alongside the Columbus Parking Garage. The majority of the pedestrian track crossing remains in the sun at this time period.

At 3:00 p.m., new shadows will extend towards the east and fall onto a portion of the Columbus Parking Garage roof and onto the proposed access roadway between the ISEB and the Columbus Parking Garage.

4.1.3 Summer Solstice (June 21)

Figures 4.1-4 through 4.1-7 depict shadows on June 21.

At 9:00 a.m., the Proposed Project will cast new shadows in a northwesterly direction onto portions of the pedestrian track crossing over the MBTA tracks. The majority of the pedestrian track crossing remains in the sun at this time period. New shadows will be cast across a portion of the rails and reach the Commuter Rail platform.

At 12:00 p.m., new shadows will extend north and are confined to the immediate vicinity of the Proposed Project and fall on a portion of the pedestrian track crossing. New shadow will be cast on the ground at the space between the Proposed Project and the Columbus Parking Garage.

By 3:00 p.m., new shadows will extend in an easterly direction to the space between the ISEB and the Columbus Parking Garage and onto a portion of the west façade of the Columbus Parking Garage.

At 6:00 p.m., due to the length of shadows at this time of the day, much of the area is covered in existing shadows. New shadows will extend in a southeasterly direction, primarily on the west façade and rooftop of the Columbus Parking Garage and onto Columbus Avenue. New shadows will fall onto the front façade of 748, 750, and 752 Columbus Avenue, and onto the rear and west façade of 981-993 Tremont Street.

4.1.4 Autumnal Equinox (September 21)

Figures 4.1-8 through 4.1-10 depict shadows on September 21.

At 9:00 a.m., new shadows will be cast in a northwesterly direction onto the pedestrian track crossing. The majority of the pedestrian track crossing remains in the sun at this time period. New shadows will be cast across the rails and reach the foot of Northeastern's Snell Library.

At 12:00 p.m., new shadows will be cast in a northerly direction onto the pedestrian track crossing and onto the west façade of the Columbus Parking Garage.

By 3:00 p.m., new shadows will extend to the northeast onto the western portion of the Columbus Parking Garage. These new shadows will reach a portion of the Columbus Parking Garage rooftop.

4.1.5 Winter Solstice (December 21)

Figures 4.1-11 through 4.1-13 depict shadows on December 21. Winter sun casts the longest shadows of the year.

The 9:00 a.m. new shadows will be cast in a northwesterly direction onto the pedestrian track crossing and the south façade of the Snell Library. These new shadows will also reach the rooftop of the Snell Library and cover a portion of the space in-between the Proposed Project and the Columbus Parking Garage.

By 12:00 p.m., long winter shadows will extend to the north, onto the Columbus Parking Garage rooftop and west facade, and onto the pedestrian track crossing.

At 3:00 p.m., new shadows will fall in a southeasterly direction, covering the entire roof of the Columbus Parking Garage and extending onto a portion of Carter Playground.

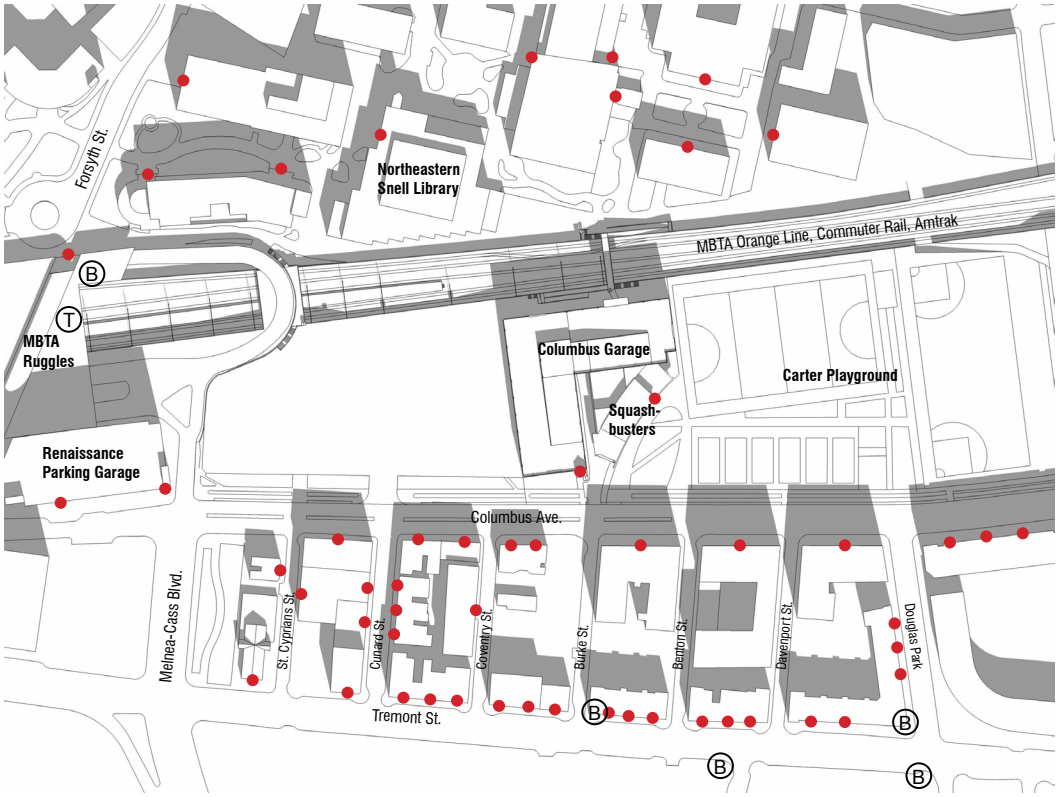
4.1.6 Summary

For much of the year, most of the new shadows cast by the Proposed Project will affect mainly the pedestrian track crossing across the MBTA tracks and west façade of the Columbus Parking Garage in the afternoon. At the apex of the summer season, new shadows will extend across the MBTA tracks to the north and reach the foot of the Snell Library.

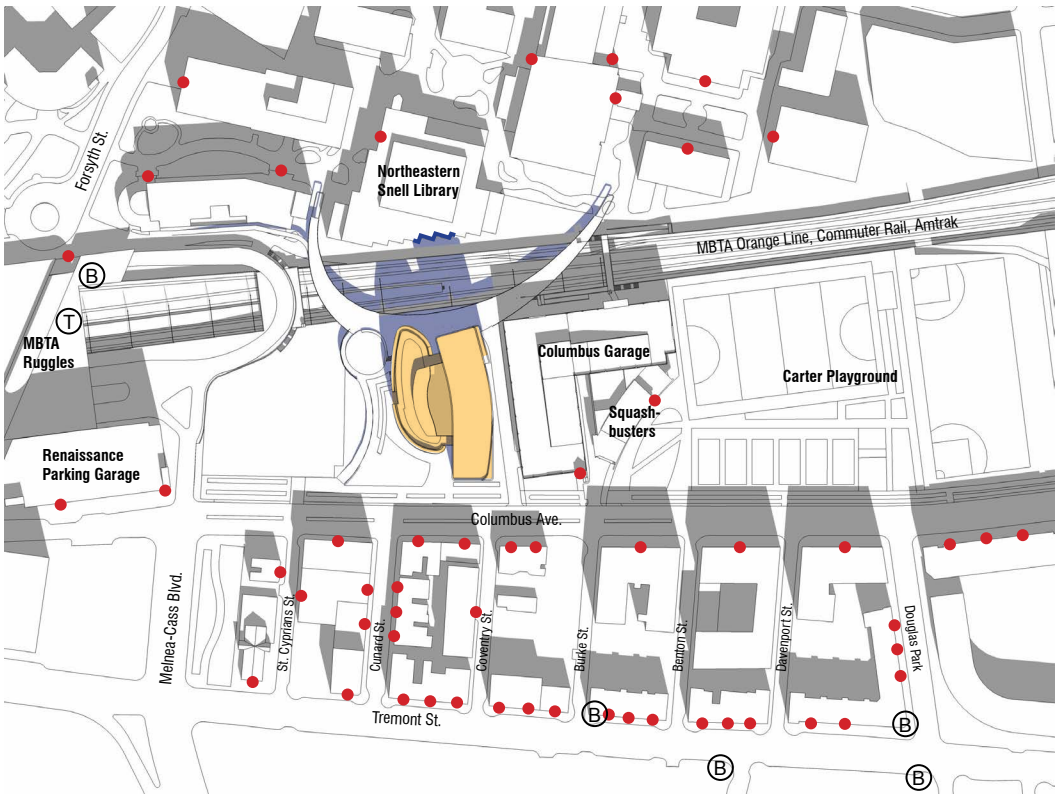
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build



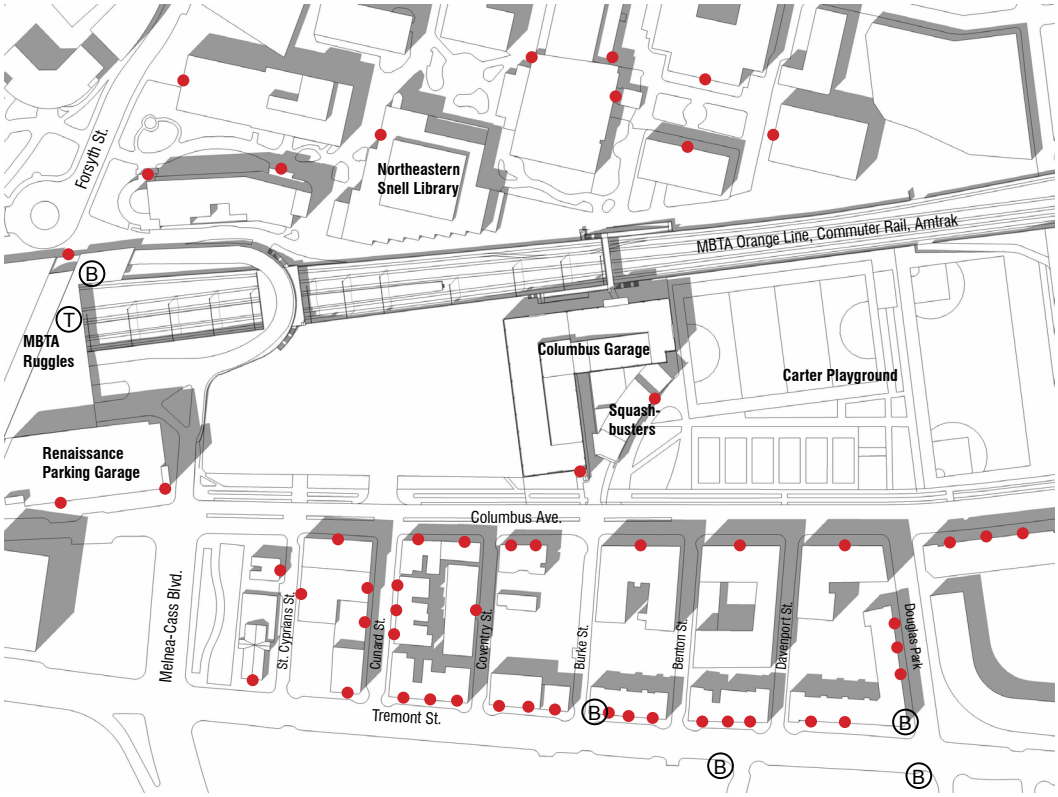
PAYETTE

Figure 4.1-1
Shadow Study - March 21, 9:00 am
Azimuth 112.6 Altitude 23.5

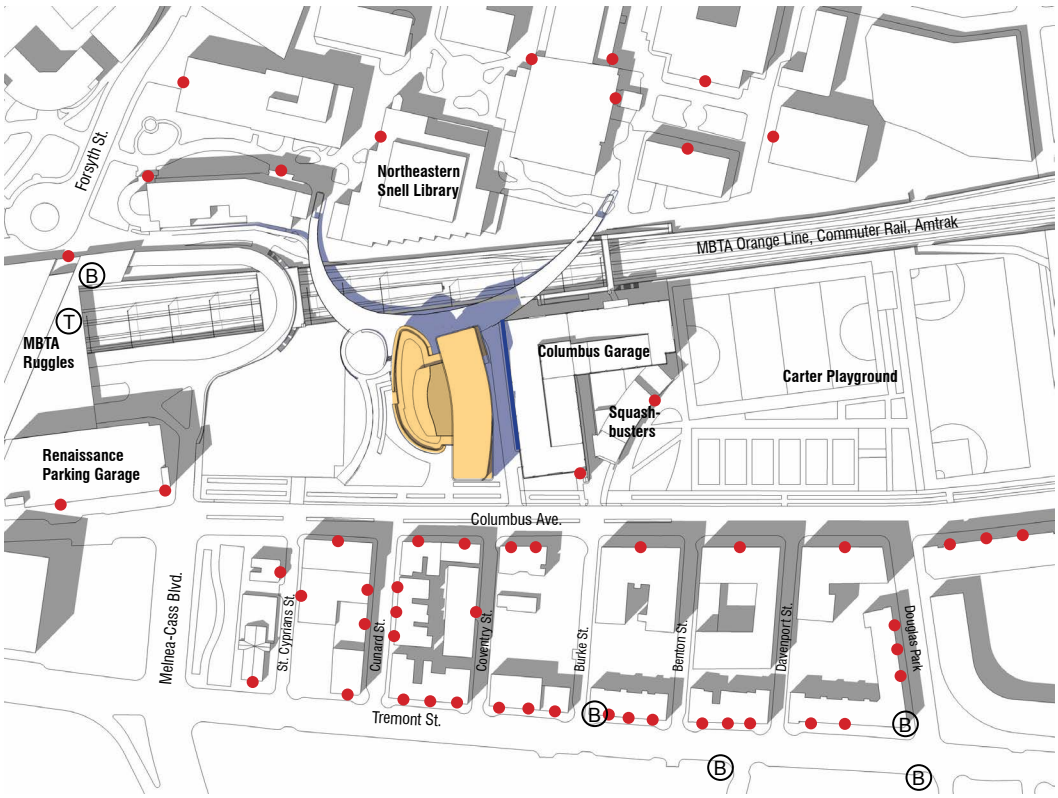
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build



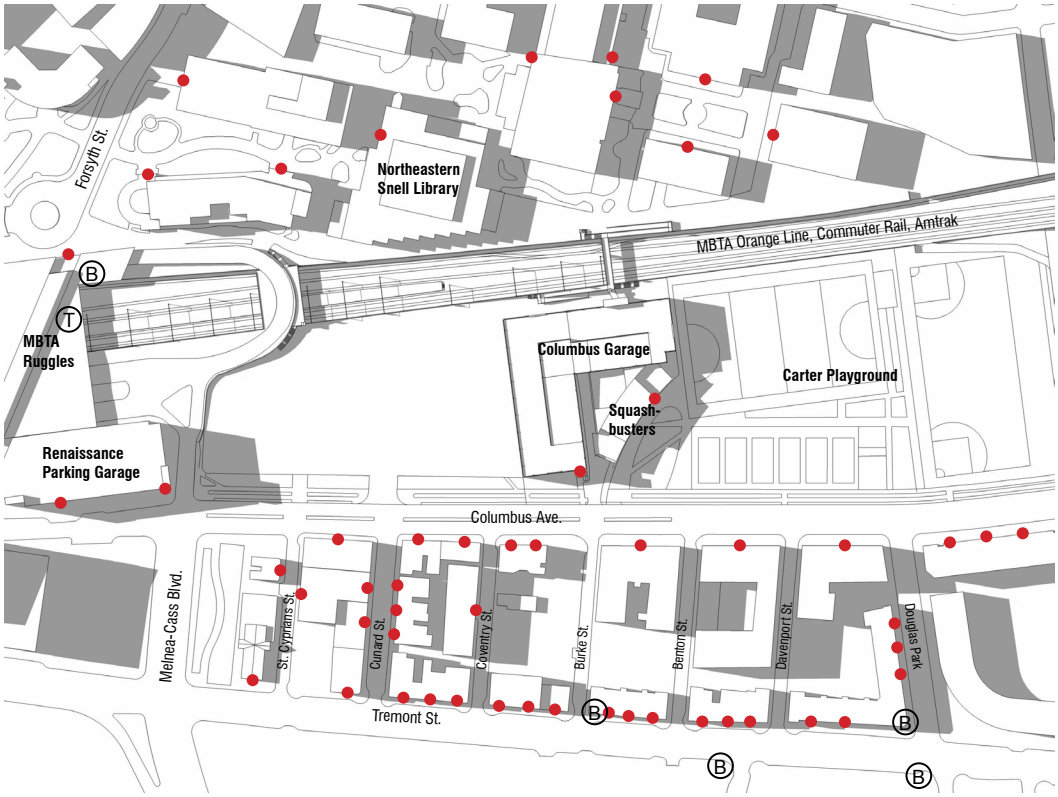
PAYETTE

Figure 4.1-2
Shadow Study - March 21, 12:00 pm
Azimuth 161.1 Altitude 46.6

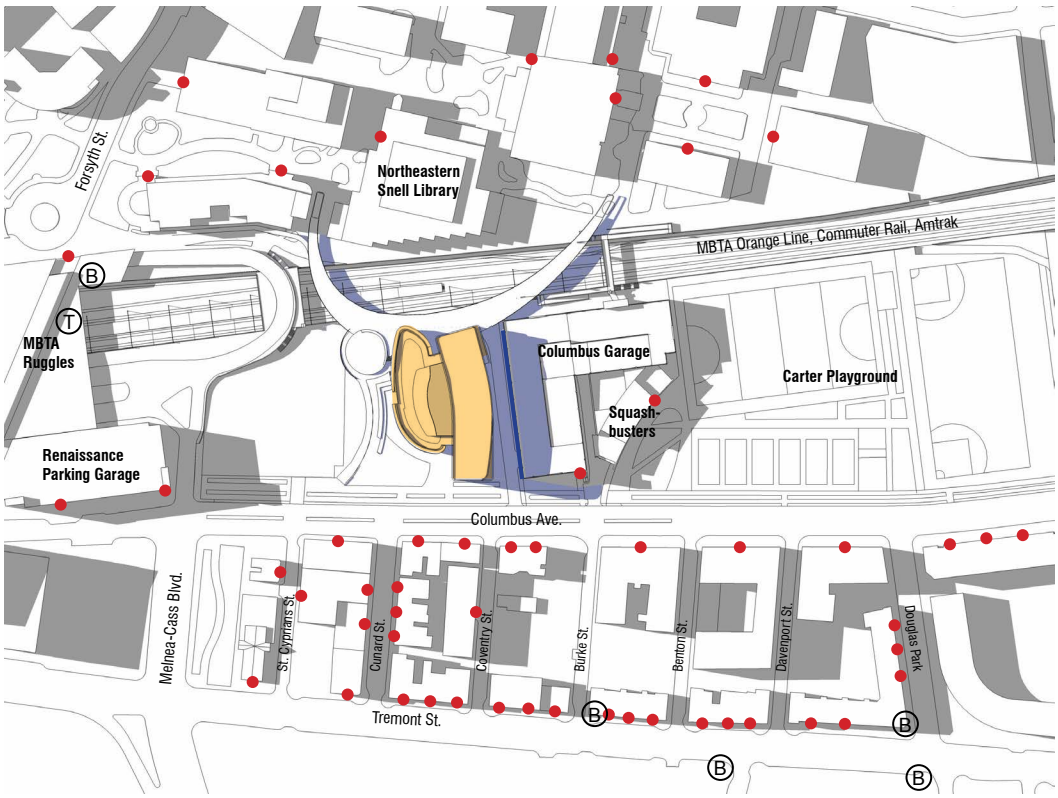
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Rapid Transit Station
- Bus Stop

No Build



Build



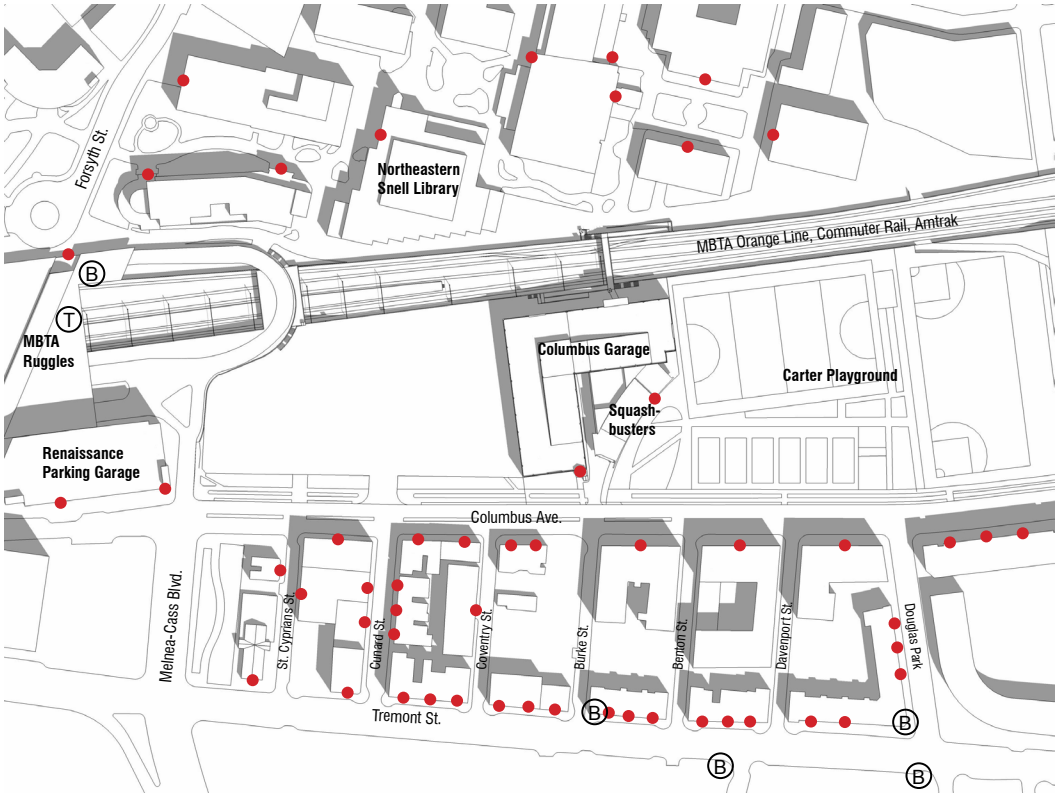
PAYETTE

Figure 4.1-3
Shadow Study - March 21, 3:00 pm
Azimuth 223.4 Altitude 39.2

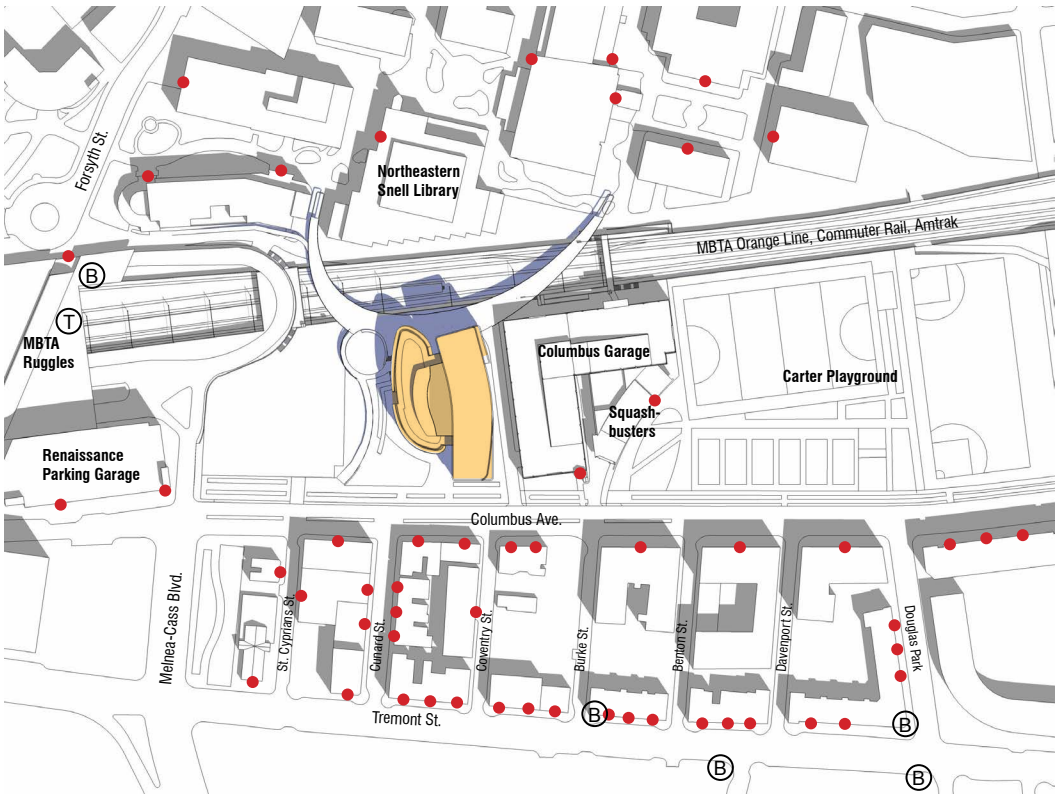
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build



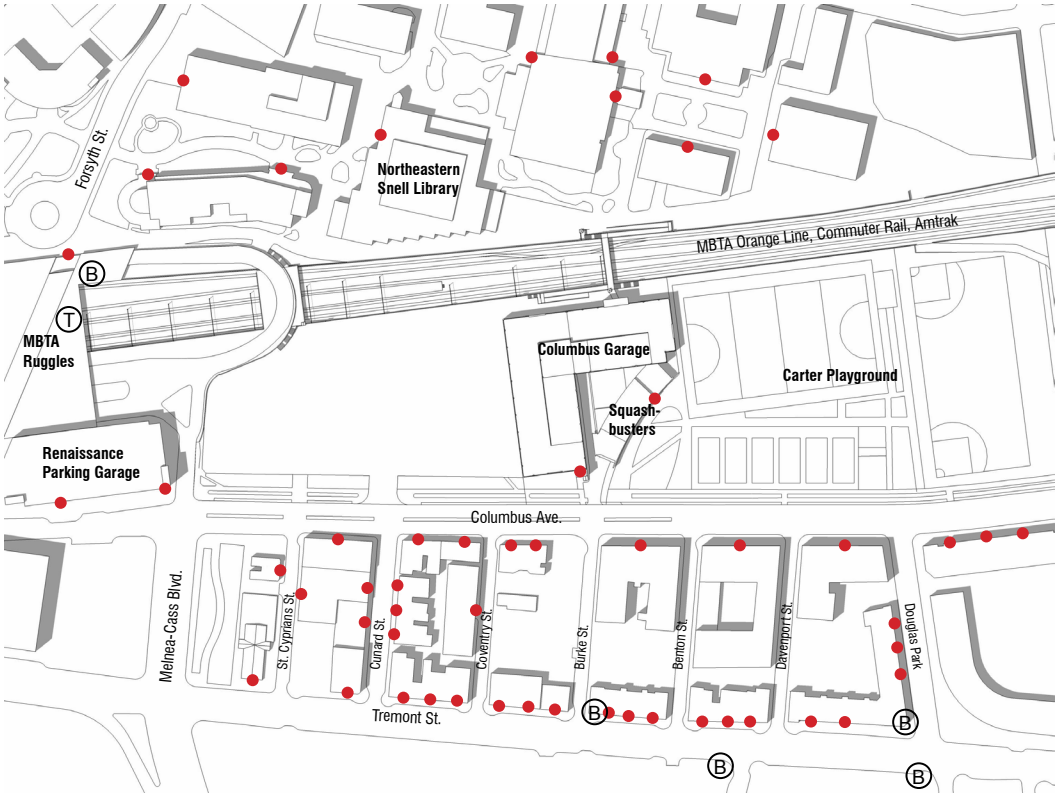
PAYETTE

Figure 4.1-4
Shadow Study - June 21, 9:00 am
Azimuth 93.5 Altitude 39.9

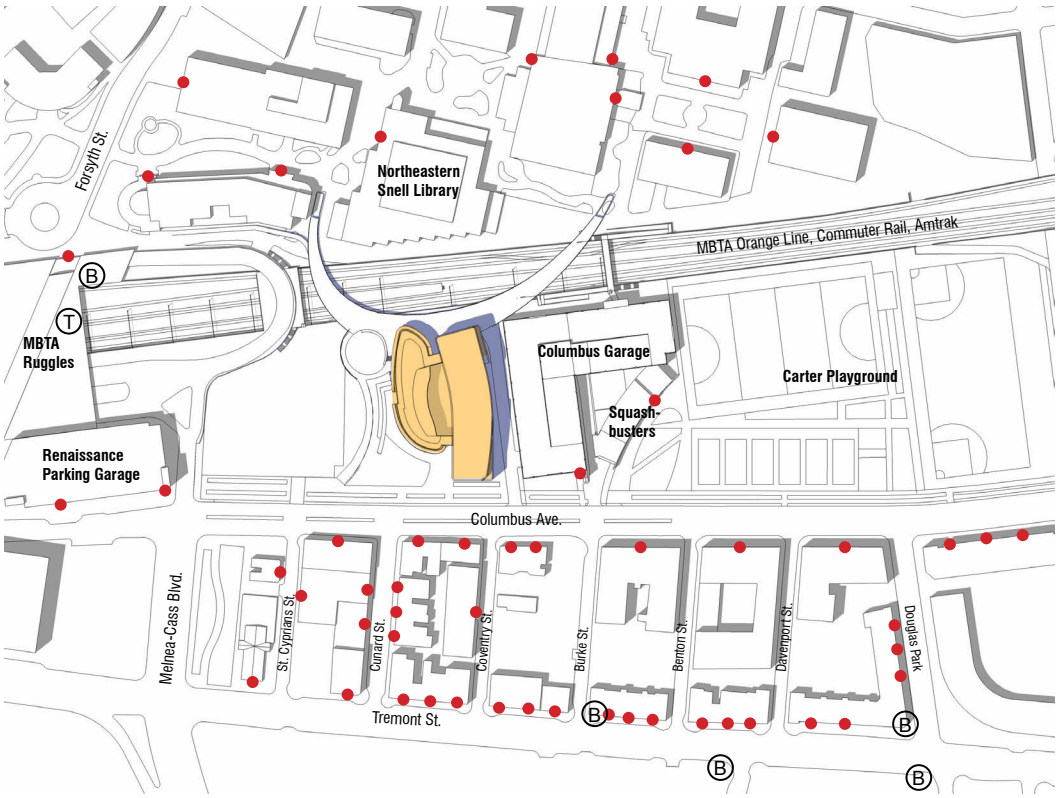
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build



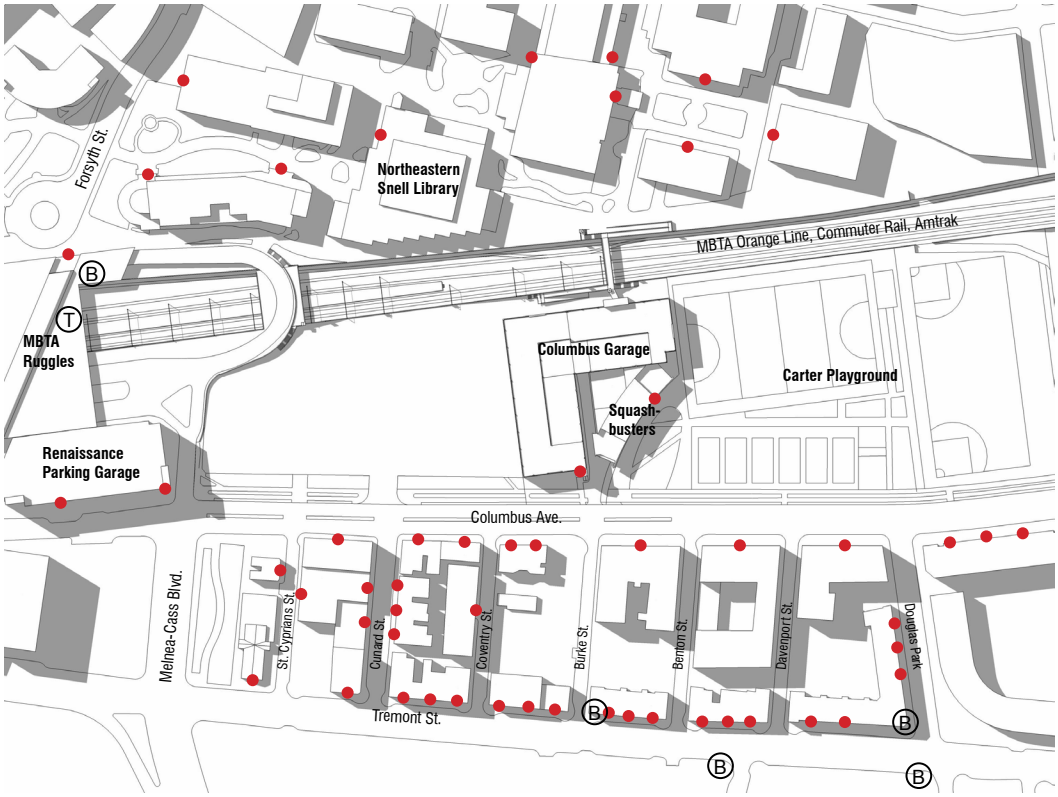
PAYETTE

Figure 4.1-5
Shadow Study - June 21, 12:00 pm
Azimuth 149.4 Altitude 68.8

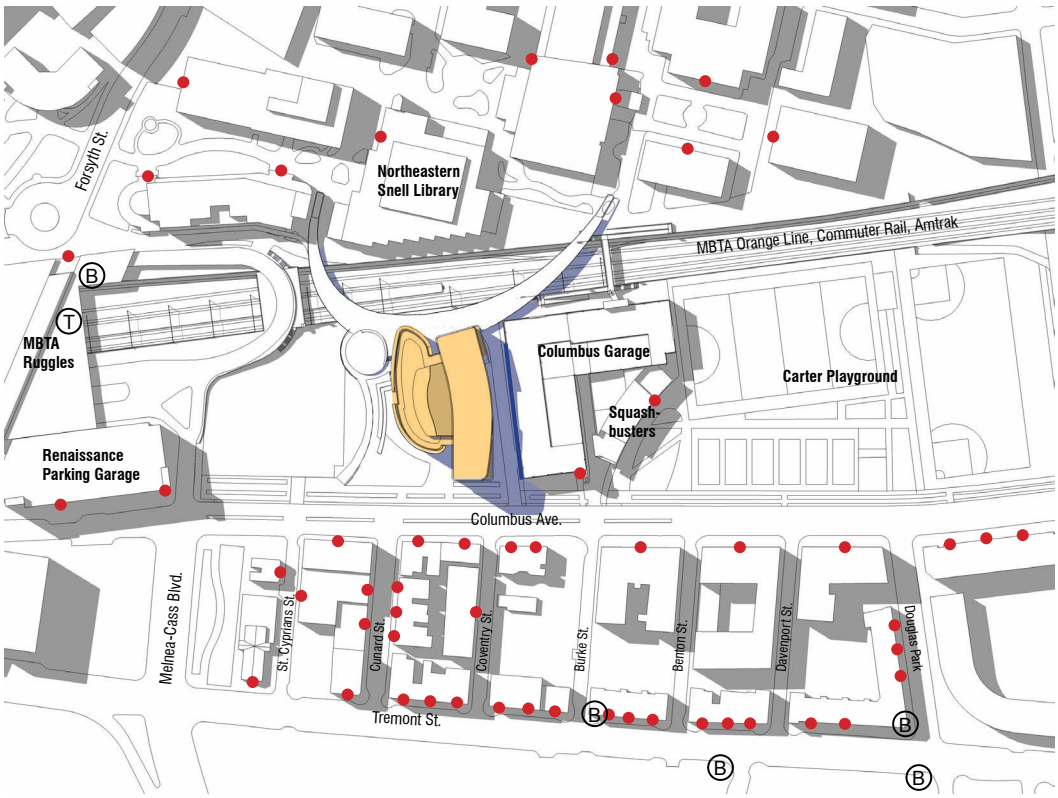
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build



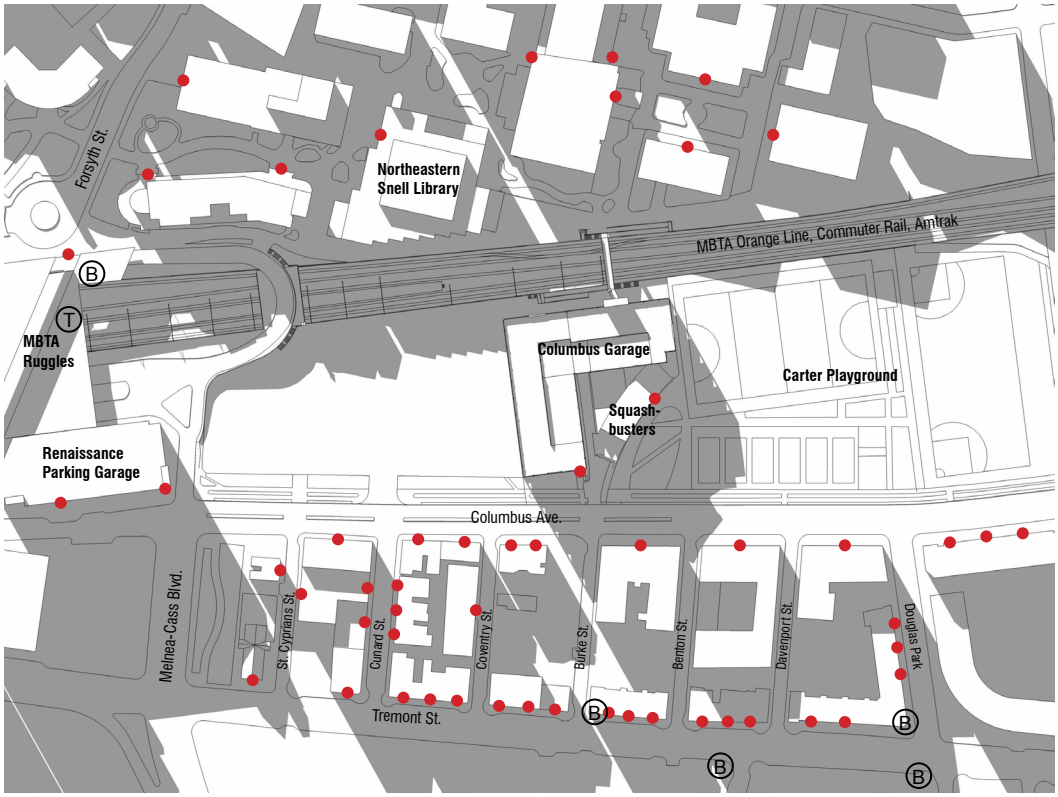
PAYETTE

Figure 4.1-6
Shadow Study - June 21, 3:00 pm
Azimuth 246.4 Altitude 56.5

Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Rapid Transit Station
- Bus Stop

No Build



Build

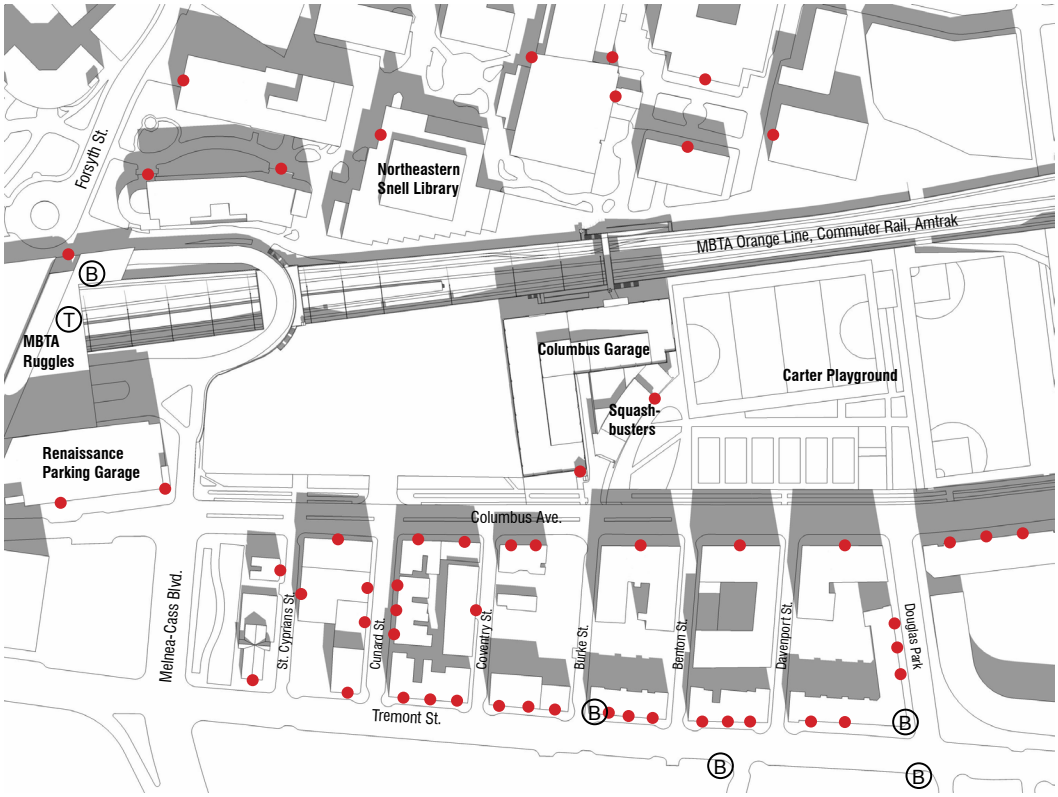
PAYETTE

Figure 4.1-7
Shadow Study - June 21, 6:00 pm
Azimuth 280.7 Altitude 23.8

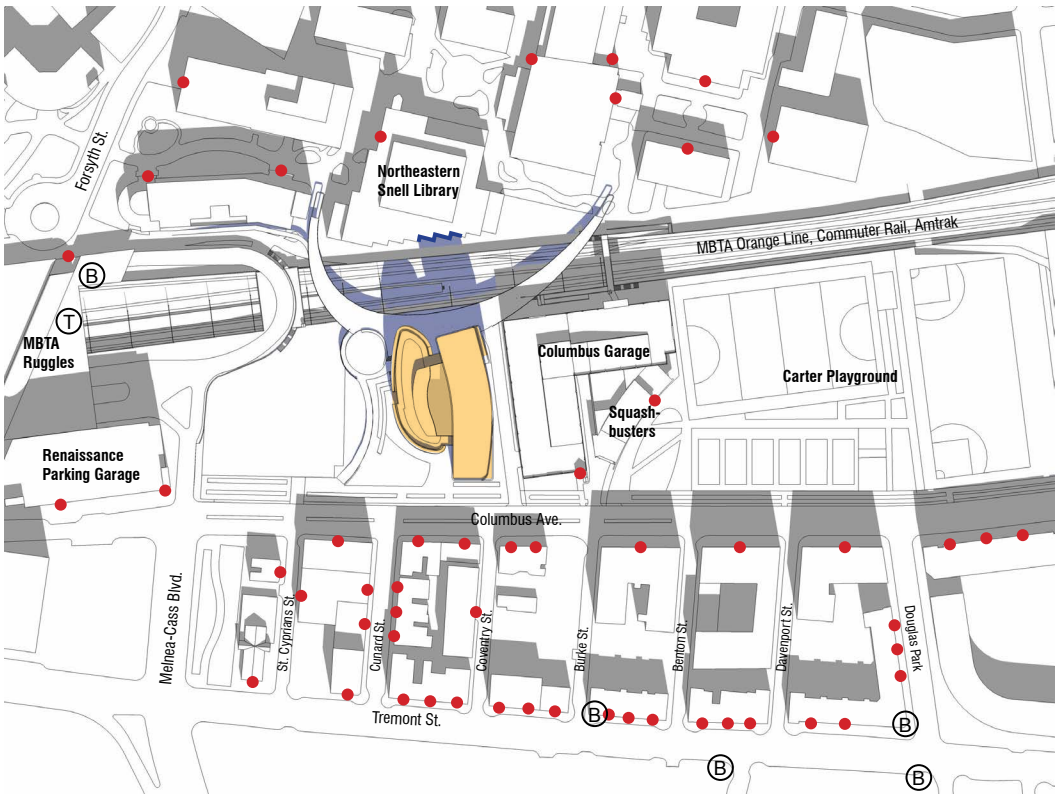
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build



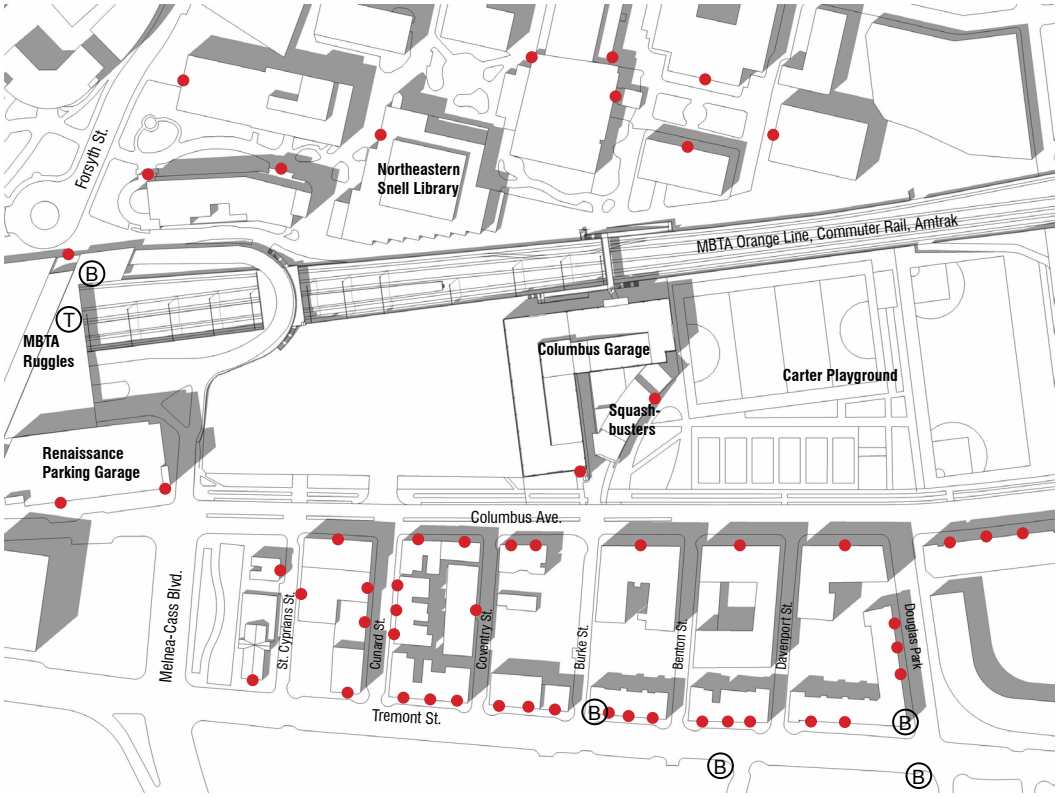
PAYETTE

Figure 4.1-8
Shadow Study - September 21, 9:00 am
Azimuth 115.4 Altitude 26.0

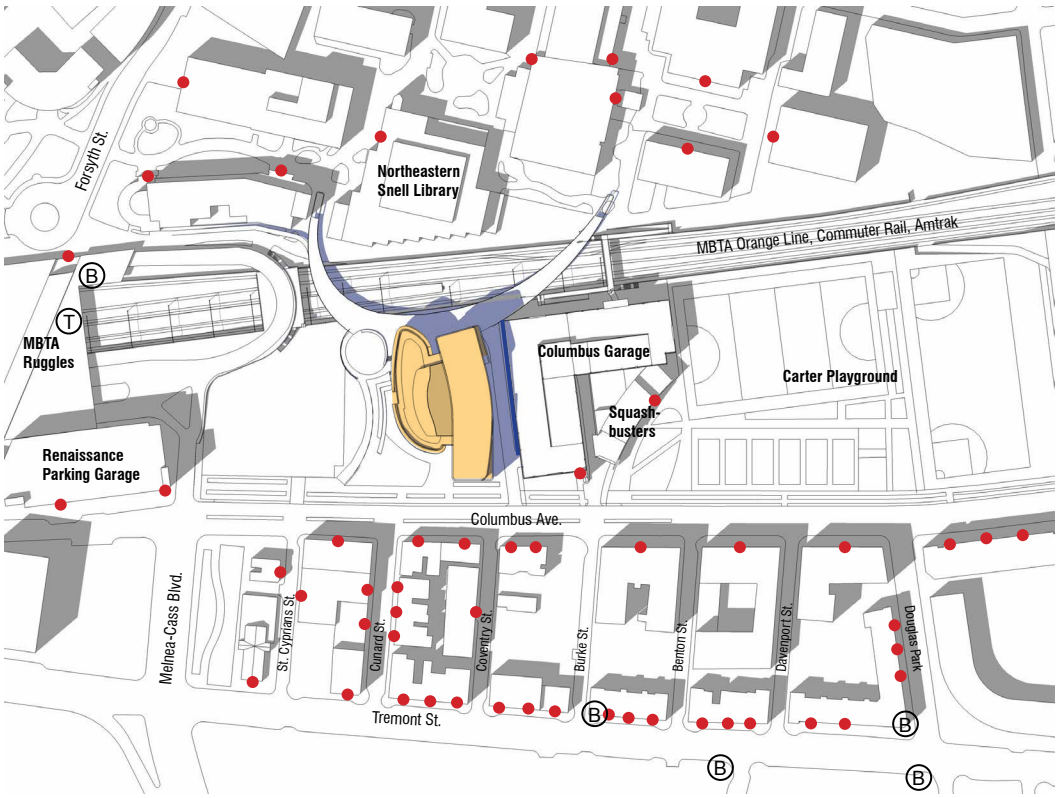
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build



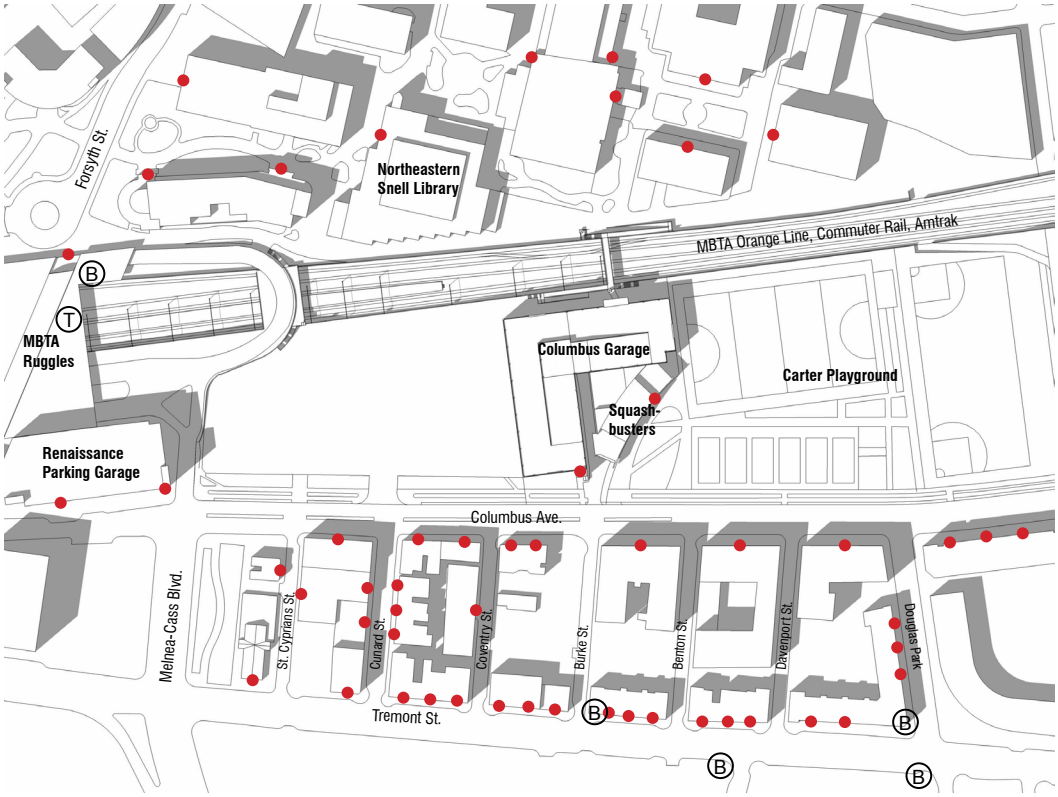
PAYETTE

Figure 4.1-9
Shadow Study - September 21, 12:00 pm
Azimuth 166.2 Altitude 47.3

Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build

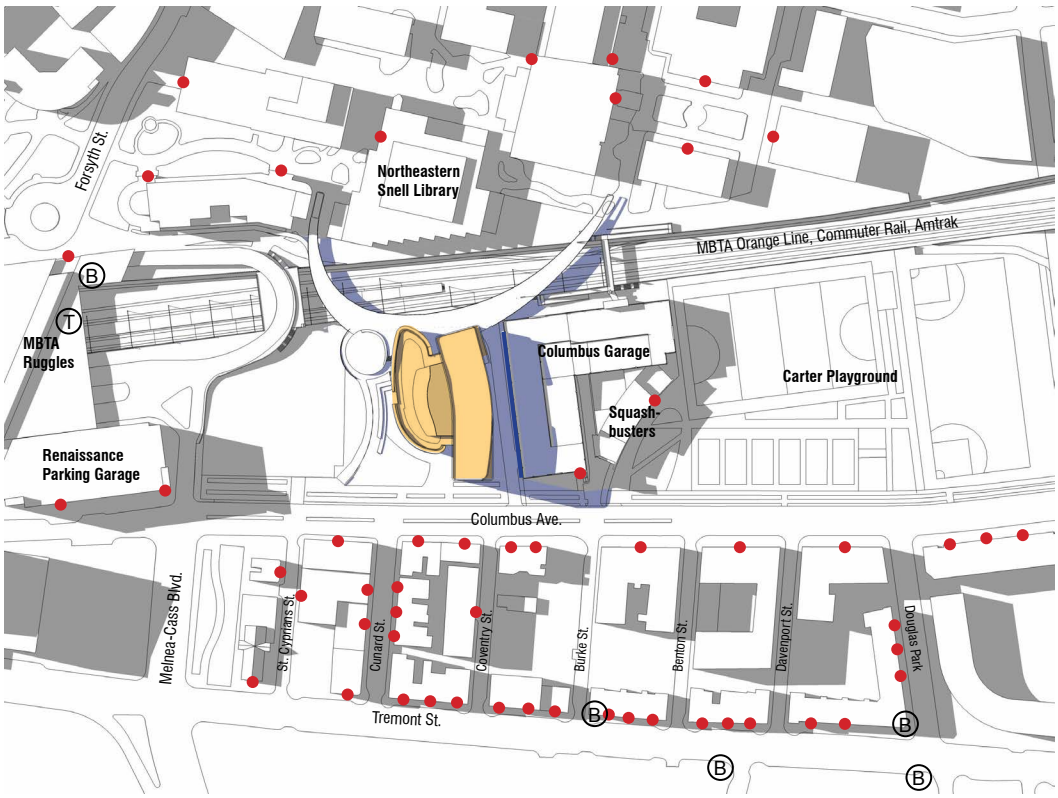


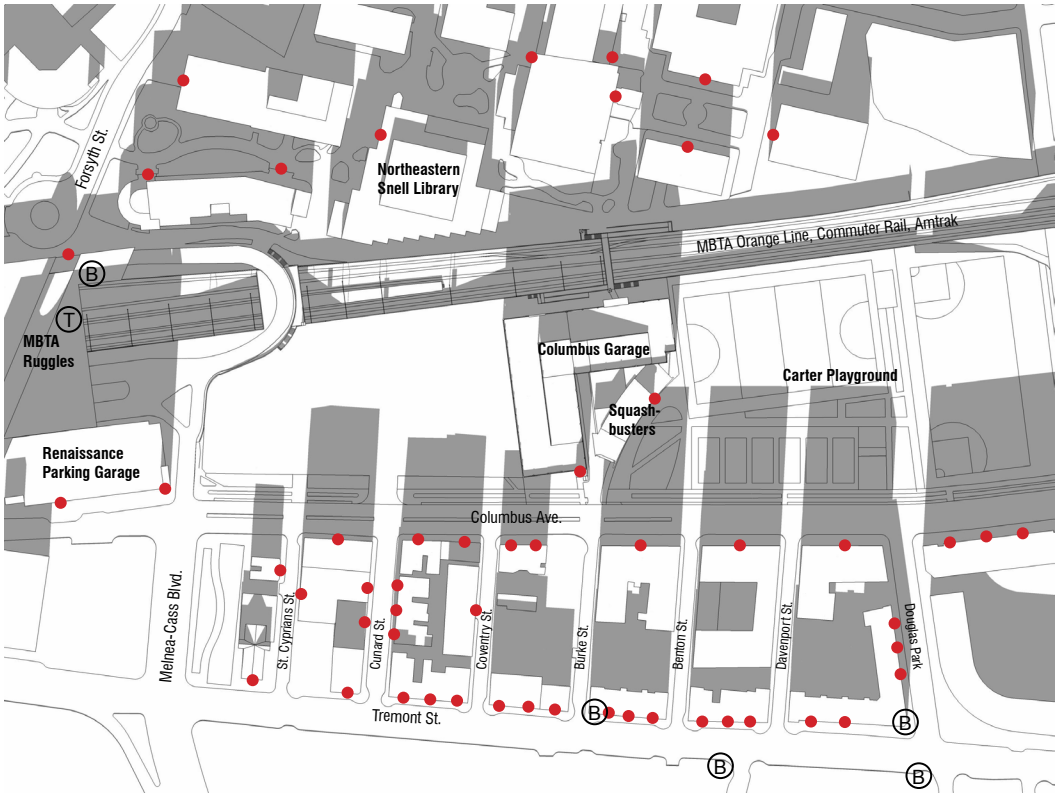
Figure 4.1-10
Shadow Study - September 21, 3:00 pm
Azimuth 227.1 Altitude 37.3

PAYETTE

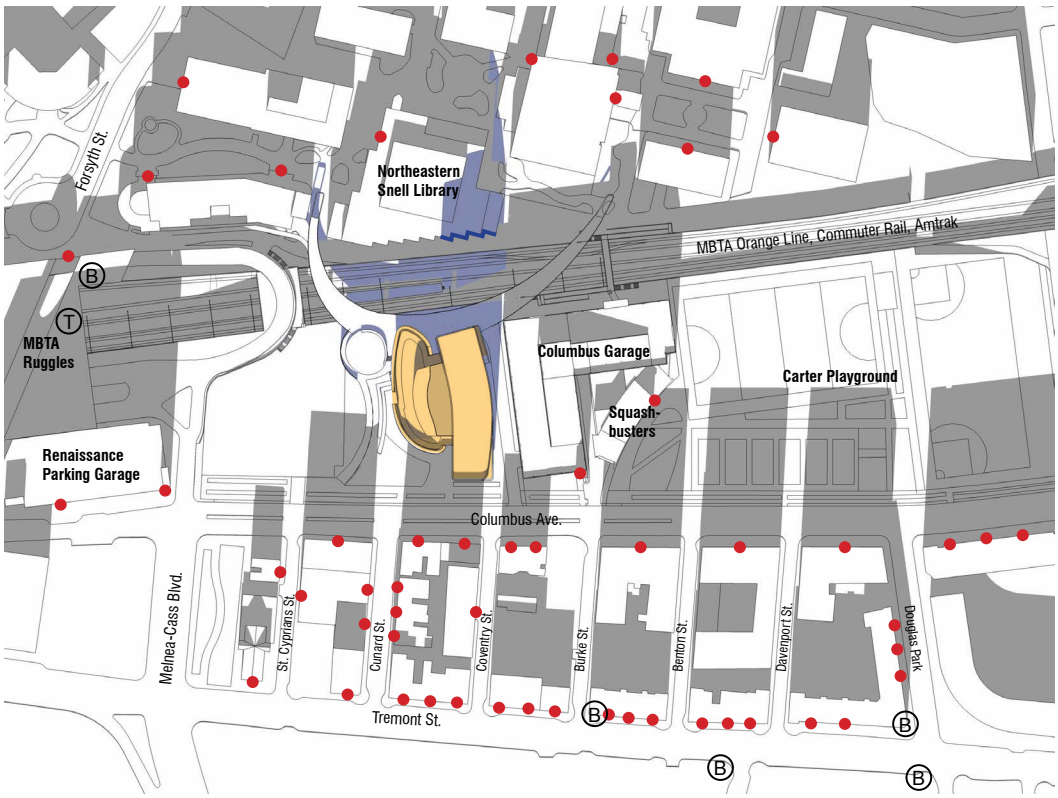
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Rapid Transit Station
- Bus Stop

No Build



Build



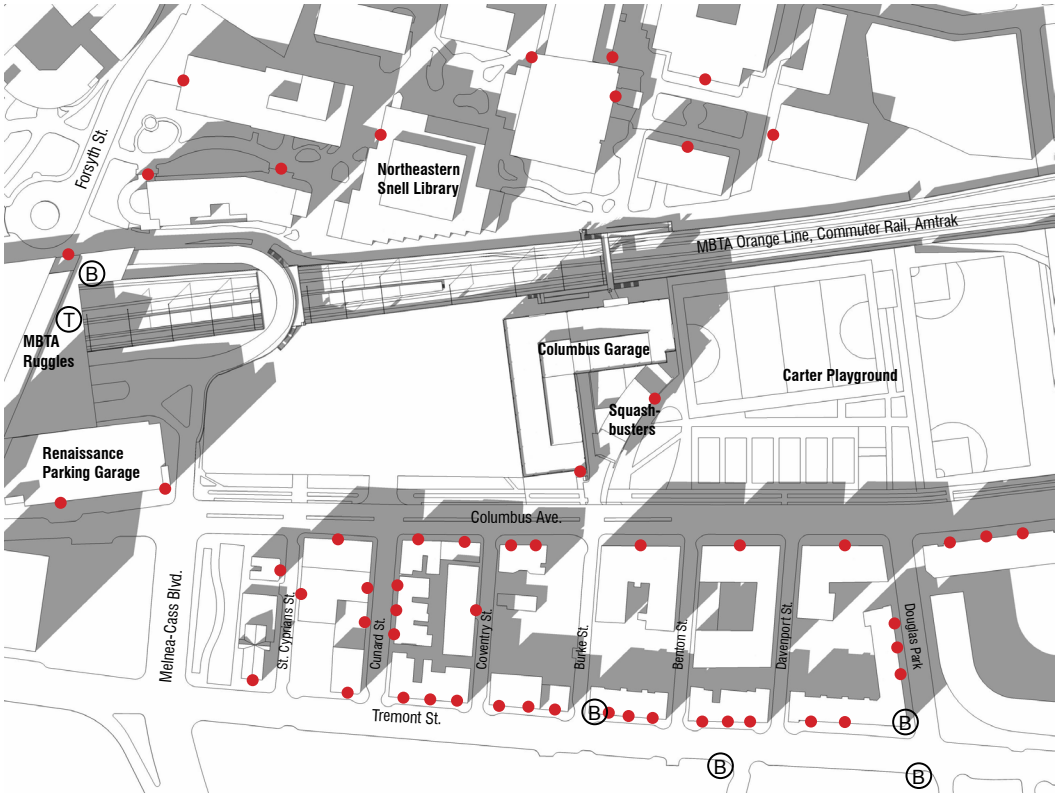
PAYETTE

Figure 4.1-11
Shadow Study - December 21, 9:00 am
Azimuth 141.9 Altitude 14.4

Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Ⓣ Rapid Transit Station
- Ⓑ Bus Stop

No Build



Build

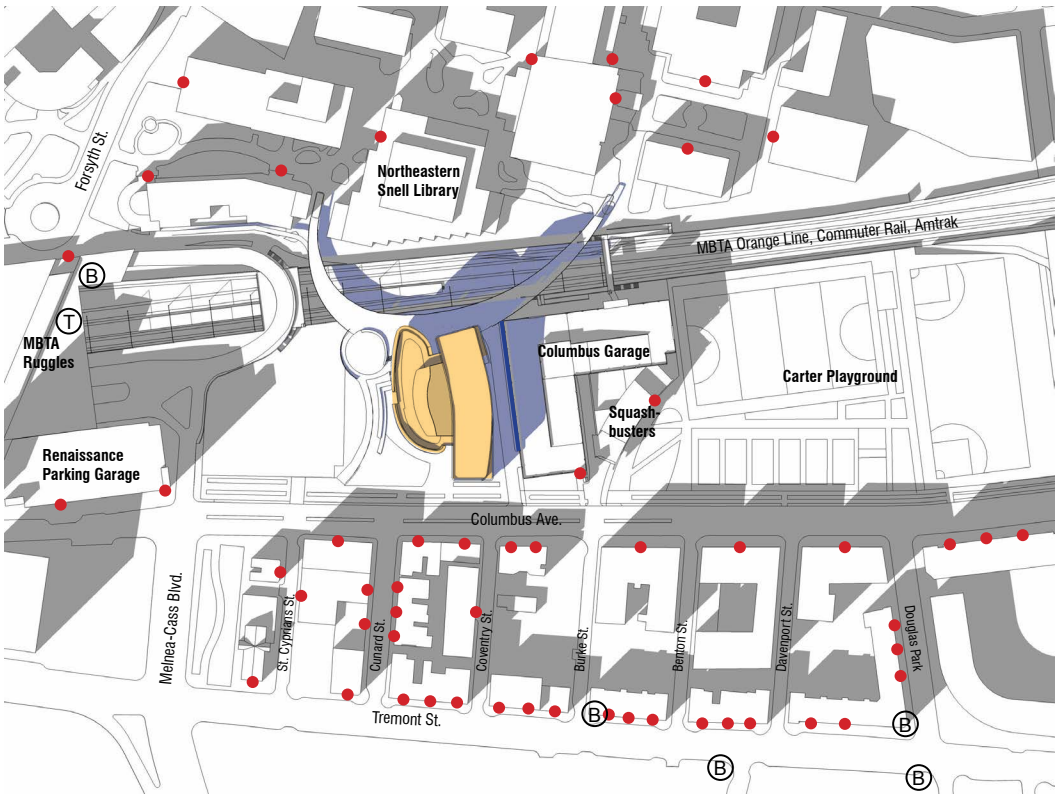


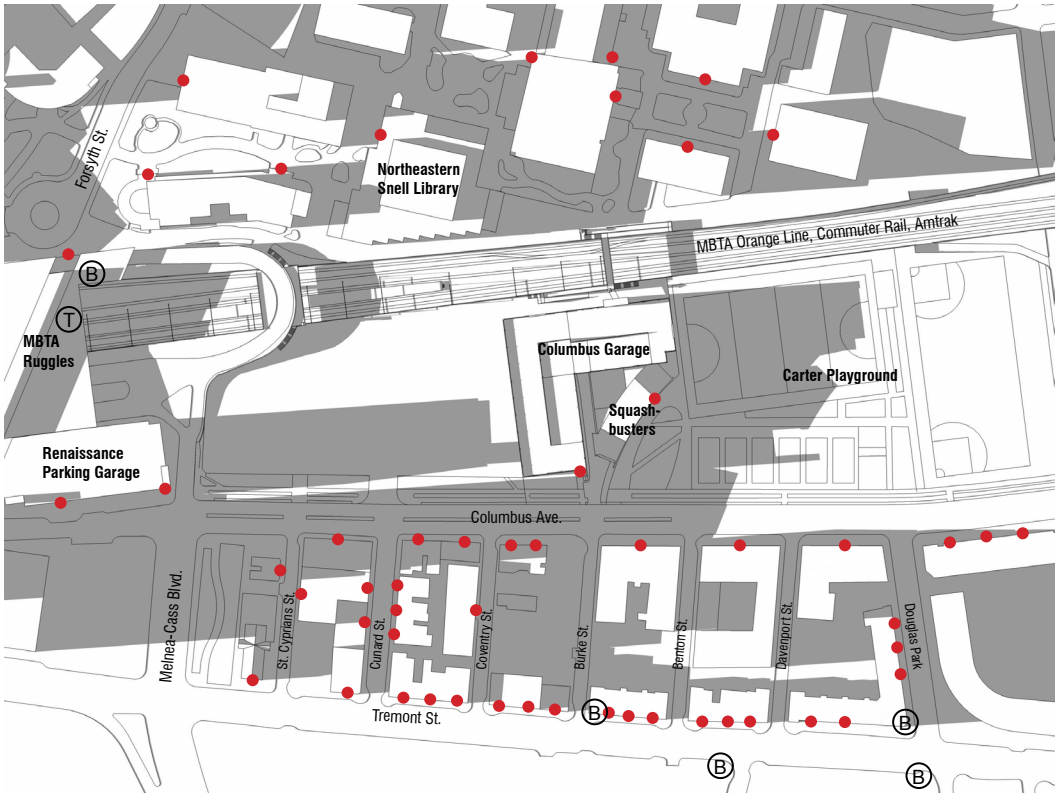
Figure 4.1-12
Shadow Study - December 21, 12:00 pm
Azimuth 184.4 Altitude 24.2

PAYETTE

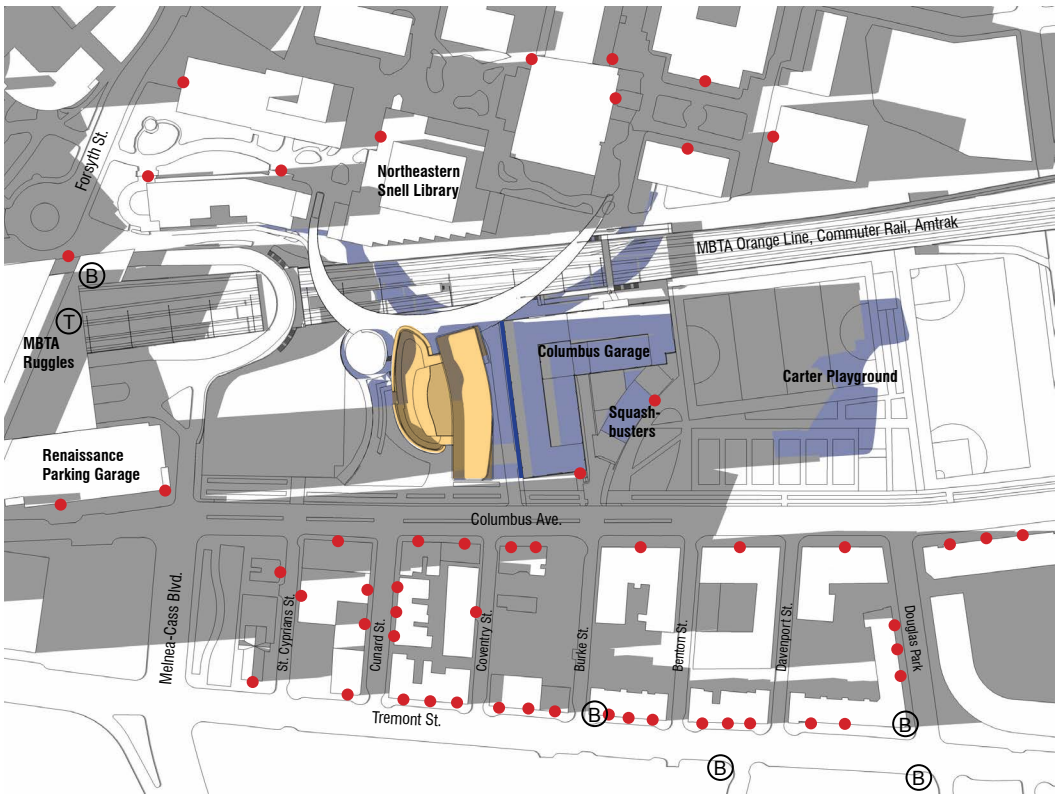
Legend

- Proposed Building
- Existing Shadow
- New Shadow
- New Shadow on Facade
- Building Entrance
- Rapid Transit Station
- Bus Stop

No Build



Build



PAYETTE

Figure 4.1-13
Shadow Study - December 21, 3:00 pm
Azimuth 225.0 Altitude 10.1

4.2 Wind Analysis

A quantitative pedestrian level wind analysis is being completed for the ISEB project. In addition to the wind tunnel results from the ISEB project alone on the Columbus Lot site, a separate wind tunnel evaluation is being completed for the full possible Institutional Master Plan (IMP) build-out for the complete site which includes the completion of at least two other mixed-use academic buildings in accordance with the recently filed Northeastern IMP. The results of this analysis will be submitted to the BRA by July 15, 2013 as a supplemental filing to the ISEB PNF.

4.3 Daylight

A daylight study was performed for the Project to determine the extent to which it would restrict the amount of daylight reaching streets or pedestrian ways in the immediate vicinity of the Project Site. In the existing condition, there is no daylight obstruction at the various viewpoints as shown on **Figure 4.3-1.** The proposed project will alter the skydome of the site when viewed from the selected study points. This change is consistent with the density and massing for the site that Northeastern University has envisioned in its Institutional Master Plan. In the 2015 Build Condition, the proposed project will alter the view of the skydome from Columbus Avenue and adjacent areas. This effect cannot be avoided. Replacing an existing surface at-grade parking lot with any building development on this site will necessarily create some skydome impacts. The proposed ISEB will, by design, increase substantially the foot traffic between Columbus Avenue to the remainder of the Northeastern campus. Pedestrian enjoyment of the urban experience in this area will be improved. Given the general lack of activity generated by the existing uses, the net effect of the project will be a substantial enhancement of the public realm in this area.

4.3.1 Methodology

The following section describes the Project's anticipated effect on daylight coverage at the site. The analysis was prepared using the BRA's Daylight Analysis Program and has been completed in accordance with the requirements of Article 80 of the City of Boston Zoning Code. The results of the analysis are presented in **Table 4.3-1** and **Figures 4.3-1** through **4.3-6**. The Proponent has completed an analysis of the percentage of skydome obstructed in the No Build and Build Conditions.

The proposed project was analyzed using the Boston Redevelopment Authority's Daylight Analysis Program (BRADA) comparing the No-Build and Build Conditions. This section provides a description of the methodology used for the analysis. The BRADA program was developed in 1985 by the Massachusetts Institute of Technology to estimate the pedestrian's view of the skydome taking into account the massing and building materials used. The software approximates a pedestrian's view of a site based on input parameters such as: location of viewpoint, length and height of buildings, and the relative reflectivity of the building facades. The model typically uses the midpoint of an adjacent right-of-way or sidewalk as the analysis viewpoint. Based on these data, the model calculates the perceived skydome obstruction and provides a graphic depicting the analysis conditions.

The model inputs used for the study presented in this PNF were taken from a combination of the existing conditions survey prepared by R.E. Cameron, dated May 2013, and schematic design plans prepared by Payette, dated June 2013. As described above, the BRADA software considers the relative reflectivity of building facades when calculating perceived daylight obstruction. Highly reflective materials are thought to reduce the perceived skydome obstruction when compared to non-reflective materials. For the purposes of this study, the building facades are considered non-reflective, resulting in a conservative estimate of daylight obstruction.

The following viewpoints were used for this daylight analysis. They represent viewpoints for each building façade when viewed from the adjacent public way, sidewalk or property line as appropriate.

1. Columbus Avenue – This viewpoint is located on the centerline of Columbus Avenue centered on the building's southern façade (**Figure 4.3-2.**)
2. Bike/Pedestrian Path – This viewpoint is located on the bike/pedestrian path along the north side of Columbus Avenue, centered on the building's southern façade (**Figure 4.3-3**).
3. Ruggles Station Busway – This viewpoint is located on the Ruggles Station Busway westerly to the ISEB, centered on the building's western façade (**Figure 4.3-4**).
4. Proposed Driveway – This viewpoint is located on the proposed service driveway between the ISEB and the existing parking garage, centered easterly of the ISEB (**Figure 4.3-5**).
5. Proposed Pedestrian Bridge – This viewpoint is located on the centerline of the pedestrian track crossing north of the ISEB, centered on the building's northern façade (**Figure 4.3-6**).

Under the Existing and No-Build Condition, the majority of the skydome is visible from the selected viewpoints. The existing at grade parking lot occupies no skydome when viewed from the centerlines of the surrounding streets. **Table 4.3-1** and **Figures 4.3-2** through **4.3-6** provide the percentage of skydome obstructed under the Existing and No-Build scenarios.

The proposed project will alter the skydome of the site when viewed from the selected study points. This change is consistent with the density and massing for the site that Northeastern University has envisioned in their Institutional Master Plan. In the 2015 Build Condition, each viewpoint is expected to experience an increase in skydome obstruction. This effect is to be expected when replacing an at grade parking lot with a building with the varied massing of the project. The desired density and massing of the proposed projects necessitates obstructing a portion of the views at the existing site.

The results for each of the five viewpoints are presented in **Table 4.3-1,** and **Figures 4.3-1** through **4.3-6.**

Table 4.3-1: Results of BRADA Analysis			
Frontage	Elevation	Percent Daylight Obstruction	
		2015 No-Build Conditions	2015 Build Conditions
Columbus Avenue	South	0	5.0
Bike/Pedestrian Path	South	0	5.8
Ruggles Station Busway	West	0	7.6
Proposed Driveway	East	0	87.6
Proposed Pedestrian Bridge	North	0	9.3

The proposed project will alter the view of the skydome from the adjacent streets and areas. This effect cannot be avoided. Replacing the existing parking lot with any building development on this site will necessarily create some skydome impacts. The proposed ISEB will, by design, increase substantially the foot traffic between Columbus Avenue to the remainder of the Northeastern campus. Pedestrian enjoyment of the urban experience in this area will be improved. Given the general lack of activity generated by the existing uses the net effect of the project will be a substantial enhancement of the public realm in this area.

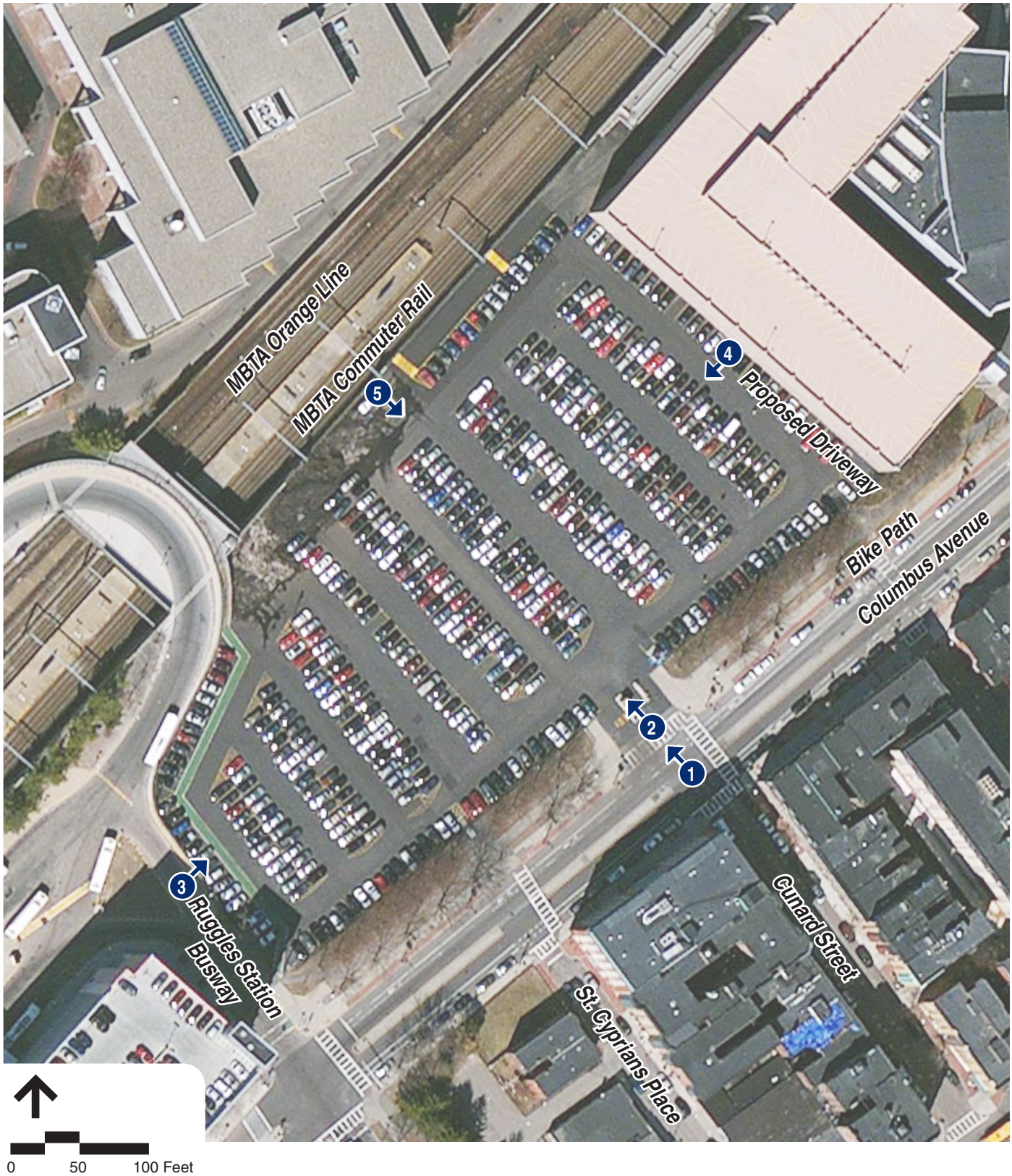
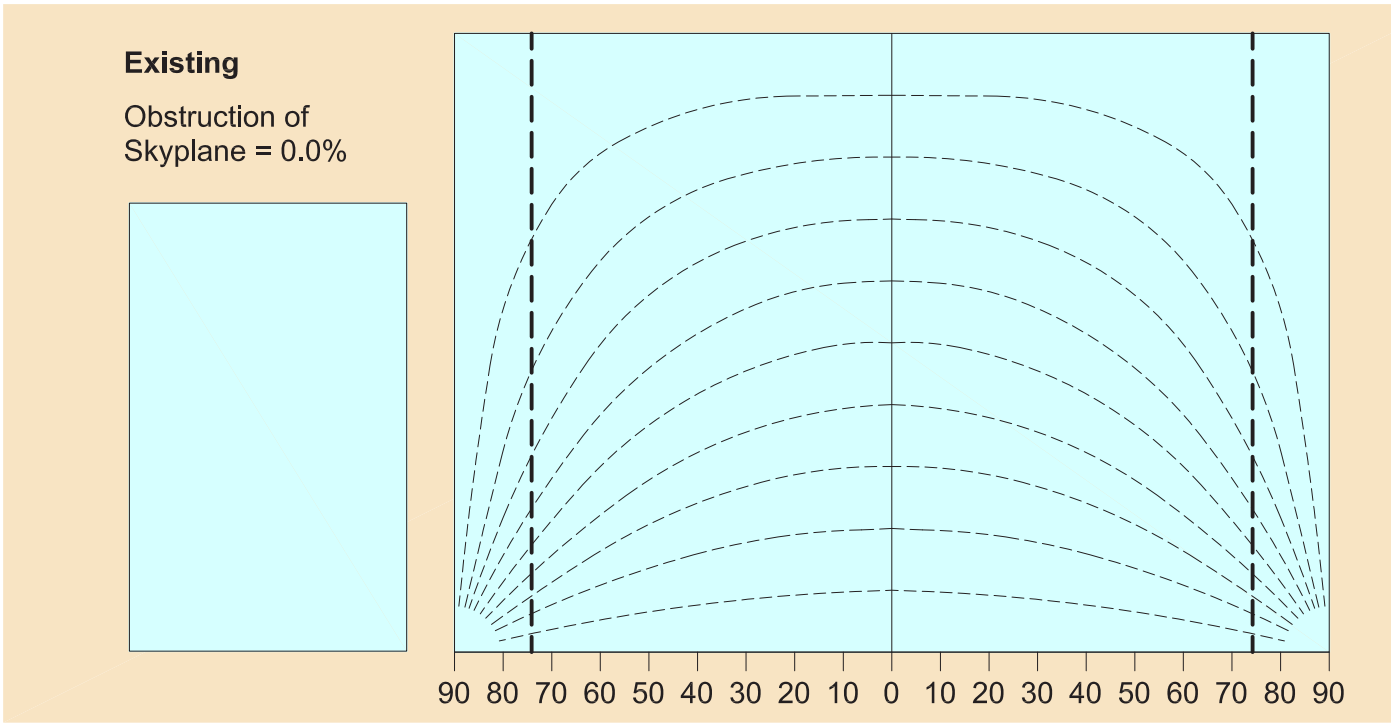
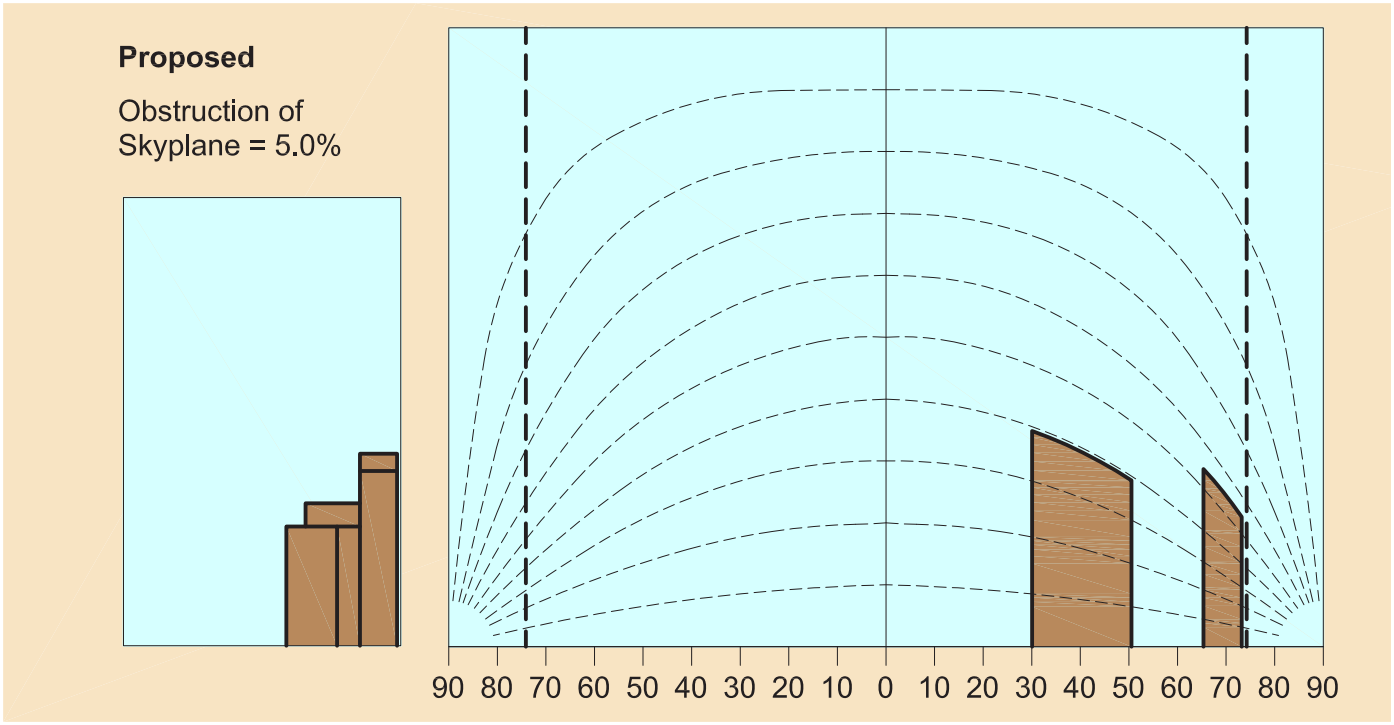


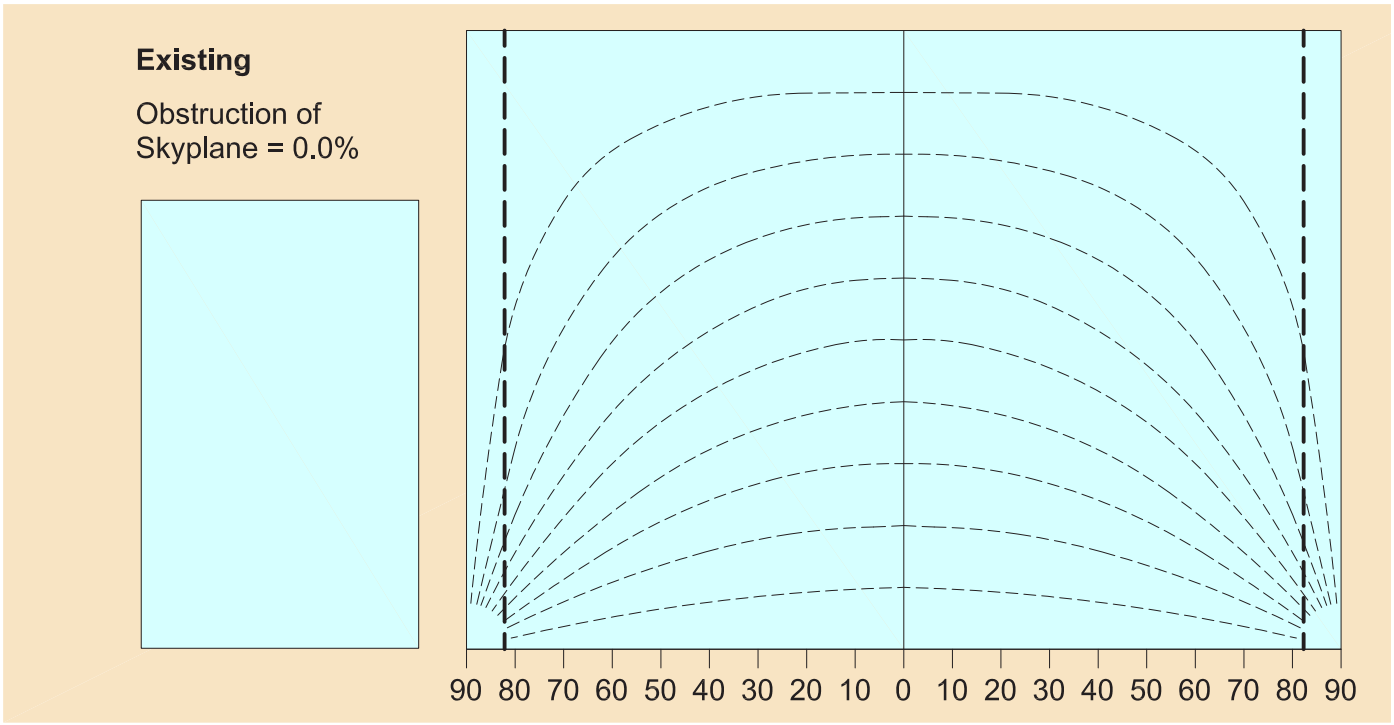
Figure 4.3-1
Daylight Analysis Study Viewpoints

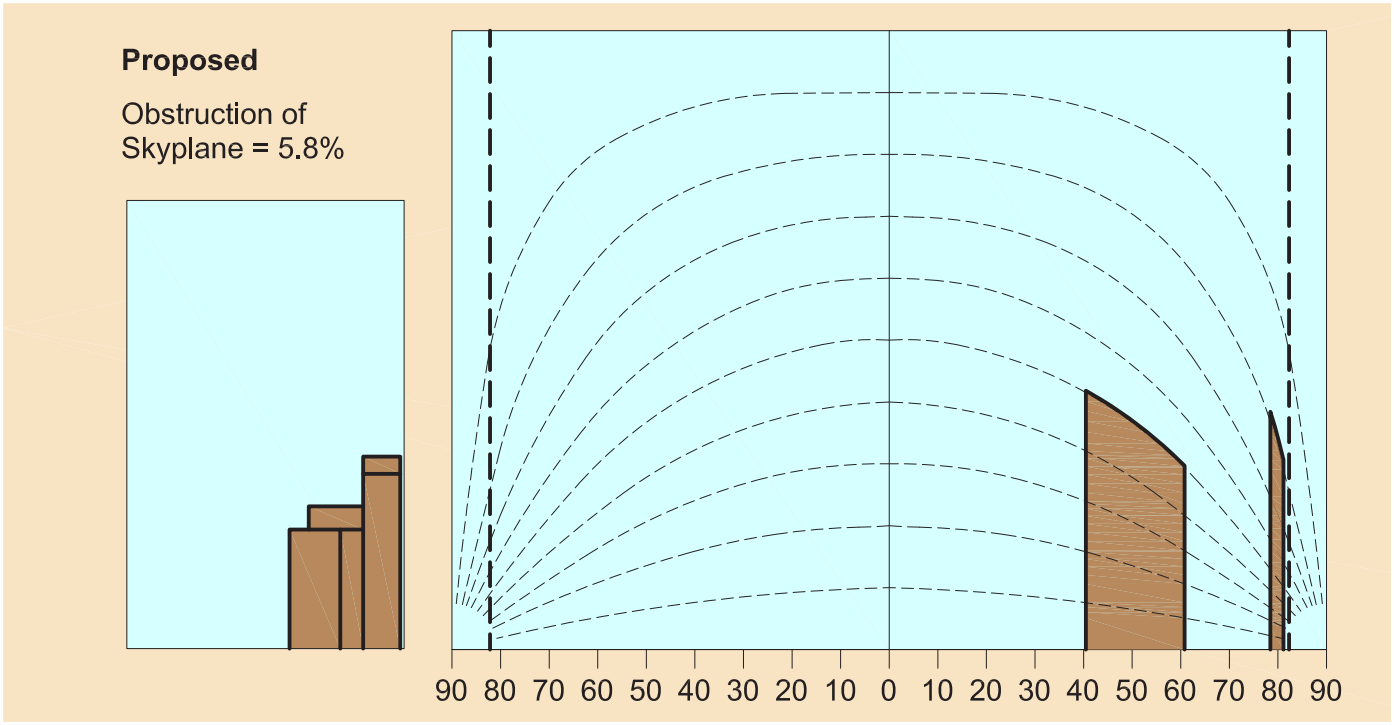




Note: BRADA software limitations and wide property line width prevent accurate display of all building facades in skyplane diagram

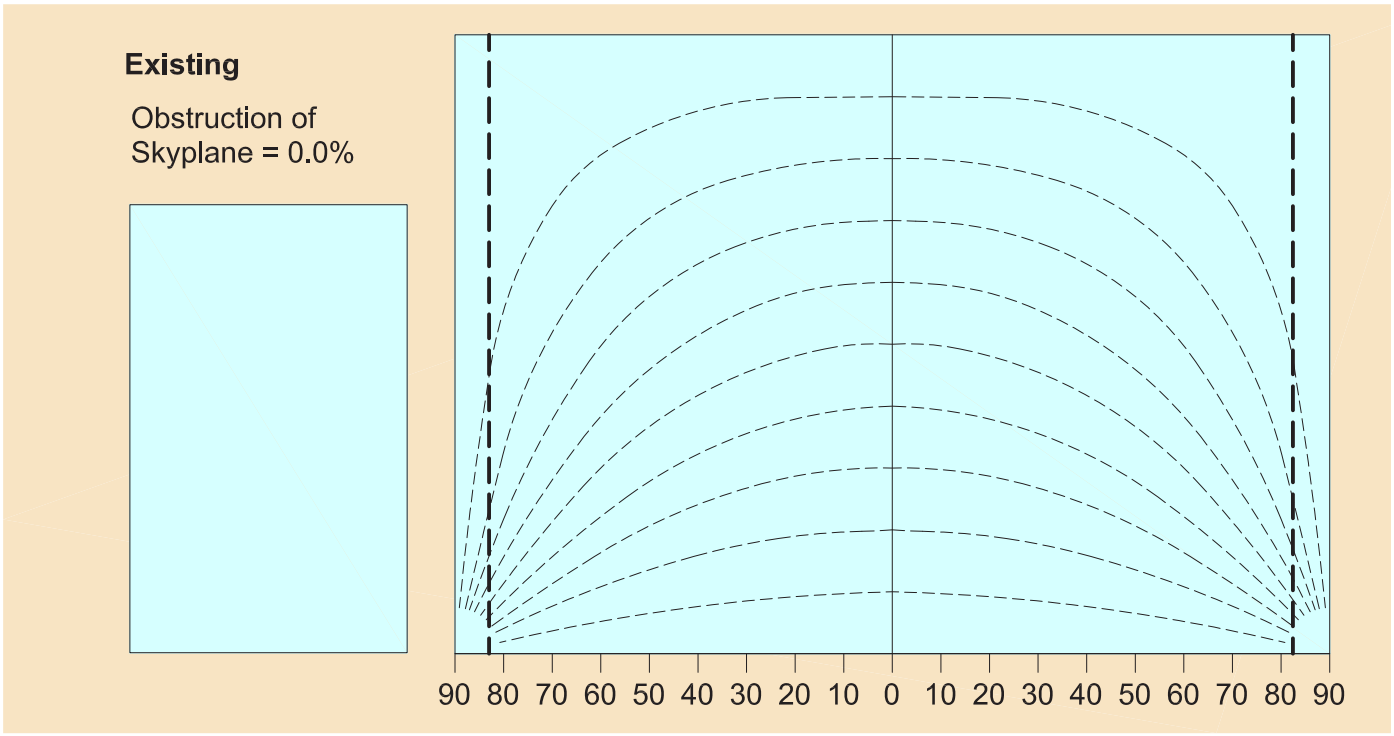
Figure 4.3-2
Daylight Analysis Viewpoint 1
Center of Columbus Avenue





Note: BRADA software limitations and wide property line width prevent accurate display of all building facades in skyplane diagram

Figure 4.3-3
Daylight Analysis Viewpoint 2
Center of Bike Path



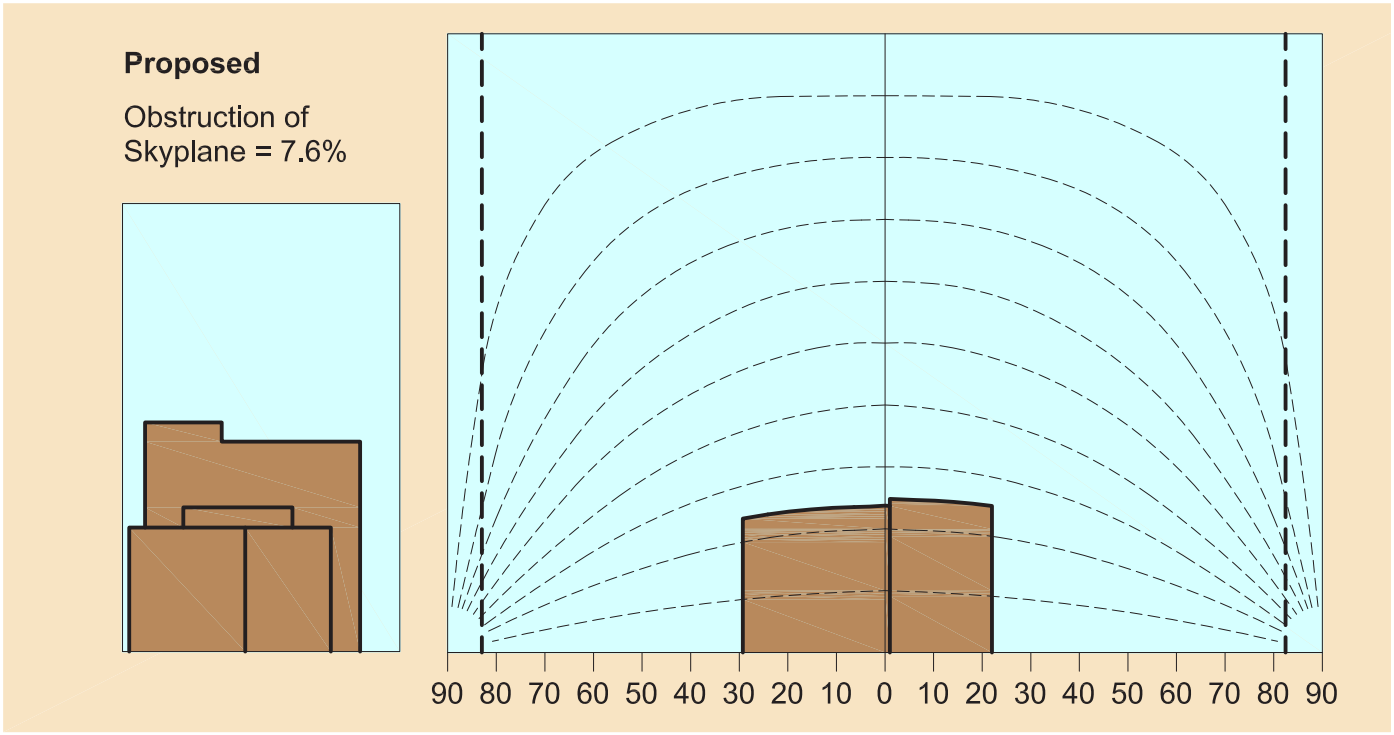
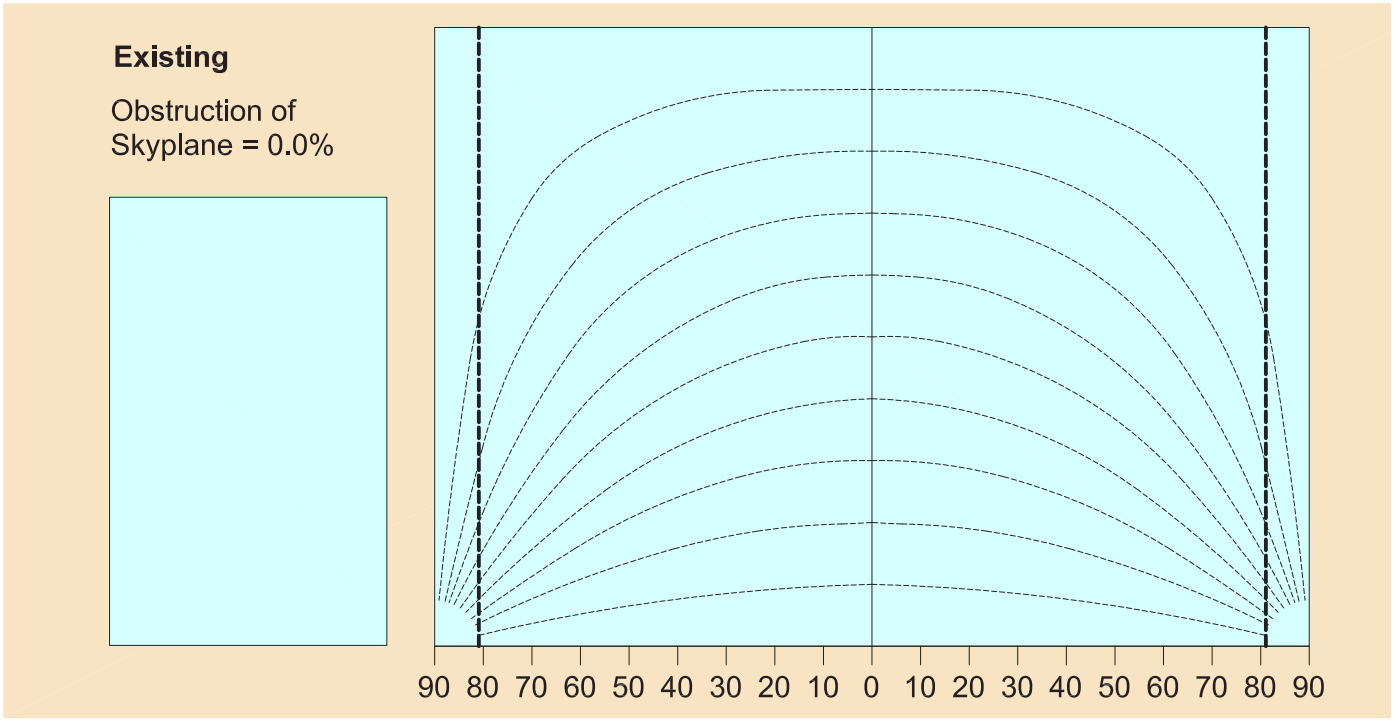


Figure 4.3-4
Daylight Analysis Viewpoint 3
Center of Ruggles Busway



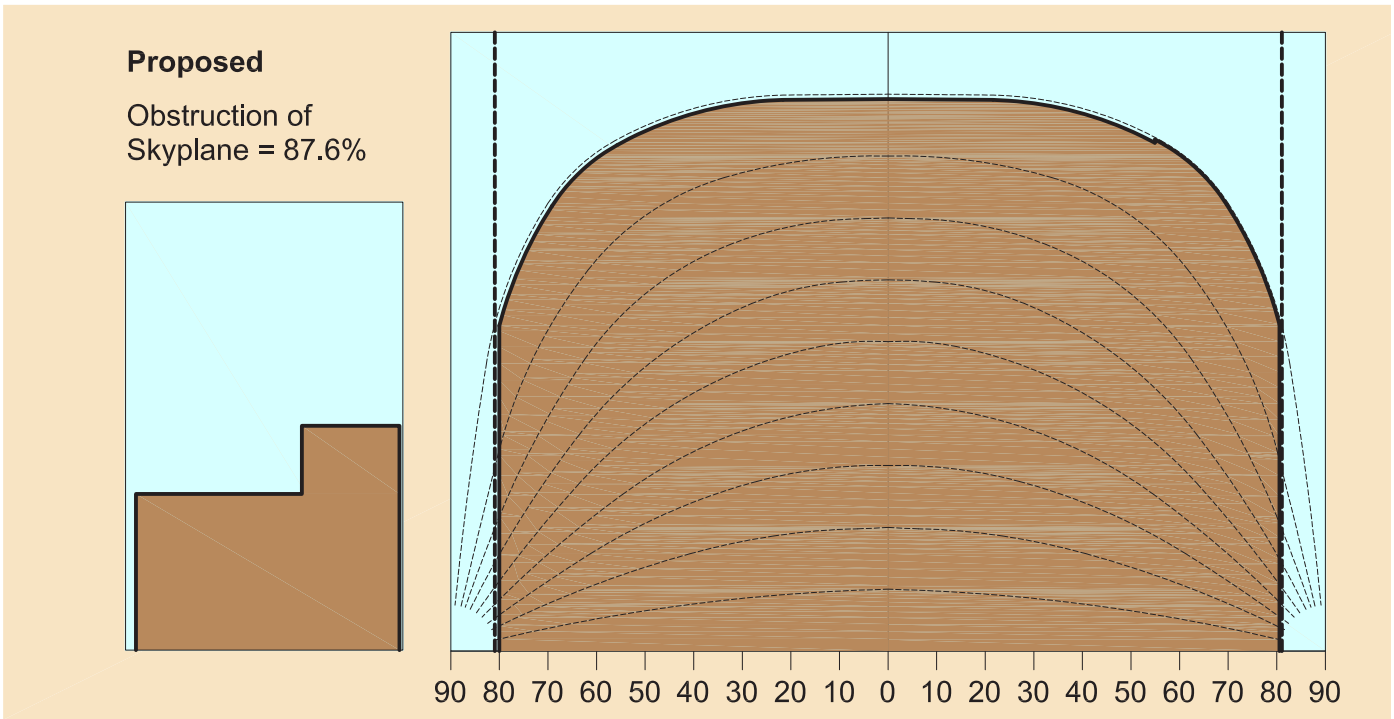
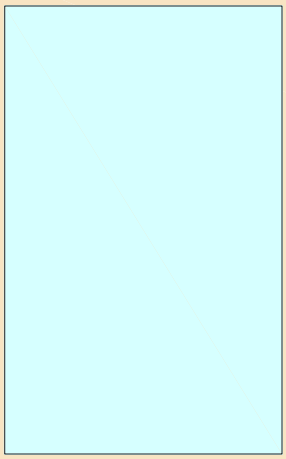
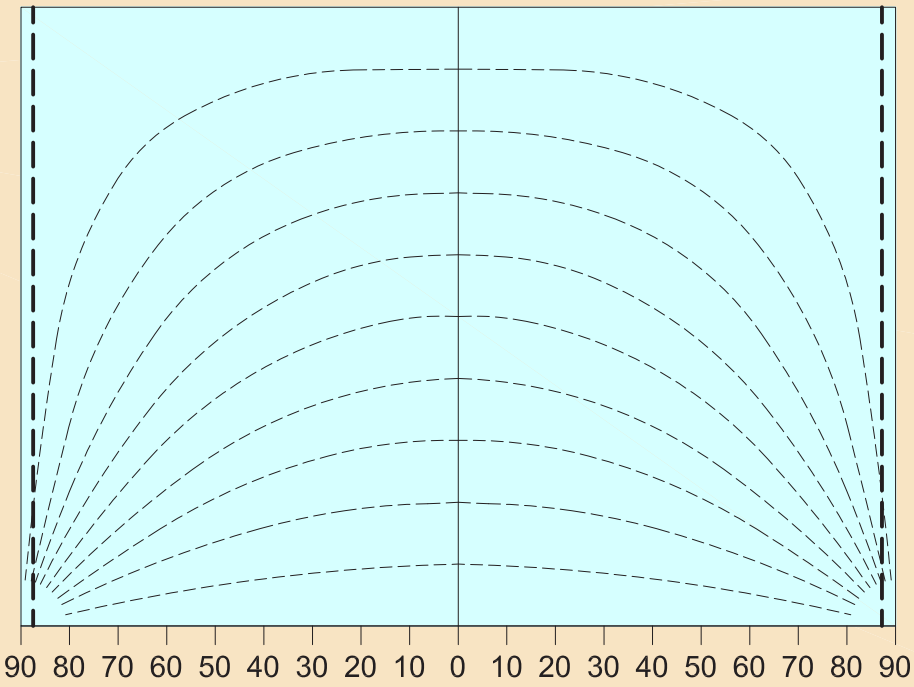


Figure 4.3-5
Daylight Analysis Viewpoint 4
Proposed Driveway

Existing

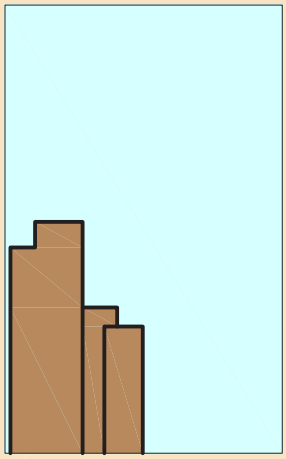
Obstruction of
Skyplane = 0.0%





Proposed

Obstruction of
Skyplane = 9.2%



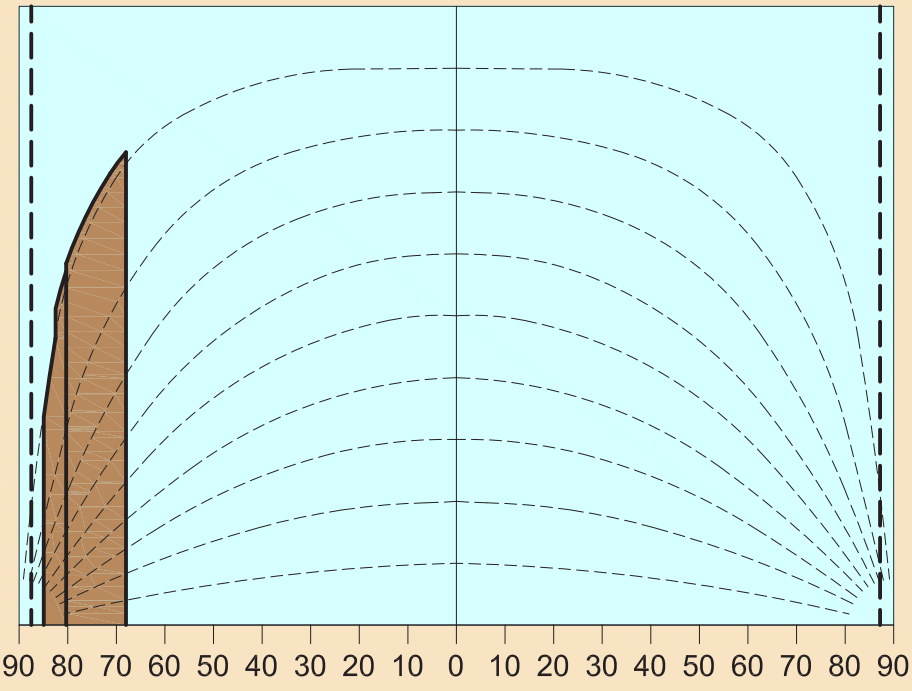


Figure 4.3-6
Daylight Analysis Viewpoint 5
Center of Proposed Pedestrian Bridge

4.4 Solar Glare Analysis

An analysis of the potential solar glare impacts is being prepared by the project team's solar glare consultant, RWDI. A number of design features have been implemented to avoid reflection issues. The building height is below 100 feet, facade materials have been selected to be low-reflectivity glass windows as opposed to highly reflective "mirror-type" glass, and exterior shading devices envelope the southern facade. For these reasons it is not anticipated that the project will significantly impact any major public way or trains within the MBTA, Commuter, and Amtrak rail corridor. The Solar Glare Analysis will be described in detail and filed as a supplemental evaluation with the BRA by July 15, 2013.

4.5 Air Quality Analysis

RWDI has completed an analysis to evaluate air quality impacts from the project's proposed exhausts at proposed and existing sensitive receptor locations. Re-entrainment of emergency generators, laboratory fume hoods, specialty hoods, and atrium smoke fumes was quantified using physical dispersion modeling. Our preliminary results are included below. **Figure 4.5-1**. Location of Exhaust Sources and Receptors, illustrates the location of the sources and receptors that were evaluated in the wind tunnel.

Other proposed and existing sources (such as the new cooling towers, or the nearby trains and vehicular traffic) were not investigated in the detailed study as the potential for re-entrainment was determined to be low based on the results of a screening-level numerical analysis.

4.5.1 Sources A1-A2 (1,000 kW Emergency Diesel Generators)

The recommended health criterion for combustion pollutants was met at all receptors evaluated with both generators operating at 100% of rated capacity, and with stacks extending 21 ft above the roof level (149.5 ft elevation). Diesel odors are expected at nearby upper level air intakes (represented by R1-R4 in **Figure 4.5-1**) with this stack design. The criterion for diesel odors could however not be met without implementing extremely tall stacks (on the order of 49 ft above the roof level (177.5 ft elevation).

RWDI's recommendation is to implement vertical uncapped stacks that extend at least 21 ft in height. Odors could be managed by strategically testing the units during periods of low building occupancy (or under favorable winds), if it is feasible to do so. Furthermore, it may be prudent to consider sizing the air handlers served by R1-R4 such that space is available for the future installation of activated carbon filters if odor concerns arise.

4.5.2 Sources B1-B2 (Manifolded Laboratory Exhausts)

The recommended health and odor based criterion for laboratory fume hoods was met at all receptors when the manifolded exhausts operate at 100% of rated flow, and with stacks extending 20 ft above the roof level (148.5 ft elevation).

The criterion was also met at all intake locations (except the stair pressurization intake represented by R6 in **Figure 4.5-1**) with stacks extending 10 ft above the roof level (138.5 ft

elevation) and operating at 50% of rated flow (turndown). It is assumed that stair pressurization intakes will be closed during normal building operations.

RWDI's recommendation is to pursue stacks at least 10 ft in height and operate as low as 50% of the design flow whenever it is feasible to do so.

4.5.3 Sources C1-C2 (Individual Specialty Hood Exhausts)

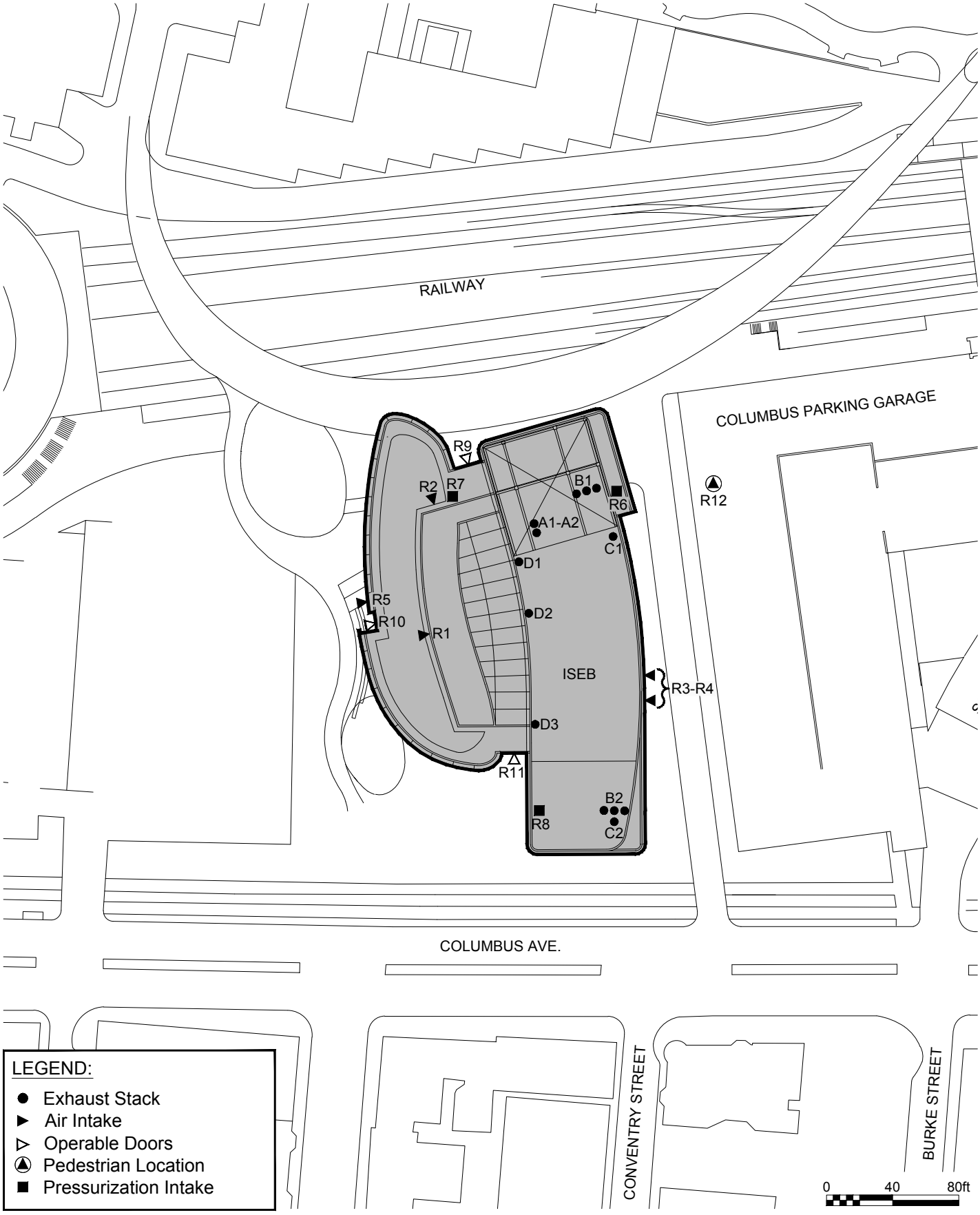
The recommended criterion for laboratory fume hoods was met at all intake locations (except the stair pressurization intake represented by R8 in **Figure 4.5-1**) when individual hood exhausts operate at 100% flow, and with stacks extending 10 feet above the roof level (138.5 feet elevation) at either stack location. A stack height of approximately 20 feet above the roof level (149.5 feet elevation) would be required to meet the criterion at R8. However, it is assumed that stair pressurization intakes will be closed during normal building operations.

RWDI's s recommendation is to pursue stacks at least 10 feet in height at either the C1 or C2 location.

4.5.4 Sources D1-D3 (Atrium Smoke Exhausts)

The recommended smoke visibility criterion was met at all receptor locations evaluated for the scenario when all smoke exhausts operate at 100% of rated flow and 3,000 fpm with vertical and uncapped stacks 6 feet above the roof level (134.5 feet elevation).

RWDI's recommendation is to pursue this design to allow for safe building egress during fire emergencies



LEGEND:

- ● Exhaust Stack
- ► Air Intake
- ▷ Operable Doors
- ⮝ Pedestrian Location
- ■ Pressurization Intake

Location of Exhaust Sources and Receptors

Project North True North

Northeastern University Interdisciolinary Science + Engineering Building - Boston, MA

Project #1301200

Drawn by: SMR	Fig: 4.5-1
Approx. Scale:	1"=80'
Date Revised:	June 10, 2013

RWDI

4.6 Noise Analysis

Acentech Inc. has performed noise studies to confirm that the operation of the completed Project will comply with the City of Boston Noise Regulations and the Massachusetts Department of Environmental Protection ("DEP") Noise Policy. The most sensitive neighbors are residences in buildings across Columbus Avenue to the southeast of the site. The other nearby receptors are occupants in Northeastern buildings, the train tracks, and a parking garage. There is a public park (Carter Playground) beyond the parking garage, but this is quite distant and with the treatments planned to meet community noise standards at the adjacent residences, the noise level reaching the park is expected to be much lower.

4.6.1 Noise Regulations

Commonwealth Noise Policy

The DEP regulates noise through 310 CMR 7.00, "Air Pollution Control." In these regulations "air contaminant" is defined to include sound and a condition of "air pollution" includes the presence of an air contaminant in such concentration and duration as to "cause a nuisance" or "unreasonably interfere with the comfortable enjoyment of life and property."

Regulation 7.10 prohibits "unnecessary emissions" of noise. The DEP DAQC Policy Statement 90-001 (February 1, 1990) interprets a violation of this noise regulation to have occurred if the noise source causes either:

1. An increase in the broadband sound pressure level of more than 10 dBA above the ambient level; or
2. A "pure tone" condition.

The ambient background level is defined as the L_{90} level as measured during equipment operating hours. A "pure tone" condition occurs when any octave band sound pressure level exceeds both of the two adjacent octave band sound pressure levels by 3 dB or more.

The DEP does not regulate noise from motor vehicles accessing a site or the equipment backup notification alarms. Therefore, the provisions described above only apply to a portion of the sources that may generate sound following construction of the Project.

Local Regulations

The City of Boston Environment Department regulates noise through the Regulations for the Control of Noise as administered by the Air Pollution Control Commission. The Project is located in an area consisting of commercial, institutional, and residential uses. The Project will have low-rise residential uses to the north, east, and south. The Project must comply with Regulation 2.2 for noise levels in Residential Zoning Districts at these residential locations**.**

Table 4.6-1 lists the maximum allowable octave band and broadband sound pressure levels for residential and business districts. Daytime is defined by the City of Boston Noise Regulations as occurring between the hours of 7:00 a.m. and 6:00 p.m. daily except Sunday. Compliance with the most restrictive nighttime residential limits will ensure compliance for other land uses with equal or higher noise limits.

Table 4.6-1: Maximum Allowable Sound Pressure Levels (dB) City Of Boston

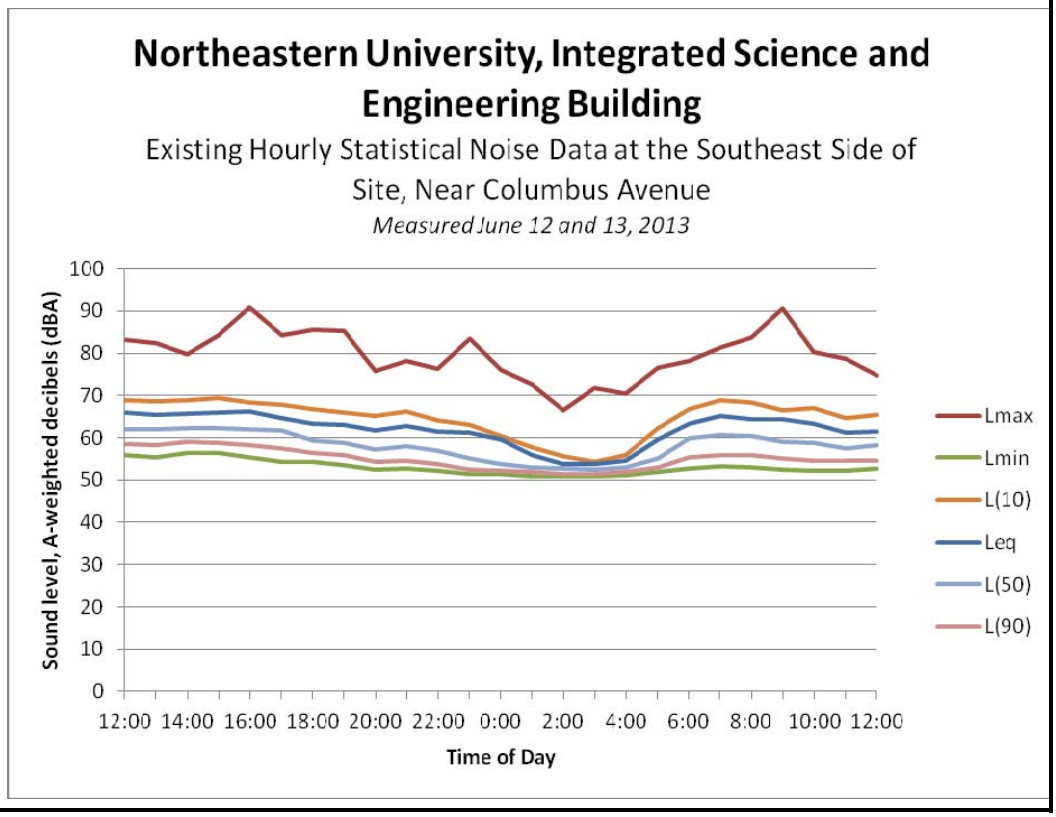
Octave Band (Hz)	Zoning District		
	Residential		Business (anytime)
	(Daytime)	(All Other Times)	
32 Hz	76	68	79
63 Hz	75	67	78
125 Hz	69	61	73
250 Hz	62	52	68
500 Hz	56	46	62
1000 Hz	50	40	56
2000 Hz	45	33	51
4000 Hz	40	28	47
8000 Hz	38	26	44
Broadband (dBA)	**60**	**50**	**65**

4.6.2 Pre-Construction Sound Level Measurements

Existing baseline sound levels were taken at the Columbus Avenue property line immediately southeast of the Proposed Project. These readings were measured during a full 24-hour period from Wednesday, June 12, 2013 through Thursday, June 13, 2013. Table 4.6-2 presents a chart from the measured data of the hourly statistical levels for several common statistical measures of environmental noise. The measurements were made with a Larsen Davis 870 environmental noise monitor. The monitor samples the noise condition about every 0.2 second and stores the data to perform statistical analyses for the hourly periods. The daytime temperatures were in the low 70s and the nighttime temperatures were in the mid 50s. Daytime winds were somewhat higher than preferred for environmental noise measurements with consistent velocities in the low teens and gusts into the middle 20s (MPH), but the environmental noise sources are generally high and it is not anticipated this will have much impact on the results. The nighttime wind conditions were more moderate with general winds on the order of 5 mph and gusts to on the order of 10 mph, which is generally suitable for environmental measurements at this most critical period of the day. A wind screen was used to avoid adverse effect of wind on the microphone. There was a little light rain during the last two hours of data collection. Of most interest in this data is the L90 sound level, which is the sound level, exceeded 90 percent of the time and is taken as the residual ambient that is the basis for the State DEP noise allowance. You can see that the quietest

measured nighttime hourly L90 level is 51 dBA during the 2:00 and 3:00 a.m. hours and this is the basis for establishing the state required limit. Based on this the noise of building systems for compliance with the State DEP requirement is 61 dBA. The most significant local sources of noise at the site are street traffic and train noise.

Table 4.6-2: Nighttime Baseline Sound Level Measurements



4.6.3 Mitigation Measures

This is to confirm plans to control exterior noise emissions from the various building mechanical systems for the planned ISEB project at Northeastern University. The Boston Noise Regulation requires that the nighttime noise level, beginning at 6:00 in the evening, be no greater than 50 dBA at the residential receiver properties. The mechanical equipment is likely still to be operating at close to peak capacity by 6:00 in the evening and the noise control treatments that are planned are for the case of all systems operating at peak duty, even though they will not be operating at this level most of the time.

The project includes cooling towers located in a roof well at the far end of the building from the critical neighbors. Planning the tower at this location helps minimize the noise that reaches the neighbors. The tower well will have solid walls in all direction except for the wall facing toward

the train track and away from the neighbors, without louvers, so that it forms an effective barrier to the neighbors. The tower well wall toward the tracks will likely have louver to air flow to the tower and we are anticipating that the louvers will either be special noise attenuating louvers or will have louver backing silencers behind them. The tower will be provided with low-noise fans and will be operated with variable speed drives to reduce noise emissions on a statistical basis. With these treatments the noise emissions from the tower will be limited to within its budget for noise emissions for the building as a whole, to be consistent with the overall noise limit. As the design develops and noise data for the specific towers to be used becomes available, we will be able to do more definitive predictions of the tower noise and determine the performance of the attenuating treatments need to be.

The generator is to be provided with a noise reduction / weatherproof housing that is specified to produce no more than 75 dBA at a distance of 50 ft from the unit. The unit will be located within the cooling tower well that is surrounded with an effective noise barrier screen and this location is on the order of 300 ft from the neighbors of concern. With this noise emission level and location, the noise this produces at the critical neighbors is expected to be on the order of 35 dBA, which is well below the most stringent nighttime noise emission limit of 50 dBA.

The main air handling units have air intakes that face toward a parking garage which is substantially away from the critical neighbors. These units are planned to have silencers in the inlets to control noise emissions consistent with the noise requirement. When more definitive noise data for the units becomes available we will make predictions of the noise reaching the critical neighboring properties and with this will select the silencers that need to be used in the units.

The exhaust air systems will be provided with sound attenuation in the exhaust stacks to be consistent with the regulation requirement. Where there are fresh air by-passes associated with the exhaust systems, these will be provided with attenuation to control exterior noise emissions. When more definitive noise data for the units becomes available we will make predictions of the noise reaching the critical neighboring properties and with this will select the silencers that need to be used in the units. Alternatively, we will establish the allowable noise emission requirement for the equipment and will check noise data from the supplier to confirm that the established limit will not be exceeded.

Ventilation fans are planned for the mechanical penthouse. These will be provided with silencers on the fresh air intakes and on the discharges of exhaust fans. When more definitive noise data for the units becomes available we will make predictions of the noise reaching the critical neighboring properties and with this will select the silencers that need to be used.

Other fans and equipment associated with the project are either quite small, or are located in shielded positions relative to the critical neighbors such that their noise is anticipated to be of no consequence.

4.6.4 Calculated Future Sound Levels

Compliance with the Boston regulation is going to require noise from the building with all equipment operating to be below 50 dBA at the critical residential receiver. To be in compliance with the state requirement the noise emission needs to be lower than 61 dBA (10 dBA over the quietest hourly L90 level). For compliance with both requirements the noise emissions must not be tonal, but with the attenuation treatments planned, noise emissions from the equipment are not expected to be perceived as being tonal.

The noise level at the critical neighbors is expected to be below 50 dBA, which is below the most stringent nighttime noise requirement. Acentech will be working with the design team to assure that the mechanical equipment and generators for the project will produce no more noise than the required State and Boston limits. Calculations will be done for the sound propagation from each significant project source to predict the sound level at the critical receivers and the noise of all the sources will be summed to determine compliance.

4.7 Solid and Hazardous Waste

4.7.1 Solid Waste

Northeastern recycles more than 255 tons of paper, 295 tons of corrugated cardboard, 71 tons of bottles and cans, and 58 tons of computers and electronics each year. Nearly 38 percent of its waste is recycled. Recycling bins are located throughout the campus to encourage members of the Northeastern community to recycle. The University even recycles many of the canvas banners that appear around campus, turning them into useful items that are given to students and alumni.

4.7.2 Hazardous Waste

Construction debris may include asphalt, or remnant buried debris (concrete, steel, etc.). The Proponent will ensure that waste removal and disposal during construction and operation will be in conformance with the City and DEP's Regulations for Solid Waste.

Previous environmental studies conducted at the site dating back to 1987 by DCPO identified chemical constituents in shallow fill soils characteristic of ranges typically encountered in urban fill. In a localized area in the southwest portion of the site, low concentrations of PAHs and petroleum hydrocarbons were encountered exceeding applicable reporting thresholds at the time. Release Tracking Number RTN- 3-3503 was assigned to the site by MA-DEP. The presence of contamination in the shallow fill soils was determined to be related to historic site usage and characteristic of urban fill soils. Groundwater sampling indicated that the chemical constituents present in the site soils had not significantly impacted groundwater quality and were below applicable reporting standards.

Subsequent investigations were undertaken by Northeastern University when they acquired the property. A Response Action Outcome Statement (RAO) was submitted by Northeastern University to DEP in July 2004 to close the site out of the MCP. The Class B-1 RAO concluded

that a condition of No Significant Risk exists at the Site under 310 CMR 40.0900, and therefore no remedial actions were necessary. It was determined that an Activity and Use Limitation (AUL) was not necessary to ensure the existence or maintenance of a level of "No Significant Risk".

Excavation for below-grade and foundation construction for the new building will generate excess soil requiring off site transport. Chemical testing of the material will be undertaken during the design of the project to define environmental quality and provide data required by receiving facilities prior to accepting the material. Material leaving the site will be legally transported in accordance with local, state and federal requirements. All work will be conducted in accordance with Massachusetts Department of Environmental Protection (MA-DEP) requirements.

There are no existing buildings on the site requiring demolition. However remnants of foundations of former structures occupying the site remain buried in place below grade. Construction debris encountered during excavation may include asphalt, wood, concrete, brick, granite and other building materials. The Proponent will ensure that waste removal and disposal during construction and operation will be in conformance with the City and DEP's Regulations for Solid Waste.

4.8 Flood Hazard Zones/Wetlands

Federal Emergency Management Agency's ("FEMA") Flood Insurance Rate Maps for the City of Boston (Community Panel 25025C0079G, Effective Date September 25, 2009) were reviewed to determine if the Project Site lies within the 100-year flood plain. The Project Site does not fall within an area of the 100-year flood, as defined by FEMA.

No Areas of Critical Environmental Concern or State Certified Vernal Pools exist within the Project Site. Likewise, the Project Site is not included on the list of either Priority Habitats for State-Listed Rare Species or the list of Estimated Habitats for Rare Wildlife.

4.9 Water Quality Resources

4.9.1 Introduction

The quality of stormwater runoff from the Project Site is expected to improve as a result of the Project. The Project will replace a portion of an existing parking lot with catch basins as the only form of stormwater quality management. When complete, the project will consist mostly of landscaped areas and the new ISEB. This will result in a reduction of impervious area. The project will comply with the BWSC and the Lower Charles River TMDL requirements for phosphorus removal. It is anticipated that the project will include stormwater BMPs such as infiltration systems, rainwater harvesting or advanced structural treatment to reduce phosphorus in the site stormwater effluent.

The stormwater management system will be designed in accordance with BWSC's design standards and the BWSC "Requirements for Site Plans." A Site Plan will be submitted for BWSC approval and a General Service Application will be completed prior to any off-site drain

work. Any drain connections that are terminated as a result of construction will be cut and capped at the main storm drain in the street in accordance with the BWSC standards. A pollution prevention plan will be prepared for use during construction including during demolition activity.

4.9.2 DEP Stormwater Management Standards

The DEP has established Stormwater Management Standards to improve water quality and control water quantity. Compliance is achieved through the implementation of Best Management Practices ("BMPs") in the stormwater management design. The Policy is administered locally pursuant to wetland protection programs under M.G.L. c. 131 § 40. Although this Project is not subject to the Conservation Commission's review, an explanation of the Policy Standards and how the Project addresses them 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: All stormwater discharge from the proposed project will be treated through structural measures. Additionally, the project will reduce overall site impervious area to further improve stormwater runoff quality. During construction, erosion control measures such as silt fence and catch basin filters will be used to ensure that there will be no uncontrolled erosion or untreated discharge into the existing storm drain system.

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

Compliance: The Project will reduce the impervious areas on-site. Additionally, the inclusion of an infiltration or rainwater harvesting system will further reduce the peak discharge rate leaving the site.

Standard #3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil types.

Compliance: The current site provides little recharge to the groundwater. The proposed infiltration system will increase groundwater recharge.

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

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

b. Structural stormwater best management practices ("BMPs") are sized to capture the required water quality volume; and

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

Compliance: The majority of the project site will consist of building roof area. There will be a small paved area serving the loading dock and some sidewalk areas. Any new associated drainage structure serving this area will be designed to meet this requirement.

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.

Compliance: The Project Site is not associated with Higher Potential Pollutant Loads.

Standard #6: Stormwater discharges to specific areas defined by the Commonwealth require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices.

Compliance: The Project is not in the vicinity of specific areas defined by the Commonwealth.

Standard #7: Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practical.

Compliance: The Project is implementing BMPs to improve stormwater management and is expected to meet or exceed the standards.

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

Compliance: Erosion and sediment controls, including silt fences and catch basin filters will be used to control construction-related impacts.

Standard #9: A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Compliance: A long-term Operation and Maintenance Plan will be developed and implemented to ensure that stormwater management systems function as designed.

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

Compliance: There will be no connections between the stormwater and wastewater management systems. The Construction Contractor will be responsible for material management, including spill prevention and control, to prevent any illicit discharges to the storm drain system.

4.10 Geotechnical and Groundwater Impacts

4.10.1 Subsurface Soil Characteristics

Numerous previous exploration (test pits and test borings) have been completed at, or in the immediate vicinity of, the project site for previously planned development of the site and for adjacent developments. These test borings were conducted to depths ranging from 4 to 175 feet below existing ground surface and have been reviewed and evaluated to define subsurface conditions. In general, the subsurface soil profile at the site consists of about 5 to 10.5 feet of fill

over a thick layer of marine sand and clay, underlain by glacial till and bedrock at depths exceeding 100 ft. **Table 4.9-1** summarizes the subsurface conditions encountered in the borings completed to date, and anticipated at the project site, in order of increasing depth below the ground surface.

Table 4.9-1: Subsurface Soil Profile

Generalized Description	Depth[(1)] to Top of Layer (feet)	Thickness of Layer (feet)
Fill	–	5.0 to 10.5
Marine Sand	4.5 to 10	2.0 to 13.0
Marine Clay	8.0 to 29.0	91.5 to 152.0
Glacial Deposits	101 to 172	0.5 to 7.0
Bedrock	120 to 159	–

Exterior site grades within the Columbus Avenue parking lot range from El. 18 along Columbus Avenue to El. 15 near the along the MBTA right-of-way in Boston City Base (BCB) datum.

4.10.2 Groundwater Conditions

Groundwater monitoring wells have been installed and monitored at or in the vicinity of the Project site. Groundwater level measurements between 1999 and 2013 ranged from about 10 to 14 feet below the ground surface, corresponding to approximately Elevation 1.7 to 9.7 Boston City Base Datum ("BCB"). Groundwater levels tend to decrease in elevation from Columbus Avenue towards the MBTA right-of-way.

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, leakage into or out of sewers, storm drains, transit and water lines nearby to the site. Seasonal fluctuations can also be expected.

4.10.3 Groundwater Conservation Overlay District (GCOD)

The ISEB project itself is not located within the Groundwater Conservation Overlay District. Specific requirements of Article 32 are not applicable except for the footbridge structure over the rails, which touches down in an area north of the tracks within the GCOD. Project design criteria will be established to not negatively impact, by potentially lowering, area groundwater levels.

It is currently planned to install a storm water collection and infiltration system as designed by the Proponent's civil engineer and installed on the property.

4.10.4 Foundation Construction Methodology

It is planned to support the building on shallow conventional footing foundations. Deep foundations, such as driven piles, are not expected to be used for the building. The new building basement is planned to be at about 14 to 15 feet below site grades. The basement will be below site groundwater level and will be constructed with a groundwater cut off and fully waterproofed basement foundations walls. No permanent dewatering is planned.

Excavation for building basement construction will be conducted within a temporary earth support system designed and constructed as a groundwater seepage and cut-off wall to maintain groundwater levels outside of the excavation. Temporary construction dewatering of the excavation will be conducted within an impervious earth support system to drain the site soils prior to excavation. The dewatering 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 NPDES and BWSC by the Proponent.

Considerations for Off-Site Impacts and Mitigation Measures

Based on the design and construction methodology developed for the project, potential impacts to abutting facilities, from foundation construction, such as ground movement, vibration, and groundwater lowering are anticipated to be negligible.

4.11 Construction Impacts Analysis

4.11.1 Introduction

The following section describes impacts that may result from the Project's construction and steps that will be taken to avoid or minimize environmental and transportation-related construction impacts. The Proponent has engaged Suffolk Construction Co., Inc. (Suffolk) to be the Construction Manager for the Interdisciplinary Science and Engineering Building (ISEB).

Suffolk Construction as the Construction Manager will be responsible for developing a construction phasing and staging plan and for coordinating construction activities with the appropriate regulatory agencies and abutting properties. The Project's geotechnical consultant will provide consulting services associated with foundation design recommendations, prepare geotechnical specifications, and review the Construction Contractor's proposed procedures.

4.11.2 Construction Management Plan

A Construction Management Plan (CMP) will be submitted to the Boston Transportation Department (BTD) for approval prior to the start of construction. It will include specific mitigation measures and staging/logistics plans to minimize impacts to the City of Boston and the abutters to the project site. The Construction Manager will be bound by the approved CMP.

The project will be constructed on a portion of Northeastern's approximately 3.5 acre open parking (Columbus) lot at 795 Columbus Avenue. Sensitivity to abutters and pedestrians is a critical element of the project that will be paramount to the development of the CMP.

4.11.3 Overview of Construction Activities

Construction Activity Schedule

Construction mobilization is scheduled to commence in December 2013 with occupancy planned by Northeastern for July 2016 (32 months). Typical construction hours will be from 7:00 am to 6:00 pm, Monday through Friday. See **Table 4.10-1** for proposed construction schedule for the major construction activities.

Table 4.10-1. Proposed ISEB Construction Schedule

Construction Activity	Anticipated Duration
Mobilization, Site Prep & Steel Sheeting	December 2013 - March 2014
Foundations	April 2014 - May 2014
Building Structure (structural steel)	June 2014 - October 2014
Pedestrian Bridge Construction (over the railroad tracks)	August 2014 - June 2015
MEP Rough-In, Façade, Roofing	September 2014 - April 2015
Interior Construction	March 2015 - February 2016
Commissioning, Inspections & Occupancy	January 2016 - July 2016

4.11.4 Perimeter Protection/Public Safety

A police detail will direct traffic entering and exiting the construction site at all times during construction and will facilitate pedestrian and bicycle traffic on Columbus Avenue. Appropriate signage will be installed to assist pedestrians and cyclists. There will be no need for overhead sidewalk protection due to the 20-foot easement "buffer" zone between the existing Columbus Avenue sidewalk and the existing parking lot construction area

All construction staging will be within the construction site on Northeastern property. Construction deliveries will be planned and managed to facilitate a direct flow into and out of the Northeastern property/construction site without staging on Columbus Avenue or other neighborhood streets.

Fencing will be installed to isolate the construction area from pedestrian and vehicular traffic. Construction procedures will be designed to satisfy all OSHA safety standards for specific site construction activities.

Each ISEB subcontractor will implement and manage its own Safety and Health Program for the project. All employees of subcontractors and suppliers, regardless of tier, will be trained relative to the complete safety and health requirements for the project.

Adequate site lighting will be provided at all times.

4.11.5 Emergency Vehicle Access

The project logistics and staging plan will ensure that emergency vehicle access to and from the construction site will be maintained at all times.

4.11.6 Material Handling/Construction Waste

Suffolk will take an active role relative to the processing and recycling of construction waste. Arrangements will be made for the segregation, reprocessing, reuse and recycling of materials. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per DEP's Regulations for Solid Waste Facilities, 310 CMR 16.00.

4.11.7 Construction Traffic Impacts

Construction Trip Generation

No personal vehicles will be allowed to park at the project construction site or in the adjacent neighborhood. Jobsite personnel will be encouraged to utilize public transportation. Due to the proximity and connections to T line branches and several MBTA bus routes, a substantial level of public transportation use is anticipated for the construction workers. Lock-up facilities for work tools will be provided to make public transportation more convenient and desirable. Terms and conditions related to workforce parking and public transportation use will be written into each subcontract agreement.

Truck Routes and Volumes

Truck traffic is expected to remain fairly consistent throughout the project. The defined truck routes to the site will be included in the Traffic Management Plan prepared by Howard/Stein-Hudson Associates, Inc.

On-Street Parking

The ISEB Project is not intended to impact existing parking on Columbus Avenue, with the exception of parking spaces eliminated by the new curb cut for the planned roadway adjacent to the Columbus Avenue Parking Garage.

4.11.8 Construction Air Quality

Suffolk will implement strictly enforced mitigation measures to reduce emission of fugitive dust and minimize impacts on the location environment.

4.11.9 Construction Noise

The ISEB Project will be committed to mitigating noise impacts caused by the project and the construction process will be planned in accordance with the site constraints.

4.11.10 Rodent Control

Consistent with the Massachusetts State Sanitary Code, Chapter 11, 105 CMR 410.550 and the State Building Code, Section 108.6 - Policy Number 87-4 (City of Boston), the ISEB Project will develop a rodent control program prior to the start of construction. The program will include the performance of extermination and control procedures on a bi-weekly basis and the placement of tamper resistant bait boxes around the perimeter of the site.

4.11.11 Geotechnical Impacts and Monitoring

Excavation will be required for the construction of foundations and the basement level. Support of excavation utilizing steel sheeting will be provided for water cutoff. Based on the design and construction methodology developed for the Project, the potential impacts to abutting facilities, from foundation construction, such as ground movement, vibration and groundwater lowering are anticipated to be negligible. Although impacts to adjacent structures are anticipated to be negligible, Northeastern may elect to perform a geotechnical monitoring program for documentation purposes.

4.11.12 Utilities

Due to the current site use as a surface parking lot, there will be minimal utility cutting and capping required. All new utility installation will be performed in accordance with the project contract documents.

4.11.13 Groundwater Impacts

The construction of the project is not expected to impact area groundwater levels based on the use of steel sheeting for groundwater cutoff. The water table is approximately 10 ft below the existing parking lot surface. Dewatering will be required inside the excavation to remove any rainwater or surface water runoff during excavation. Any groundwater removed from the excavation will be discharged to a catch basin under NPDES and BWSC discharge permits obtained for the Project. Dewatering effluent will be managed in accordance with permit requirements.

4.11.14 Emergency Contacts

A 24-hour emergency contact list will be distributed to all parties involved in the project. Additionally, appropriate signage (BTD-CWS) will be displayed at gate locations.

5.0 TRANSPORTATION COMPONENT

5.1 Introduction

This chapter provides an overview of the existing transportation conditions on the Northeastern University Campus and the transportation impacts of the first institutional project to be constructed on a portion of the Columbus Lot – the Interdisciplinary Science and Engineering Building (ISEB). The proposed project's trip generation by mode is reviewed, and an analysis of future No-Build and Build conditions over a five-year period. In developing this study, the team has consulted with the Boston Transportation Department and the Boston Redevelopment Authority, and reviewed community and stakeholder comments. The sections that follow reflect attention to the issues and concerns raised by the community and City agencies.

5.1.1 Project Overview

The Project Site is located on an approximately 150,000 square foot (SF) portion of Northeastern's approximately 3.5-acre surface parking area (Columbus Lot) located at 795 Columbus Avenue between the Renaissance Park Parking Garage and the Columbus Parking Garage, south of the MBTA tracks within its Campus land area (Project Site). The Project involves the development of a new building of approximately 197,000 (FAR) gross square feet (GSF) consisting of research and office space for new faculty, interdisciplinary research clusters/collaborative space, specialized teaching labs, classrooms, and student space (see **Figure 5-1**). This new building will displace approximately 317 existing surface parking spaces and incorporate new pedestrian connections over the Southwest Corridor tracks, linking the north and south campuses. No new parking would be provided with the project and vehicles that currently park in the displaced parking spaces would in the future park in the Columbus Garage, which has adequate available supply to accommodate this demand.

All service and loading activity for the ISEB would be provided within a dedicated loading area located behind the building. The existing curb cut serving the Columbus Lot, opposite Cunard Street, would be relocated approximately 200 feet east of its current location to serve as the Project's two-way service driveway. Access to the remaining approximately 165 surface parking spaces in the Columbus Lot would then be provided through widening the existing, but currently inactive, driveway located opposite St. Cyprians Place. In order to accommodate the construction of the ISEB building, the Columbus Garage exit driveway located at the northwest corner of the parking structure would be closed and the entrance driveway on Columbus Avenue would be converted to a two-way driveway.

The Project proposes to provide a dedicated bicycle storage room and shower facilities within the building for students and employees as well as outdoor bicycle racks for visitors and guests.

Figure 5-1.
Site Access and Circulation Plan

5.1.2 Existing Transportation System

Northeastern University and its neighbors depend upon a transportation system comprised of several different modes. Each of these modes is briefly described below and analyzed in more detail later in this chapter.

- Public Transportation. Use of public transportation is critical to the sustainability of the Northeastern University Campus. Northeastern has excellent access to a wide variety of public transportation alternatives, including 15 Massachusetts Bay Transportation Authority (MBTA) bus routes; rapid transit on the Orange Line at the Ruggles and Massachusetts Avenue stations; Green Line rapid transit at the Northeastern University, Museum of Fine Arts, and Symphony stops; Commute Rail service at Ruggles Station; and MASCO shuttle bus service. Transit is the primary mode of access to the campus for faculty and staff, accounting for more than 53% of these commuter trips. Public transportation is also an important mode of access for students and visitors and provides important connections to the surrounding commercial and cultural attractions, particularly for students living on the campus. The accessibility of the University by public transit is a function of the service quality provided and the travel demands placed upon this system. Public transit service is described in more detail below.
- Bicycles and Walking. Bicycling and walking is the primary mode of access to the University for students and also serves as a key access mode for faculty, staff, and visitors. Bicycling and walking is also an important way for people to move around the campus throughout the day. The accessibility of the campus by these modes is a function of bicycle accommodation on city streets and bikeways, bicycle storage on-campus, location of pedestrian walkways leading to and through the campus, and adequate, safe crossings of the streets and tracks surrounding the campus.
- Automobile. The automobile continues to serve as an important access for the University; however, it is notable that drive-alone commuter trips to and from campus have declined substantially between 1998 and 2012 – from 27% to just 11% for students and from 49% to only 28% for employees. The accessibility of the University by automobile is a function of the roadway system serving the institution, the traffic demands placed upon this system and the parking provided at the University. The automobile mode serves employees and students who drive alone or carpool. Several arterial streets including Huntington Avenue, Columbus Avenue, Tremont Street, Ruggles Street, Massachusetts Avenue, the Fenway, and Melnea Cass Boulevard provide the primary automobile access to the University. These roadways and the key intersections within the study area are detailed below.

5.1.3 Study Area

Transportation operating conditions have been evaluated at the following 11 intersections, primarily located along Columbus Avenue, which provides direct vehicular access to the proposed project:

Signalized Intersections:

1. Ruggles Street/MBTA Exit
2. Ruggles Street/Tremont Street/Whittier Street
3. Tremont Street/Melnea Cass Boulevard
4. Melnea Cass Boulevard/Columbus Avenue/MBTA Ruggles Station Driveway
5. Massachusetts Avenue/Columbus Avenue

Unsignalized Intersections:

6. Ruggles Street/MBTA Entrance
7. Columbus Avenue/St. Cyprians Place
8. Columbus Avenue/Cunard Street/Columbus Lot Driveway
9. Columbus Avenue/Coventry Street
10. Columbus Avenue/Burke Street/Columbus Garage Driveway
11. Columbus Avenue/Camden Street

Detailed descriptions of study area intersections are included below.

5.2 Existing Transportation Conditions

5.2.1 Roadway Conditions

The roadway system surrounding Northeastern serves two principal functions. First, the major arterial streets are part of Boston's citywide roadway network and carry a significant volume of traffic through the area. Second, the roadways provide access to the University, nearby institutions and surrounding neighborhoods. This section describes campus access, roadway circulation, traffic volumes, and traffic operations.

The University is bordered by four major arterial roadways and divided by two. The arterial roadways bordering the campus are Massachusetts Avenue, Tremont Street, Ruggles Street, and the Fenway. The portion of the campus north of the Orange Line is divided by Huntington Avenue between Massachusetts Avenue and Ruggles Street and by Forsyth Street between the Orange Line and the Fenway. The portion of the campus south of the Orange Line is divided by Columbus Avenue between Massachusetts Avenue and Melnea Cass Boulevard. Melnea Cass Boulevard, which ends at Tremont Street, provides access between the campus and I-93. Vehicular access between the two parts of the campus north and south of the Orange Line is

provided only via Massachusetts Avenue or Ruggles Street. Columbus Avenue provides access to the majority of campus parking. A detailed description of the major roadways providing access to the south campus is provided below.

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; sidewalks range in width from approximately eight to 28 feet. 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.

Massachusetts Avenue, an urban principal arterial, runs north–south from Cambridge and the northwestern part of the Boston metropolitan area to Columbia Road on the southeast. Within the study area, Massachusetts Avenue provides two travel lanes in each direction. Massachusetts Avenue is separated by a raised median southeast of St. Botolph Street. On-street parking is provided on both sides of the roadway near St. Botolph Street. Bus stops are located regularly on both sides of Massachusetts Avenue. Sidewalks on each side range in width from seven to 23 feet. Massachusetts Avenue carries about 40,000 vehicles total in both directions on an average weekday.

Melnea Cass Boulevard extends from Massachusetts Avenue to Columbus Avenue in the South End. Across Massachusetts Avenue, Melnea Cass Boulevard connects to the "Massachusetts Avenue Connector," which provides access to I-93 northbound and southbound and I-90 eastbound and westbound. Classified as an urban principal arterial street under control of the City of Boston, Melnea Cass Boulevard provides two lanes in each direction with additional left turn lanes at Tremont Street, Washington Street, Harrison Avenue, Hampden Street, and Massachusetts Avenue. All of the intersections along the street are signalized, except the intersection with Northampton Street (Crosstown Drive). While varying in width from block to block, the roadway is generally 55-feet wide, with 7-foot sidewalks on either side. On-street parking is prohibited along the entire roadway. Massachusetts Bay Transportation Authority (MBTA) Buses 8, 19, 43, and 47 run along Melnea Cass Boulevard within the study area. On the north side of the street, a 40-foot wide easement has been dedicated to accommodate a future dedicated bus lane. Today this easement is planted with a pedestrian/bicycle path, the South Bay Harbor Trail (SBHT), running through it. Sidewalks provided along both sides of the roadway in the vicinity of the study area are approximately seven feet wide.

Ruggles Street, an urban minor arterial, runs north-south from Huntington Avenue to Tremont Street. Ruggles Street generally consists of two lanes northbound and one lane southbound, with no on-street parking provided on either side of the roadway. There are three MBTA bus stops located along Ruggles Street. Sidewalks provided along both sides of the roadway range in width from eight to 12 feet.

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, providing two lanes in each direction with additional turning lanes at Massachusetts Avenue, Columbus Avenue, and Ruggles Street. Near Massachusetts Avenue, on-street parking is provided along both sides of the roadway; however, there is no parking near any other intersection in the vicinity of the study area. Sidewalks provided along both sides of the street range in width from nine to 24 feet.

The network of minor roadways that serve the project area and adjacent major arterials are generally one-way. St. Cyprians Place, Cunard Street, Coventry Street and Burke Street are alternating one-way roadways between Columbus Avenue and Tremont Street, with sidewalks along both sides. Whittier Street is a one-way northbound roadway serving Ruggles Street with sidewalks and parking permitted along both sides.

5.2.2 Intersection Conditions

Signalized Intersections

Ruggles Street/MBTA Exit is a signalized intersection with three approaches. The Ruggles Station MBTA Exit Driveway is a one-way westbound approach consisting of one 41-foot wide multi-use lane with no pavement markings. The road is private and may be used by MBTA vehicles only. It was observed in the field that buses typically form two lanes, including a left-turn lane and a right-turn lane. The Ruggles Street northbound approach consists of one 13-foot through lane and a five-foot bicycle lane. The Ruggles Street southbound approach consists of two approximately 11-foot through lanes and a six-foot bicycle lane.

There is a restricted MBTA one-way entrance driveway located 140 feet north of the intersection on the east side of Ruggles Street. The Southwest Corridor runs east to west across the intersection and consists of dual paths, for bicycles and pedestrians. Concrete sidewalks are provided along both sides of Ruggles Street and the north side of the station driveway in the vicinity of the intersection. Sidewalks are approximately 10-feet wide. Crosswalks, handicap-accessible ramps, and count-down pedestrian signal indications are provided on all Ruggles Street approaches. The narrow handicap ramps do not adequately accommodate the high volume of cyclists traveling through the Southwest Corridor. The Ruggles Station Driveway provides a crosswalk but there is no handicap-accessible ramp on the south side. Crosswalk pavement markings are in good to poor condition, varying from approximately 10 to 15-feet wide.

Ruggles Street/Tremont Street/Whittier Street is a four-way signalized intersection. The Tremont Street eastbound approach consists of an 11-foot left-turn lane with 190 feet of storage and three approximately 11-foot though lanes. The Tremont Street westbound approach consists of two approximately 11-foot through lanes and one 12-foot right-turn lane; the pavement markings along this approach are very faded. At the far side of intersection, along Tremont Street westbound, there is an 11-foot marked parking lane reserved for the Boston Police Department. The Tremont Street eastbound and westbound travel lanes are separated by an approximately 4 to 12-foot wide raised median. The one-way northbound Whittier Street approach consists of one

approximately 30-feet wide multi-use lane with no visible pavement markings. It was observed in the field that motorists typically form two lanes, including a left-turn lane and a through/right-turn lane. Unrestricted on-street parking is provided along the west side of Whittier Street just south of the intersection approach that narrows the travel lane to approximately 22 feet. The Ruggles Street southbound approach consists of two approximately 11-12-foot wide left-turn lanes with approximately 270 feet of storage, a five-foot bicycle lane, and a 12-foot right-turn lane.

Concrete sidewalks are provided along both sides of Ruggles Street, Tremont Street, and Whittier Street in the vicinity of the intersection. Sidewalks range in width from seven feet to 24 feet. Crosswalks, handicap accessible ramps, and count-down pedestrian signal indications are provided across all of the intersection approaches. Pavement markings are in fair to poor condition with some crosswalk markings badly worn.

Tremont Street/Melnea Cass Boulevard is a four-way signalized intersection. The Tremont Street eastbound approach consists of a 12-foot shared left-turn/through lane, a nine-foot through lane, and a 24-foot channelized right-turn lane. The Tremont Street eastbound right-turn lane is channelized into a 16-foot long and 10-foot wide raised island. At the far side of the intersection, along Tremont Street eastbound, there is a MBTA bus stop. The Tremont Street westbound approach consists of an 11-foot shared left-turn/through lane and an 18-foot shared through/right-turn lane. The Melnea Cass Boulevard northbound approach consists of a 14-foot left turn lane with 325 feet of storage, a 12-foot shared left-turn/through lane with 350 feet of storage, and a 17-foot shared through/right-turn lane. The Melnea Cass Boulevard southbound approach consists of an 11-foot shared left-turn/through lane and a 13-foot shared through/right-turn lane. The Melnea Cass Boulevard northbound and southbound travel lanes are separated by an approximately six to seven foot wide raised median in the vicinity of the intersection. Right-turn-on-red is not permitted for the Tremont Street eastbound approach or the Melnea Cass Boulevard northbound approach.

Parking is prohibited along all legs of the intersection. Concrete sidewalks ranging from six to 12 feet in width are provided along both sides of Tremont Street and Melnea Cass Boulevard. Crosswalks, handicap-accessible ramps, and count-down pedestrian signal indications are located at all approaches of the intersection, although field observations noted that the pedestrian signal was out of order. Crosswalks are approximately 10 to 11-feet wide. Pavement markings are in good condition.

Melnea Cass Boulevard/Columbus Avenue/ MBTA Ruggles Station Driveway is a four-way signalized intersection. The Columbus Avenue eastbound approach consists of one 23-foot shared left-turn/through/right-turn lane. The Columbus Avenue westbound approach consists of an 11-foot shared left-turn/through/right-turn lane, a four-foot bicycle lane, and an eight-foot parking lane. As the Columbus Avenue westbound through movement does not permit through traffic, trucks and through traffic must turn left. A seven-foot wide cobblestone median separates the eastbound and westbound Columbus Avenue travel lanes east of the intersection. Parking along Columbus Avenue in the vicinity of the intersection is resident permit or two-hour parking from 8:00 a.m. until 6:00 p.m. from Monday through Friday. The Melnea Cass Boulevard

northbound approach consists of a 14-foot shared left-turn/through lane, and a 14-foot shared through/right-turn lane. The northbound and southbound travel lanes are separated by an approximately seven-foot wide raised median in the vicinity of the intersection. The MBTA Ruggles Station Driveway southbound approach consists of one 16-foot shared left-turn/through/right-turn lane. The driveway's use is restricted to MBTA vehicles.

Sidewalks ranging in width from seven to 28 feet are provided along both sides of Columbus Avenue, Melnea Cass Boulevard, and the MBTA Driveway. The Southwest Corridor's dual paths, for bicycles and pedestrians, run along the north side Columbus Avenue. Crosswalks, handicap-accessible ramps, and pedestrian signal indications are provided across all approaches of the intersection. Crosswalks are approximately 10-feet wide. The pavement markings on Columbus Avenue west of the intersection are very faded. Field observations noted heavy ponding at the wheel chair ramp located on the northeast corner of the intersection.

Massachusetts Avenue/Columbus Avenue is a four-way signalized intersection. The Columbus Avenue eastbound approach consists of a 10-foot left-turn lane with approximately 175 feet of storage, an 11-foot through lane, and a 10-foot shared through/right-turn lane. The Columbus Avenue westbound approach consists of an 11-foot left-turn lane with 160 feet of storage, a 12-foot shared through/right-turn lane, and a 12-foot unrestricted parking lane. The eastbound and westbound travel lanes are separated by a four-foot wide cobblestone median. The Massachusetts Avenue northbound approach consists of a 10-foot left-turn lane with 100 feet of storage, an 11-foot through lane, an 11-foot shared through/right turn-lane, and a six-foot bicycle lane. The Massachusetts Avenue northbound and southbound travel lanes are separated by a median that narrows to four-feet wide in the vicinity of the intersection. The Massachusetts Avenue southbound approach consists of a 10-foot left-turn lane with 100 feet of storage, an 11-foot through lane, an 11-foot shared through/right-turn lane, and a four-foot bicycle lane. The northbound and southbound approaches also accommodate MBTA bus stops. A Shell Gas Station located on the southwest corner of the intersection has driveways on both Columbus Avenue and Massachusetts Avenue.

Brick sidewalks ranging from eight to 13 feet in width are provided along both sides of Columbus Avenue and Massachusetts Avenue in the vicinity of the intersection. Crosswalks, handicap-accessible ramps, and count-down pedestrian signal indications are provided at all of the intersection approaches. Crosswalks, approximately 14-feet wide, are composed of both pavement markings and decorative, in-ground paint.

Unsignalized Intersections:

Ruggles Street/MBTA Entrance is an unsignalized intersection with two approaches. The MBTA entrance, located at the eastern leg of the intersection, is approximately 25-feet wide and one-way eastbound. The Ruggles Street northbound approach consists of one 11-foot shared through/right-turn lane. The Ruggles Street southbound approach consists of a 12-foot shared left-turn/through lane and a 14-foot through lane. Both Ruggles Street approaches are free movements. There are five-foot bike lanes along both sides.

Parking is prohibited along all intersection approaches. Sidewalks are provided along both sides of Ruggles Street. In the vicinity of the intersection, sidewalks are provided along both sides of the MBTA Entrance; however the sidewalk along the north side ends approximately 50 feet from the intersection. Sidewalks range in width from approximately nine to 10 feet. Ten foot wide crosswalks are provided across the Ruggles Street northbound approach and the MBTA Entrance. The crosswalks across Ruggles Street and the MBTA Entrance are approximately 55 and 40 feet long, respectively. Handicapped-ramps are provided at both corners on the east side of the intersection but not on the west side of Ruggles Street.

Columbus Avenue/St. Cyprians Place is an unsignalized intersection with three approaches. The Columbus Avenue eastbound approach consists of a 10-foot shared left-turn/through/right-turn lane, a four-foot bicycle lane, and an eight-foot parking lane. The westbound approach consists of an 11-foot shared left-turn/through/right-turn lane, a four-foot bicycle lane, and an eight-foot parking lane. The eastbound and westbound travel lanes are separated by a 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. St. Cyprians Place northbound approach consists of a 12-foot through lane with approximately eight foot parking on both sides of the roadway. Parking along St. Cyprians Place in the vicinity of the intersection is all marked residential and 2 hour restricted. The southbound approach is currently closed to vehicular access to the Columbus Parking lot.

Concrete and brick sidewalks ranging from eight to 34 feet are provided along both side of Columbus Avenue and five feet along St. Cyprians Place. Ten-foot wide crosswalks and handicap-accessible ramps are provided across the east and south legs of the intersection approaches. Pavement markings along St. Cyprians Place are in poor condition, along with both crosswalks. There are no stop-controls or pedestrian signal indications.

Columbus Avenue/Cunard Street/Columbus Lot 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 an eight-foot parking lane. The westbound approach consists of an 11-foot shared left-turn/through/right-turn lane, a five-foot bicycle lane, and an eight-foot parking lane. The eastbound and westbound travel lanes are separated by a seven-foot cobblestone median. The Columbus Lot Driveway southbound approach consists of one approximately 20-foot shared left-turn/through/right-turn lane. South of the intersection, Cunard Street runs one-way southbound with resident parking along the west side and two-hour parking along the east side. Sidewalks are provided along both sides of both streets. Parking along Columbus Avenue is resident or two-hour parking from 8:00 a.m. until 6:00 p.m. Monday through Friday.

Sidewalks range in width from approximately eight feet to 13 feet. On the north side of Columbus Avenue the Southwest Corridor dual paths, for bicycles and pedestrians and approximately 26 feet wide, run parallel to the street. Crosswalks and handicap-accessible ramps are provided across the Columbus Avenue westbound approach, Cunard Street, and the Columbus Lot Driveway.

Columbus Avenue/Coventry Street is an unsignalized intersection with three approaches. The Columbus Avenue eastbound approach consists of a 10-foot shared left-turn/through/right-turn lane, a four-foot bicycle lane, and an eight-foot parking lane. The westbound approach consists of an 11-foot shared left-turn/through/right-turn lane, a four-foot bicycle lane, and an eight-foot parking lane. The eastbound and westbound travel lanes are separated by a 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 consists of a 12-foot through lane with approximately eight foot parking lanes on both sides of the roadway. 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.

Concrete and brick sidewalks ranging from eight to 34 feet are provided along both sides of Columbus Avenue, with five-foot sidewalks along Coventry Street. Ten-foot wide crosswalks and handicap-accessible ramps are provided across the east and south legs of the intersection approaches. Pavement markings along Coventry Street and both crosswalks are in poor condition. There are no stop-controls or pedestrian signal indications.

Columbus Avenue/Burke Street/Columbus Garage Driveway is an unsignalized intersection with three approaches. The Columbus Avenue eastbound approach consists of an 11-foot shared left-turn/through/right-turn lane, a four-foot bicycle lane, and an eight-foot parking lane. The Columbus Avenue westbound approach consists of a 10-foot shared left-turn/through/right-turn lane, a five-foot bicycle lane, and a seven-foot parking lane. The Columbus Garage southbound driveway is a 20 foot wide entrance only. 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 Southwest Corridor eight-foot multi-use path runs along the north side of Columbus Avenue. The Columbus Avenue eastbound and westbound travel lanes are separated by a seven-foot cobblestone median in the vicinity of the intersection.

Brick and concrete sidewalks ranging in width from five to 19 feet are provided on both sides of Columbus Avenue and Burke Street. There are 10 to 11-foot wide crosswalks and handicap-accessible ramps across Burke Street and the Columbus Avenue eastbound approach. There is unmarked, unrestricted parking along the west side of Burke Street.

Columbus Avenue/Camden Street is a four-way unsignalized intersection. The Columbus Avenue eastbound approach consists of a 10-foot shared left-turn/through/right-turn lane, a four-foot bicycle lane, and an eight-foot parking lane. The westbound approach consists of an 11-foot shared left-turn/through/right-turn lane, a four-foot bicycle lane, and an eight-foot parking lane. The eastbound and westbound travel lanes are separated by a 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 Camden Street northbound approach is stop-controlled, consisting of one 13-foot shared left-turn/through/right-turn lane with an adjacent parking lane. The southbound approach consists of one 15-foot shared

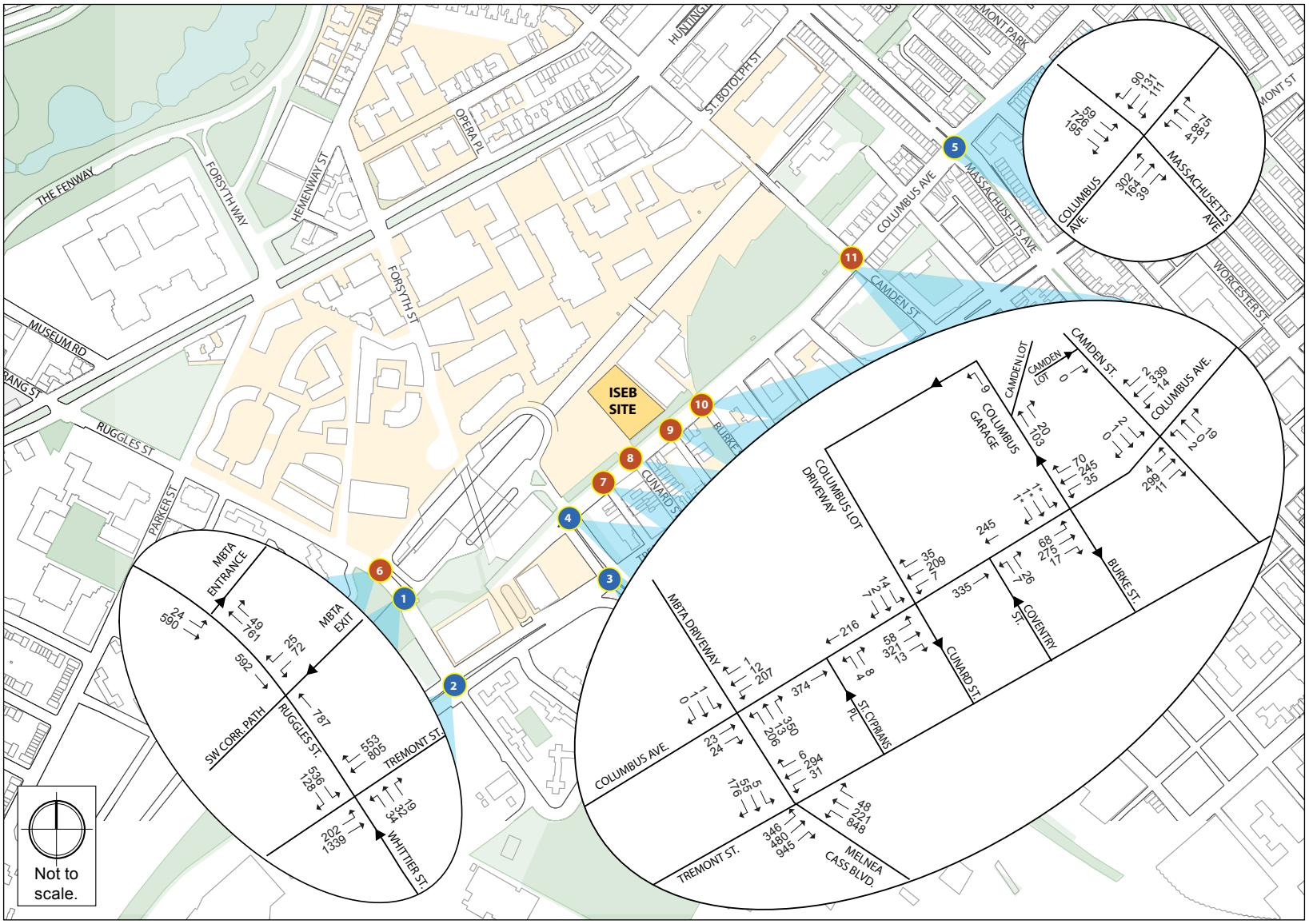
left-turn/through/right-turn lane with an adjacent parking lane. Parking along Camden Street in the vicinity of the intersection is all unmarked and unrestricted.

There are slight sidewalk bulb-outs on all Camden Street approaches. Concrete and brick sidewalks ranging from eight to 34 feet are provided along both side of Columbus Avenue and Camden Street. Ten-foot wide crosswalks and handicap-accessible ramps are provided across all of the intersection approaches. Pavement markings along Camden Street are in poor condition.

5.2.3 Traffic Volume Data

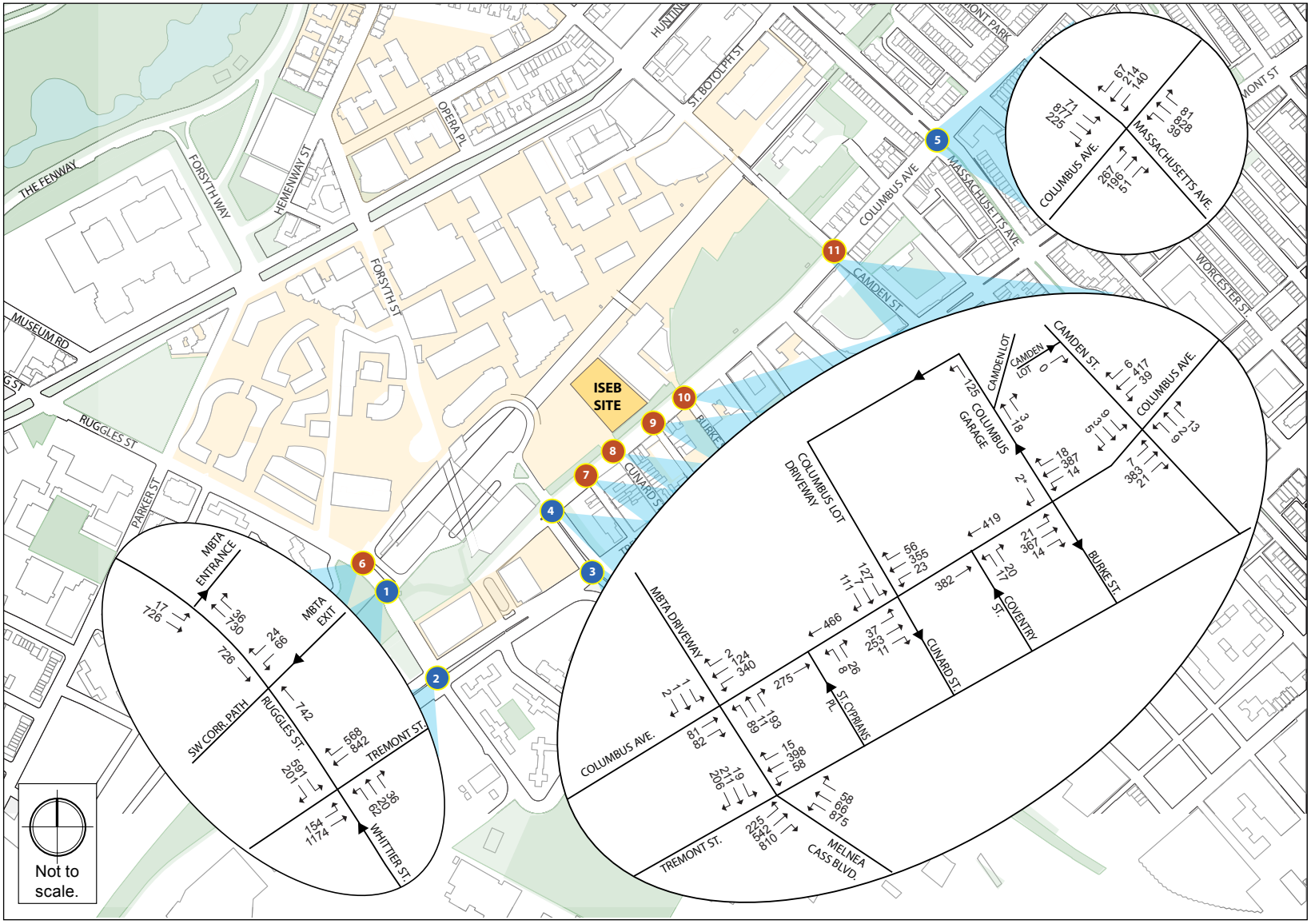
Peak period intersection counts were collected between September and October, 2012, except the Columbus Avenue intersections with St. Cyprians Place, Coventry Street, and Burke Street/Columbus Garage Driveway, which were conducted between April and May, 2013. Most of the traffic volumes during 2012 and 2013 were collected while all surrounding institutions were in session and the Boston Red Sox were hosting a game, thus represent "peak" conditions in the area. The 2012 and 2013 data were supplemented with 2011 data obtained from the traffic counts performed for the Melnea Cass Boulevard Redesign Project performed on September 21, 2011. In each of these data collection efforts, the peak period vehicle turning movement, bicycle, and pedestrian volumes were collected on a weekday from 7:00 to 9:00 a.m. and from 4:00 to 6:00 p.m. Traffic volumes were then balanced to remove any discrepancies between data collection time frames and to provide a conservative estimate.

Based on the vehicle counts, the weekday morning and evening peak hours were identified as 7:45 to 8:45 a.m. and 4:30 to 5:30 p.m., respectively. The a.m. and p.m. peak period counts are summarized in **Figure 5-2** and **Figure 5-3.**



* Prohibited Movement

Figure 5-2.
Existing Conditions (2013) Traffic Volumes, a.m. Peak Hour (7:45–8:45 a.m.)



* Prohibited Movement

Figure 5-3.
Existing Conditions (2013) Traffic Volumes, p.m. Peak Hour (4:30-5:30 p.m.)

5.2.4 Existing Traffic Operations

Traffic operations under existing conditions were analyzed at all study area intersections. Trafficware's Synchro 6 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). Signal timing and phasing used in this analysis were obtained from BTD and through field observations conducted by HSH.

LOS designations, derived from the HCM, are based on average delay per vehicle for all vehicles entering an intersection. **Table 5-1** displays the intersection level of service criteria. LOS A indicates the most favorable condition, with minimum traffic delay, while LOS F represents the worst (unacceptable) condition, with significant traffic delay. LOS D or better is typically considered acceptable in an urban area. However, LOS E or F is often typical for a stop controlled minor street that intersects a major roadway.

Table 5-1: Intersection Level of Service Criteria

LOS	Signalized Intersection	Unsignalized Intersections
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Source: *Highway Capacity Manual*, Transportation Research Board, 2000.

To evaluate existing intersection operations, the study team calibrated the level of service analysis based on field observations of actual queues and delays. Uncalibrated, the analysis can show exaggerated queues and delays.

The complete Existing, No-Build and Build Conditions a.m. and p.m. intersection LOS, delay, v/c ratio, and 95th percentile queue length analysis results are included in the Appendix along with the detailed Synchro reports. Existing traffic operations are summarized in **Table 5-2** and **Table 5-3.**

Table 5-2: Existing Conditions (2013) Capacity Analysis Summary, a.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (feet)
Signalized Intersections				
1. RugglesStreet/MBTA Exit	**B**	**15.8**	-	-
MBTA Exit WB left	D	41.1	0.54	72
MBTA Exit WB right	B	12.5	0.19	17
RugglesStreet NB thru	C	20.2	0.77	m#1354
RugglesStreet SB thru	A	6.9	0.31	123
2. RugglesStreet/Tremont Street/ Whittier Street	**D**	**36.9**	-	-
Tremont Street EB left	F	>80.0	0.87	#300
Tremont Street EB thru	B	16.8	0.51	353
Tremont Street WB thru	D	37.7	0.68	#536
Tremont Street WB right	C	21.2	0.71	570
Whittier Street NB left	E	68.6	0.37	65
Whittier Street NB thru/right	E	55.6	0.49	80
Ruggles Street SB left	E	79.3	0.91	255
Ruggles Street SB right	A	6.6	0.23	49
3. Tremont Street/Melnea Cass Boulevard	**E**	**72.6**	-	-
Tremont Street EB left/thru | thru	E	77.1	>1.00	#510
Tremont Street EB right	A	4.0	0.76	0
Tremont Street WB left/thru | thru/right	C	31.0	0.56	173
Melnea Cass Boulevard NB left	F	>80.0	>1.00	#641
Melnea Cass Boulevard NB left/thru | thru/right	F	>80.0	>1.00	#432
Melnea Cass Boulevard SB left/thru	C	30.4	0.37	m91
Melnea Cass Boulevard SB right	B	19.7	0.62	m152

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (feet)
4. Melnea Cass Blvd./Columbus Ave./MBTA Ruggles Station Dr.	**B**	**18.2**	-	-
Columbus Avenue EB left/thru | thru/right	C	27.1	0.24	24
Columbus Avenue WB left/thru/right	C	23.4	0.40	m#253
Melnea Cass Boulevard NB left/thru	D	37.1	0.83	m104
Melnea Cass Boulevard NB right	A	1.5	0.34	m8
MBTA Ruggles Station Driveway SB left/thru/right	C	21.5	0.01	5
5. Massachusetts Avenue/ Columbus Avenue	**D**	**36.5**	-	-
Columbus Avenue EB left	F	>80.0	>1.00	m#353
Columbus Avenue EB thru | thru/right	C	29.5	0.34	m86
Columbus Avenue WB left	C	29.6	0.49	90
Columbus Avenue WB thru/right	E	71.1	0.91	#272
Massachusetts Avenue NB left	B	15.8	0.30	m22
Massachusetts Avenue NB thru | thru/right	C	20.7	0.77	192
Massachusetts Avenue SB left	C	20.2	0.52	m19
Massachusetts Avenue SB thru | thru/right	B	11.3	0.76	145
Unsignalized Intersections				
6. Ruggles Street/ MBTA Entrance				
Ruggles Street NB thru/right	A	0.0	0.51	0
Ruggles Street SB left/thru | thru	A	4.7	0.27	14
7. Columbus Avenue/St. Cyprians Place				
Columbus Avenue EB thru	A	0.0	0.22	0
Columbus Avenue WB right	A	0.0	0.15	0
St. Cyprians Place NB left/right	B	11.4	0.03	3
8. Columbus Avenue/Cunard Street/Columbus Lot Dr.				
Columbus Avenue EB left/thru/right	A	2.0	0.07	6
Columbus Avenue WB left/thru/right	A	0.5	0.01	1
Columbus Lot Driveway SB left/thru/right	D	30.5	0.27	26
9. Columbus Avenue/Coventry Street				
Columbus Avenue EB thru	A	0.0	0.14	0
Columbus Avenue WB thru	A	0.0	0.22	0
Coventry Street NB left/right	B	12.1	0.10	8

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (feet)
10. Columbus Ave./Burke Street/Columbus Garage Dr.				
Columbus Avenue EB left/thru/right	A	2.6	0.09	7
Columbus Avenue WB left/thru/right	A	1.4	0.05	4
11. Columbus Avenue/Camden Street				
Columbus Avenue EB left/thru/right	A	0.2	0.01	1
Columbus Avenue WB left/thru/right	A	1.0	0.03	2
Camden Street NB left/thru/right	B	14.2	0.08	7
Camden Street SB left/thru/right	C	23.1	0.04	3

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

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

Grey shading indicates LOS operates below LOS D.

Table 5-3: Existing Conditions (2013) Capacity Analysis Summary, p.m. Peak Hour				
Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (feet)
Signalized Intersections				
1. Ruggles Street/MBTA Exit	**B**	**14.2**	-	-
MBTA Exit WB left	D	42.4	0.57	64
MBTA Exit WB right	B	12.2	0.20	14
Ruggles Street NB thru	B	17.5	0.67	m#1110
Ruggles Street SB thru	A	8.0	0.38	190
2. Ruggles Street/Tremont Street/ Whittier Street	**E**	**61.9**	-	-
Tremont Street EB left	F	>80.0	0.86	#248
Tremont Street EB thru	C	20.2	0.49	335
Tremont Street WB thru	F	>80.0	0.69	#514
Tremont Street WB right	C	23.1	0.66	481
Whittier Street NB left	F	>80.0	0.69	96
Whittier Street NB thru/right	D	54.9	0.56	82
Ruggles Street SB left	E	65.2	0.88	330
Ruggles Street SB right	A	4.4	0.36	50
3. Tremont Street/Melnea Cass Boulevard	**E**	**78.6**	-	-
Tremont Street EB left/thru | thru	F	>80.0	>1.00	#478
Tremont Street EB right	A	2.4	0.65	0
Tremont Street WB left/thru | thru/right	F	>80.0	>1.00	#305
Melnea Cass Boulevard NB left	F	>80.0	>1.00	#613
Melnea Cass Boulevard NB left/thru | thru/right	D	46.1	>1.00	#283
Melnea Cass Boulevard SB left/thru	E	59.1	0.91	m#279
Melnea Cass Boulevard SB right	A	6.9	0.54	m31
4. Melnea Cass Boulevard/Columbus Avenue/MBTA Ruggles Station Driveway	**C**	**22.5**	-	-
Columbus Avenue EB left/thru | thru/right	C	28.1	0.55	62
Columbus Avenue WB left/thru/right	C	23.3	0.65	m#502
Melnea Cass Boulevard NB left/thru	D	48.6	0.88	m61
Melnea Cass Boulevard NB right	A	0.8	0.21	m0
MBTA Ruggles Station Driveway SB left/thru/right	C	26.2	0.03	7

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (feet)
5. Massachusetts Avenue/ Columbus Avenue	**D**	**41.5**	-	-
Columbus Avenue EB left	F	>80.0	>1.00	#343
Columbus Avenue EB thru | thru/right	C	33.3	0.40	110
Columbus Avenue WB left	D	37.6	0.62	120
Columbus Avenue WB thru/right	E	69.1	0.91	#327
Massachusetts Avenue NB left	B	14.4	0.32	m14
Massachusetts Avenue NB thru | thru/right	B	12.7	0.71	139
Massachusetts Avenue SB left	B	17.2	0.51	m19
Massachusetts Avenue SB thru | thru/right	B	14.5	0.85	#484
Unsignalized Intersections				
6. Ruggles Street/ MBTA Entrance				
Ruggles Street NB thru/right	A	0.0	0.49	0
Ruggles Street SB left/thru | thru	A	2.7	0.30	9
7. Columbus Avenue/St. Cyprians Place				
Columbus Avenue EB thru	A	0.0	0.20	0
Columbus Avenue WB thru	A	0.0	0.32	0
St. Cyprians Place NB left/right	B	12.3	0.08	6
8. Columbus Ave./Cunard St./Columbus Lot Dr.				
Columbus Avenue EB left/thru/right	A	1.5	0.04	3
Columbus Avenue WB left/thru/right	A	0.7	0.02	2
Columbus Lot Driveway SB left/thru/right	F	>50.0	>1.00	283
9. Columbus Avenue/Coventry Street				
Columbus Avenue EB thru	A	0.0	0.26	0
Columbus Avenue WB thru	A	0.0	0.32	0
Coventry Street NB left/right	C	17.0	0.17	15
10. Columbus Avenue/Burke Street/Columbus Garage Driveway				
Columbus Avenue EB left/thru/right	A	1.0	0.03	3
Columbus Avenue WB left/thru/right	A	0.6	0.02	2
11. Columbus Avenue/Camden Street				
Columbus Avenue EB left/thru/right	A	0.3	0.01	1
Columbus Avenue WB left/thru/right	A	1.3	0.05	4
Camden Street NB left/thru/right	C	20.0	0.10	8
Camden Street SB left/thru/right	C	21.4	0.08	6

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

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

Grey shading indicates LOS operates below LOS D.

In the a.m. peak hour under Existing Conditions, all signalized intersections operate at LOS D or better, with the exception of Tremont Street/Melnea Cass Boulevard which operates at an overall LOS E. For unsignalized locations, all intersection movements operate at a LOS D or better.

In the p.m. peak hour, however, two signalized intersections operate at an overall LOS E: Ruggles Street/Tremont Street/Whittier Street; and Tremont Street/Melnea Cass Boulevard.

For unsignalized locations, all intersections movements operating at a LOS D or better, with the exception of Columbus Avenue/Cunard Street/Columbus Lot Driveway where the southbound left/through/right approach operates at a LOS F; however this level of operation is typical for a stop controlled minor approach that intersect a major arterial roadway.

5.2.5 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 south and Orange Line service at Massachusetts Avenue Station to the east. Ruggles is a major transportation center housing rapid transit, bus and commuter rail service. The public transportation system serving the area around Northeastern University is shown in **Figure 5-4** 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 five minutes Monday through Friday and every ten 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. 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.

The most recent MBTA published passenger count data available for the Orange Line service, compiled by the Central Transportation Planning Staff (CTPS), is available in the MBTA's *Ridership and Service Statistics,* 13th Edition, 2010 (the "Blue Book"). The data (primarily from 2009) indicate that the Orange Line serves approximately 141,000 passengers per day.

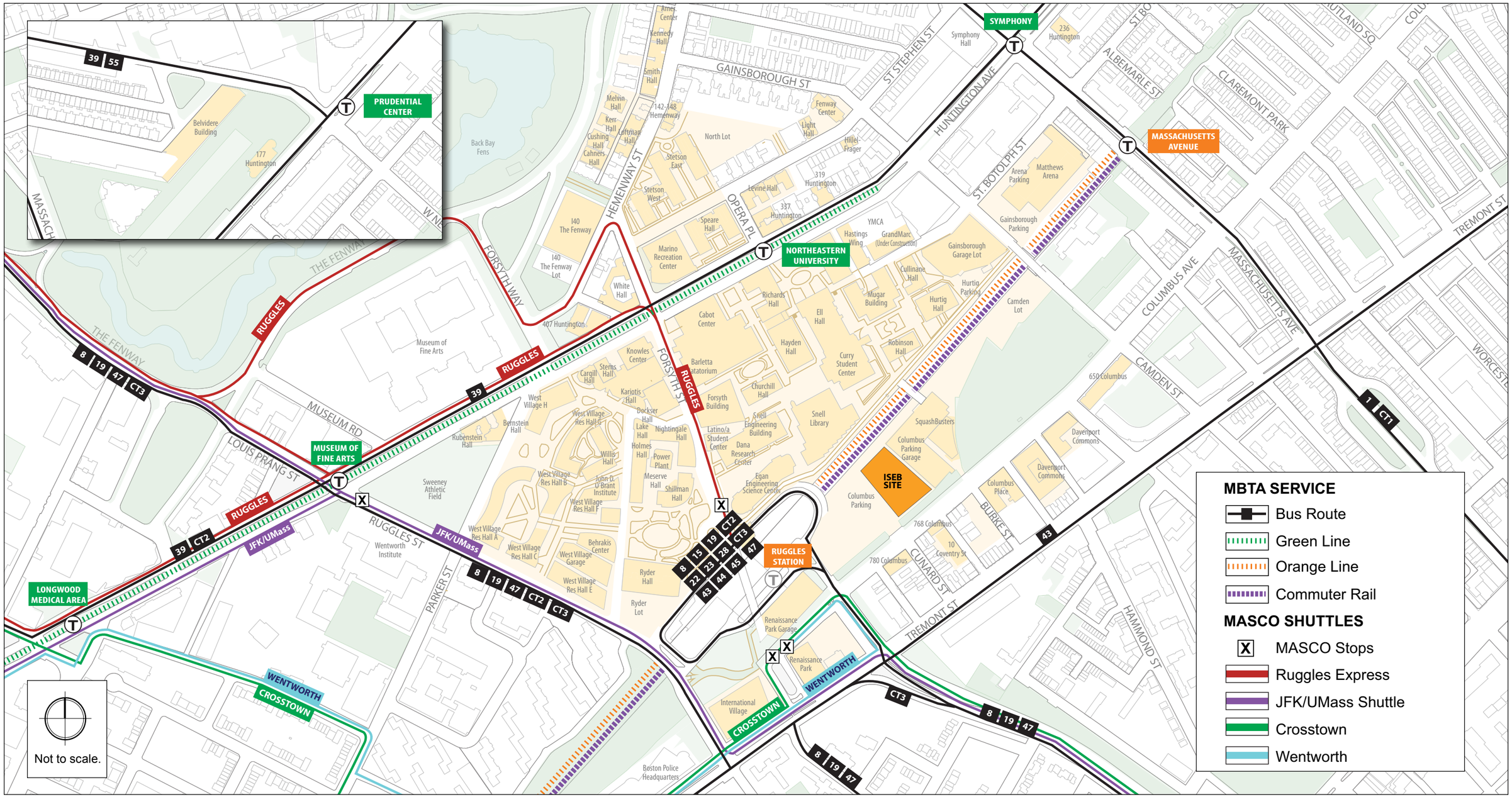


Figure 5-4.
Public Transportation

MBTA Green Line

The MBTA Green Line E Branch provides trolley service between Heath and Lechmere stations. The E Branch operates on five-minute headways in the morning and afternoon peak periods and on eight to ten minute headways during off-peak periods. Convenient to the campus are three inbound and outbound MBTA Green Line E Branch stops on Huntington Avenue: Symphony, Northeastern, and Museum of Fine Arts.

The 2010 MBTA Blue Book data indicate that the Green Line E Branch serves approximately 19,000 passengers per day. In the campus area, the Green Line station boardings were among of the highest along the E Branch, with Longwood Medical station having the most boardings (approximately 3,800 per day).

Green and Orange Line service characteristics and boardings are summarized in **Table 5-4.**

Table 5-4: Rapid Transit Service

Line/Station	Weekday Peak Headway (minutes)	Weekday Station Entries
Green		
Museum of Fine Arte	5	1,676
Northeastern University	5	3,007
Symphony	5	1,993
Orange		
Ruggles	4/5	8,378
Massachusetts Avenue	4/5	5,248

MBTA Ridership and Service Statistics, Blue Book 13th Edition 2010.

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
- #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-minute headways in the morning and afternoon peak periods and on 13-minute headways during off-peak periods. At Ruggles Station, passengers can access 18 MBTA bus routes, three MASCO shuttle bus routes and the commuter rail.

Also convenient to the campus is the frequently used #1 route (Harvard/Holyoke Gate to Dudley Sta. via Massachusetts Avenue). Bus routes with peak period headways and 2009 ridership are shown in **Table 5-5.**

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 11,000 riders each day over ten different routes by using a fleet of 41 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. Four types of shuttle services are available: Commuter Shuttles, The M2 Cambridge Shuttle, MASCO's Park-and-Ride Shuttle Program and Inter-office Shuttles. Of these, four services go near the Northeastern campus:

Table 5-5: MBTA Bus Services within the Study Area			
Bus Route	Weekday Period	Headway[1] (minutes)	Weekday Total Boarding[2]
1	Morning Peak Evening Peak	8-10 8-10	12,325
8	Morning Peak Evening Peak	14 25	3,217
15	Morning Peak Evening Peak	6 9	6,951
19	Morning Peak Evening Peak	14 14	3,376
22	Morning Peak Evening Peak	7-8 10	7,047
23	Morning Peak Evening Peak	5-6 8	11,142
28	Morning Peak Evening Peak	10 10	10,607
39	Morning Peak Evening Peak	6 10	14,405
43	Morning Peak Evening Peak	12-13 12	2,217
44	Morning Peak Evening Peak	12-13 12	3,791
45	Morning Peak Evening Peak	10 12-14	3,600
47	Morning Peak Evening Peak	8-10 20	4,341
CT1	Morning Peak Evening Peak	20 20	2,014
CT2	Morning Peak Evening Peak	20 25	1,253
CT3	Morning Peak Evening Peak	20 25	1,086

1 www.mbta.com

2 MBTA Ridership and Service Statistics, Blue Book 13th Edition 2010

- The Ruggles Express provides service between the Ruggles MBTA station and the LMA. The cost is absorbed by MASCO member institutions and riders are not charged a fee. The shuttle consists of a five bus fleet and takes approximately 13 minutes to complete a roundtrip back to Ruggles Station. This shuttle runs in the a.m. from 5:30 a.m. until 10:00 a.m. with peak headways of under five minutes between 6:30 a.m. and 9:30 a.m. and in the p.m. from 2:30 p.m. until 8:45 p.m. with peak headways of under five minutes between 4:00 p.m. and 6:00 p.m. The Northeastern community has access to this service for trips to the LMA.

The remaining three area services do not really serve Northeastern directly, but do help to reduce auto trips within the overall area.

- The JFK/UMass shuttle provides peak period service between the LMA and JFK/UMass MBTA Station. As the cost of this service is absorbed by MASCO member institutions, riders are not charged a fee. The JFK/UMass shuttle stops at Ruggles Street between Huntington Avenue and Parker Street and runs 6:00 a.m. to 10:00 a.m. and. from 3:00 p.m. until 9:30 p.m., with no service between 10:00 a.m. and 3:00 p.m.
- The Mission Hill (Wentworth) shuttle serves people who park at the Wentworth lots in Mission Hill. The cost of operating this shuttle is incorporated into the parking rate. The Wentworth route stops on the south side of Ruggles Station between 2:30 p.m. until 9:15 p.m.
- The Crosstown shuttle serves individuals who park at the Crosstown Garage at the corner of Massachusetts Avenue and Melnea Cass Boulevard near the Central Artery. The cost of this service is incorporated into the parking rate. Between 10:00 a.m. and 2:30 p.m., when the Ruggles Express does not run, the Crosstown shuttle stops at the south side of Ruggles Station on Columbus Avenue.

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 12:08 p.m. to 10:38 p.m.

The Franklin Line has seven inbound trains and fifteen outbound trains that stop at Ruggles Station. Inbound trains run between 7:00 AM and 12:57 p.m. Outbound trains run between 12:53 p.m. to 11:58 p.m.

During the weekday, the Providence/Stoughton Lines has ten inbound trains and 25 outbound trains that stop at Ruggles Station. Inbound trains run between 6:11 a.m. and 2:29 p.m. and outbound trains run between 6:28 a.m. to 12:07 a.m.

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 high-level platform on Track 2, which will allow passengers to access Ruggles Station without having to bypass it.

Commuter rail boardings are summarized in **Table 5-6.**

Table 5-6: Commuter Rail Service within the Study Area

Rail Line	Inbound Weekday Trips/day			Inbound Boardings
	a.m. Peak	p.m. Peak	Total	
Needham	5	5	32	3,414
Franklin	7	6	37	7,043
Providence	8	5	34	10,111
Stoughton	4	4	34	1,608

Inbound weekday trip, MBTA Ridership and Service Statistics, Blue Book 13th Edition 2010

5.2.6 Pedestrian Conditions

The Northeastern campus is made up of a series of open spaces connected by indirect pedestrian ways that have been fit in over time around campus buildings and some remaining surface parking lots. Gateways to the campus and connections to surrounding neighborhoods are found along Huntington Avenue, Forsyth Street, Ruggles Street, Leon Street, St. Botolph Street, Parker Street, Hemenway Street, St. Stephen Street, Camden Street, and Columbus Avenue.

Much of the new construction on campus has replaced surface parking, vacant parcels, and/or poorly maintained common space and allowed the University to dramatically improve the campus landscape and pedestrian connections. Much of the growth has occurred in the western and southern portions of campus, which have substantially increased pedestrian demand across Forsyth Street and over the Southwest Corridor tracks. These changes, combined with the substantial increase in students living on-campus, have intensified the need for the University to continue improving pedestrian and bicycle accommodations on campus. Pedestrian circulation has been improved over the last IMP term through new paths created in association with the West Village Residence Halls, International Village, and Renaissance.

Typical of universities, most on-campus pedestrian activity occurs before and after scheduled classes, with defined peak periods that represent the peak class load times between the hours of 9:00 a.m. and 3:00 p.m. Major generators include the campus dormitories, the MBTA Green Line stops on Huntington Avenue, Ruggles Station, Curry Student Center, Menino Recreation Center, Matthews Arena during events, and the campus garages and parking lots on Columbus Avenue, Gainsborough Street and Leon Street.

Because the site is located along Columbus Avenue, the major pedestrian issue for the proposed ISEB project is the need for improved connections across the MBTA train tracks. There are four current crossings of the Southwest Corridor train tracks south of the campus at Ruggles Station, the Columbus Parking Area, the Columbus Avenue Parking Garage and the Camden footbridge. Pedestrian activity at the overpasses and at study area intersections was documented in conjunction with the intersection traffic counts conducted between September 2012 and November 2012. The a.m. and p.m. peak hour pedestrian counts are shown in **Figure 5-5.**

Table 5-7 summarizes the comparison of pedestrians crossing the Southwest Corridor train track overpasses. These pedestrian numbers are conservative as most student activity occurs continuously throughout the day, and not only during peak hours. Volumes crossing at Ruggles Station, the busiest location, increased dramatically from 2000 to 2013 in the a.m. and p.m. peak hours by 114% and 132% respectively. Camden Crossing volumes increased in both the a.m. and p.m. peak hours, with Columbus Parking Area only increasing during the p.m. peak. Columbus Parking Garage crossing volumes decreased during both peak hours.

Table 5-7: Pedestrian Volume Trends – Southwest Corridor Tracks

Location	Pedestrian Crossings per Hour		% Change 2000 to 2013
	2000[1]	2013	
Ruggles Station Crossing			
a.m. Peak Hour	913	1952	114%
p.m. Peak Hour	935	2,166	132%
Columbus Parking Area Crossing			
a.m. Peak Hour	349	202	(42%)
p.m. Peak Hour	286	368	29%
Columbus Avenue Parking Garage Crossing			
a.m. Peak Hour	568	311	(45%)
p.m. Peak Hour	735	562	(24%)
Camden Footbridge			
a.m. Peak Hour	94	116	23%
p.m. Peak Hour	159	264	66%

1 Northeastern University IMP, February 22, 2000

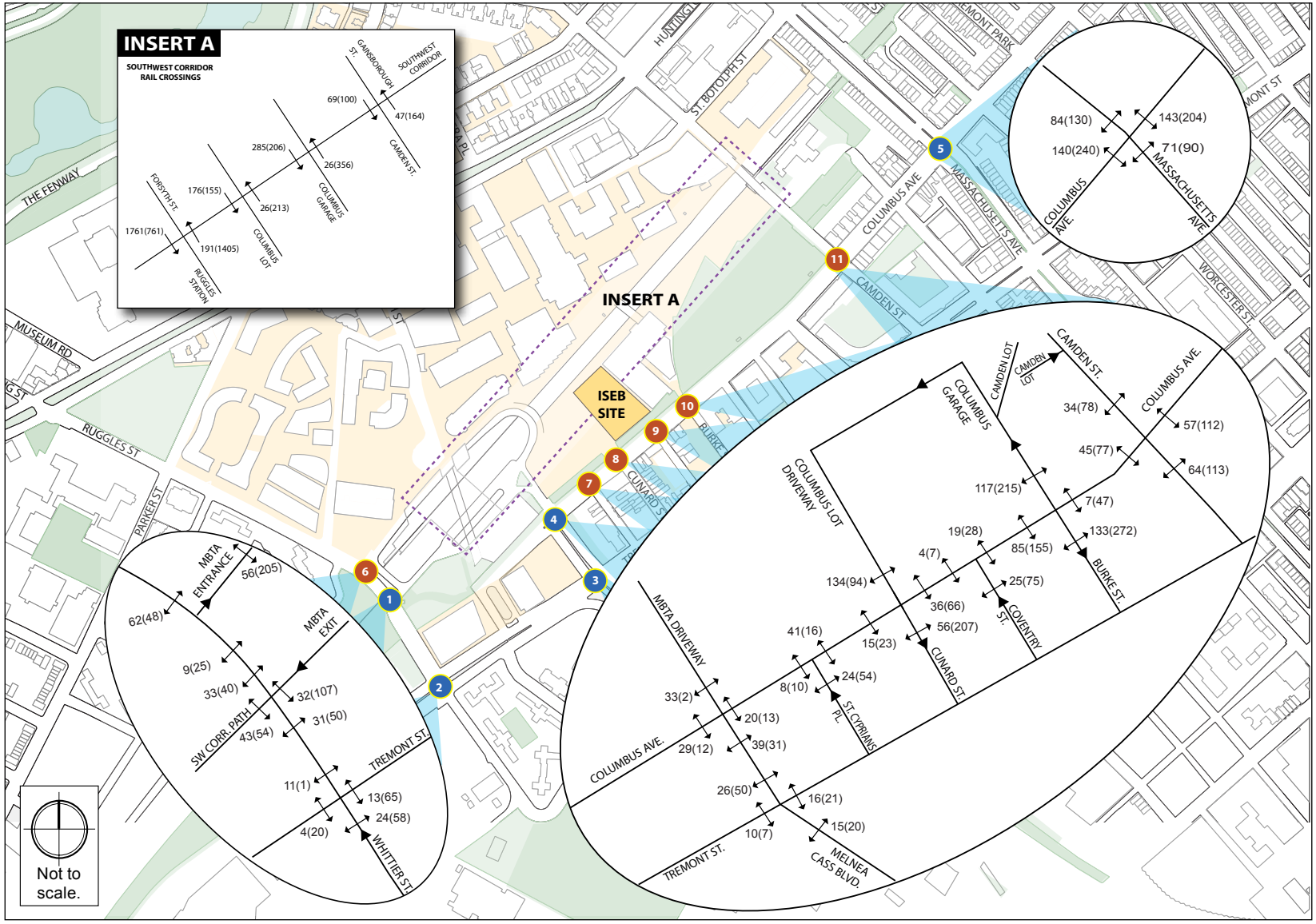


Figure 5-5.
Existing Conditions (2013) Pedestrian Volumes, a.m. and p.m. Peak Hours

5.2.7 Bicycle Conditions

In recent years, bicycle use has increased dramatically on the Northeastern University Campus and throughout the City of Boston. According to preliminary data from Northeastern's 2010 Massachusetts Department of Environmental Protection (DEP) Rideshare Survey, approximately 5 percent of all students, staff, and employees 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. 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.

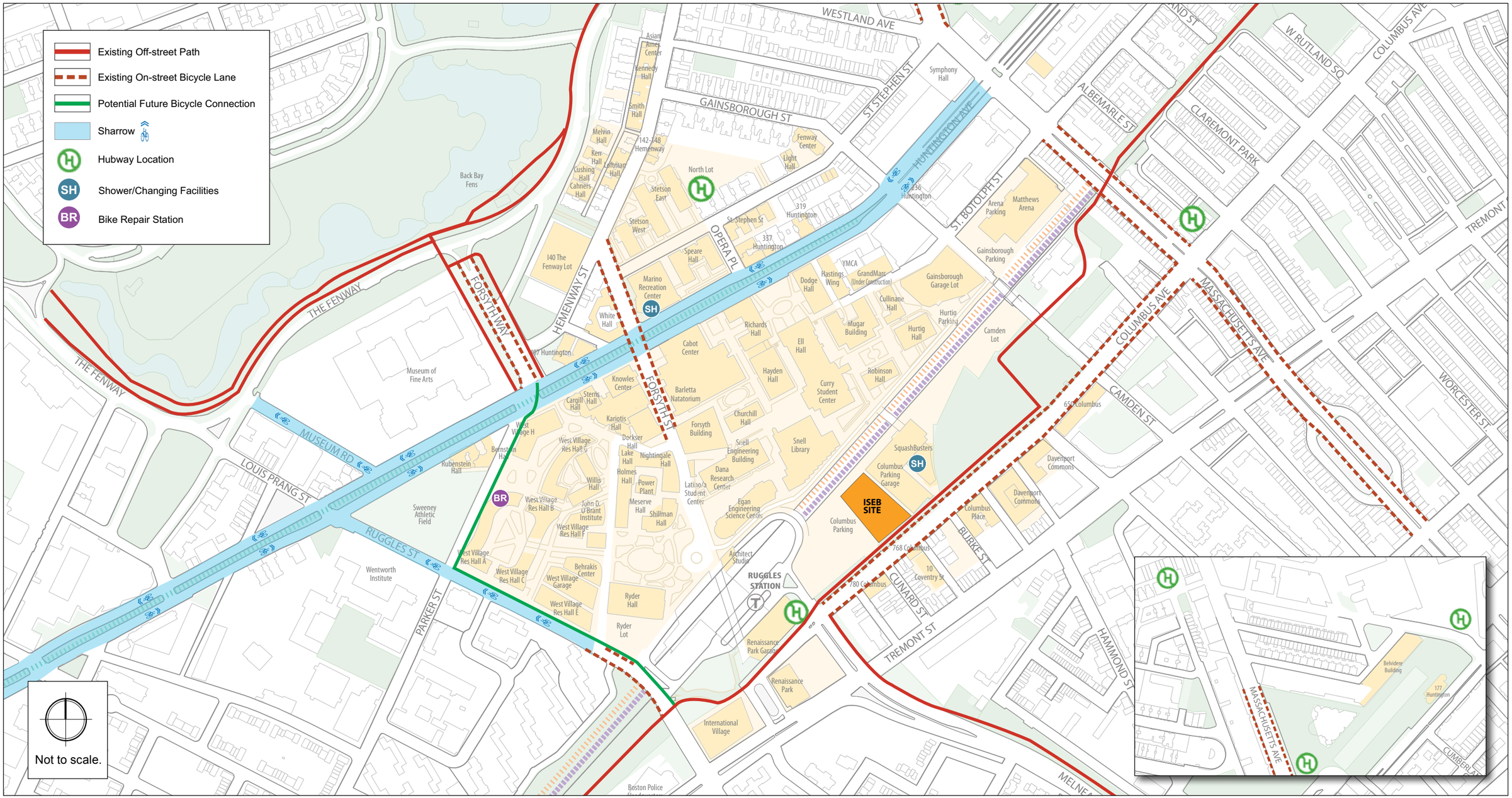
Bicycle Routes

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. 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.

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.

According to the 2010 Bike Routes of Boston Map, published by the City of Boston, Huntington and Massachusetts Avenues are classified as "advanced," suitable for experienced and traffic-confident cyclists. Parker Street, Ruggles Street, Columbus Avenue, St. Botolph Street and Tremont Street are classified as "intermediate," suitable for riders with some on-road experience. Westland Avenue, Hemenway Street, Forsyth Way, Symphony Road and portions of Gainsborough Street are classified as "beginner," suitable for all types of bicyclists.

Figure 5-6 shows major bicycle routes to and through the campus and potential future connections. The a.m. and p.m. bicycle counts, conducted in association with the traffic and pedestrian counts, are shown in **Figure 5-7** and **Figure 5-8,** respectively.



Howard/Stein-Hudson Associates, Inc.
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Figure 5-6.
Existing (2013) Bicycle Facilities

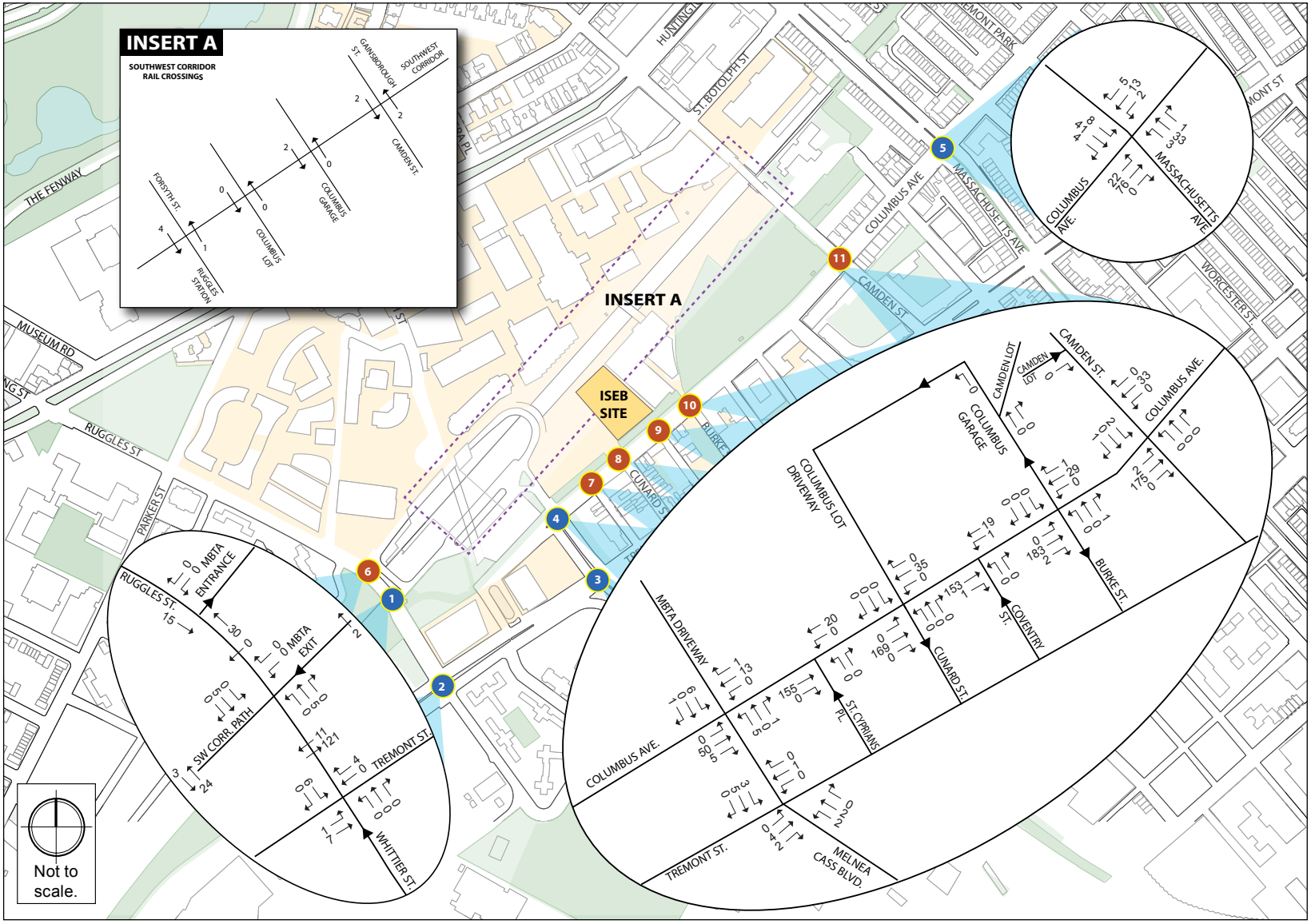


Figure 5-7.
Existing Conditions (2013) Bicycle Volumes, a.m. Peak Hour

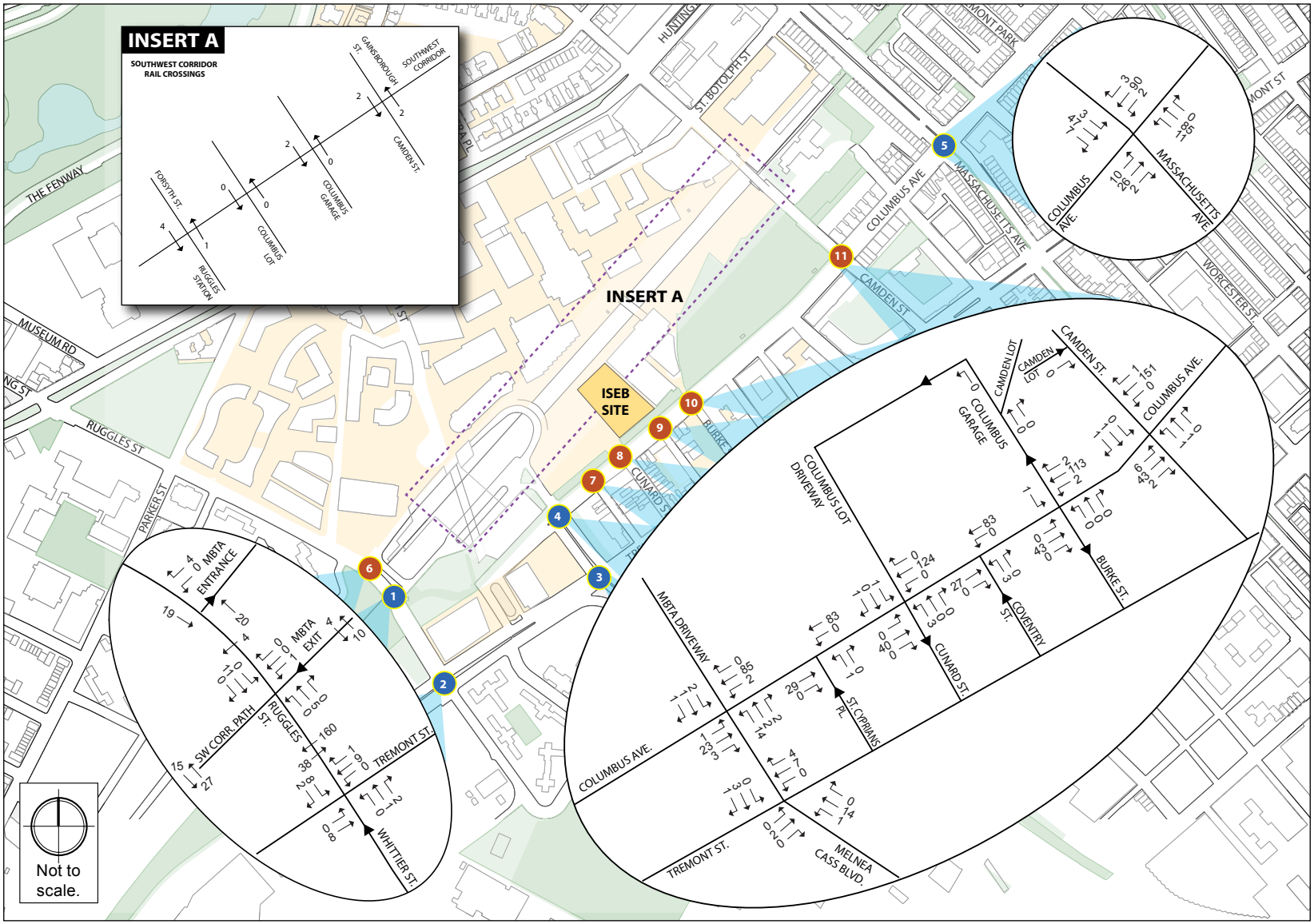


Figure 5-8.
Existing Conditions (2013) Bicycle Volumes, p.m. Peak Hour

Bicycle Storage and Demand

Figure 5-9 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.

Northeastern is continually evaluating on-campus bicycle usage and storage and actively adds bicycle racks and/or relocates existing racks to meet changing demand patterns as bicycle demand continues to evolve. The University has significantly increased on-campus bicycle storage from only 141 bicycles at eight locations in 2000 to approximately 780 bicycles at nearly 40 locations throughout the campus today.

Hubway Bike Share

In 2011, the University partnered with the City of Boston on the New Balance Hubway Bikeshare program. Hubway is a bicycle sharing system in Metro Boston, which offers 100 stations and 1,000 bicycles in Boston, Brookline, Cambridge, and Somerville. As shown in **Figure 5-6** and summarized in **Table 5-9,** Hubway currently has five locations with a combined total of 83 bicycles within a quarter mile walking distance of campus.

Table 5-8: Existing Hubway Locations

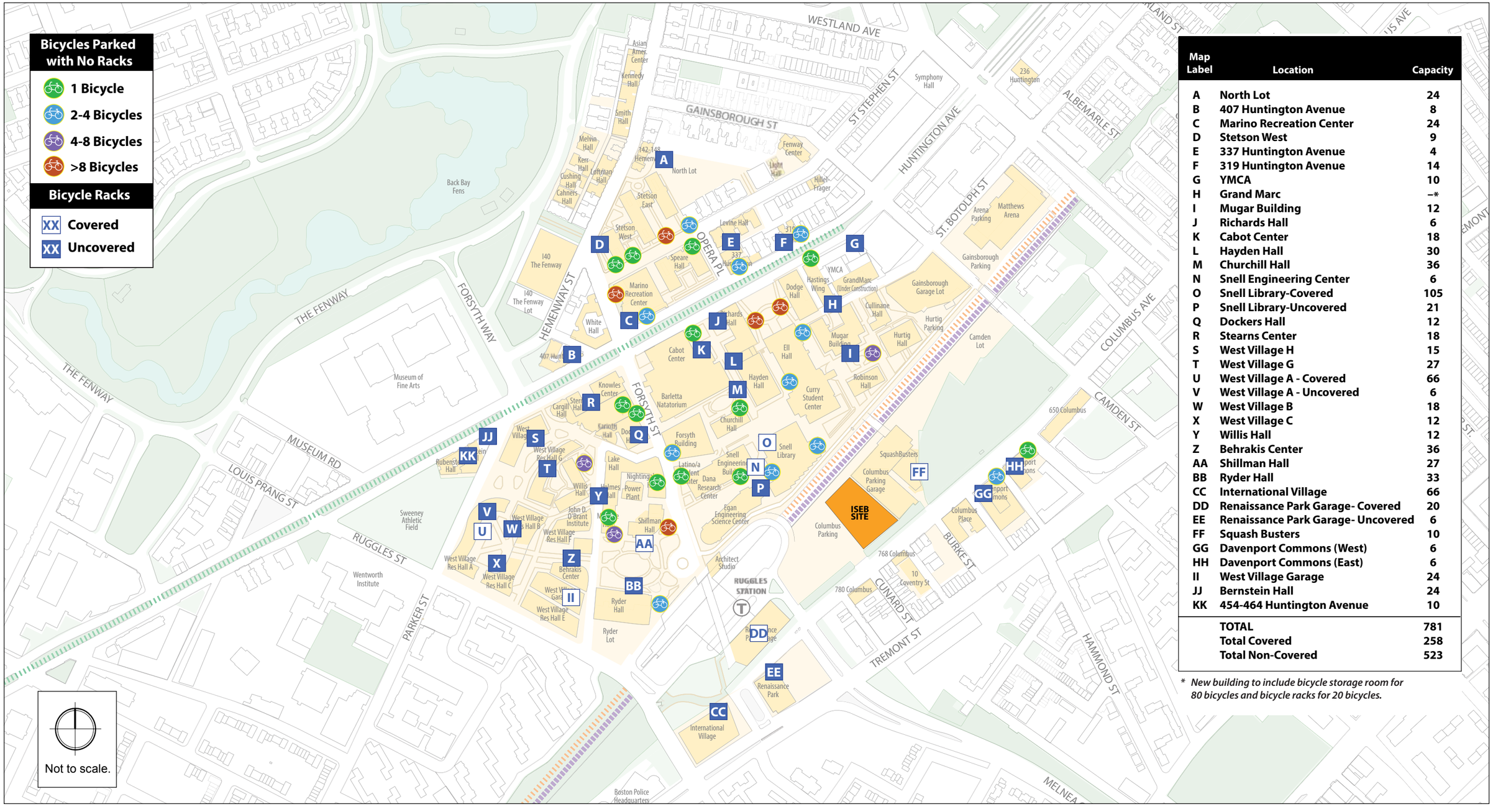
Location	Number of Bicycles[2]
North Parking Lot[1]	14
Christian Science Plaza	18
Ruggles Station/Columbus Avenue	15
Prudential Center/Belvidere Street	25
Columbus Avenue/Massachusetts Avenue	11
Total Bicycles	**83**

1. Hubway bike station at North Lot is sponsored by Northeastern University.

2. Source: www.hubway.com, April 2013.

NORTHEASTERN UNIVERSITY
Boston Campus

Interdisciplinary Science and Engineering Building
Project Notification Form



Map Label	Location	Capacity
A	North Lot	24
B	407 Huntington Avenue	8
C	Marino Recreation Center	24
D	Stetson West	9
E	337 Huntington Avenue	4
F	319 Huntington Avenue	14
G	YMCA	10
H	Grand Marc	–*
I	Mugar Building	12
J	Richards Hall	6
K	Cabot Center	18
L	Hayden Hall	30
M	Churchill Hall	36
N	Snell Engineering Center	6
O	Snell Library-Covered	105
P	Snell Library-Uncovered	21
Q	Dockers Hall	12
R	Stearns Center	18
S	West Village H	15
T	West Village G	27
U	West Village A - Covered	66
V	West Village A - Uncovered	6
W	West Village B	18
X	West Village C	12
Y	Willis Hall	12
Z	Behrakis Center	36
AA	Shillman Hall	27
BB	Ryder Hall	33
CC	International Village	66
DD	Renaissance Park Garage- Covered	20
EE	Renaissance Park Garage- Uncovered	6
FF	Squash Busters	10
GG	Davenport Commons (West)	6
HH	Davenport Commons (East)	6
II	West Village Garage	24
JJ	Bernstein Hall	24
KK	454-464 Huntington Avenue	10
	TOTAL	**781**
	Total Covered	**258**
	Total Non-Covered	**523**

* *New building to include bicycle storage room for 80 bicycles and bicycle racks for 20 bicycles.*

Figure 5-9.
Existing Bicycle Storage

5.2.8 Campus Parking Supply and Demand

Northeastern University currently owns and operates four parking garages and 13 surface parking lots on campus with a combined capacity of approximately 3,728 parking spaces. Parking is available for a combination of faculty, staff, students, visitors, and the general public. Northeastern's parking supply is summarized in **Table 5-9** and illustrated in **Figure 5-10.**

A large proportion of campus parking, just over 3,000 spaces, is found in the area of campus south of the train tracks. The ISEB building site itself sits on a portion of the Columbus Lot that currently has a total of 482 surface parking spaces. Construction of the proposed ISEB Project will displace 282 of those spaces, leaving just 200 surface parking spaces.

Table 5-9: Northeastern University South 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	314
C	Renaissance Garage[3]	General Public, Faculty/Staff decal, Overnight Student decal, Snow Emergency	930[3]
D	West Village Garage[4]	Faculty/Staff, Day/Evening Student, Admissions	264
	Subtotal Garages		2,503
Surface Lots			
E	140 The Fenway	Faculty/Staff decal	31
F	Arena Parking Lot[5]	Faculty/Staff decal	22
G	Burke St Lot (Columbus Place)[5]	Faculty/Staff decal	58
H	Camden Parking Lot[1]	Faculty/Staff decal, Student Decal	230
I	Churchill Hall	Restricted	11
J	Columbus Lot[6]	Faculty/Staff decal, Students decal	482
K	Gainsborough Lot	General Public, Event	33
L	Hurtig/YMCA[5]	Faculty/Staff decal, Restricted	74
M	Latino/a Student Center	Restricted	8
N	North Lot[6]	Faculty/Staff decal, Student decal	145
O	Renaissance Park Lot[7]	Monthly Card Holders	75[7]
P	Ryder Lot[8]	Faculty/Staff decal, Vendor decals	45
Q	Shillman Hall	Restricted	11
	Subtotal Lots		1225
	Total		**3,728**

[1] 5:30 a.m. – 11:00 p.m., Monday – Friday. Overnight parking in Columbus Garage only during snow emergencies.

[2] 24 hours, 7 days a week for hourly rate. Faculty/staff permits allowed between 4:00 a.m. – 1:00 a.m.

[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 (25 permits), and NU Vans (58 nested spaces).

[4] 5:30 a.m. – 11 p.m., Monday – Friday and 8:00 a.m. – 5 p.m. Saturday. No overnight parking.

[5] 48 spaces dedicated to YMCA during the day with remaining 26 spaces available to YMCA after 5:00 p.m. No overnight parking.

[6] 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.

[7] Lot is used exclusively by Beth Israel monthly card holders (about 75 permits).

[8] 5:30 a.m. – 11:00 p.m. Monday – Sunday.

Map Label	Parking Facility	Supply (spaces)
A	Columbus Parking Garage	995
B	Gainsborough Garage	314
C	Renaissance Garage *	930
D	West Village Garage	264
E	140 The Fenway	31
F	Arena Parking Lot	22
G	Burke Street Lot	58
H	Camden Parking Area	230
I	Churchill Hall	11
J	Columbus Surface Parking Area	482
K	Gainsborough Lot	33
L	Hurtig/YMCA	74
M	Latino/a Student Center	8
N	North Lot	145
O	Renaissance Park Lot	75
P	Ryder Lot	45
Q	Shillman Hall	11
Total Spaces		**3,728**

* *Includes 58 spaces reserved for Notheastern vans, special permits, and handicapped parking.*

Figure 5-10.
Northeastern Parking Supply

As shown in **Table 5-10,** the Gainsborough, Renaissance, and West Village garages are all well utilized during the day, reaching or exceeding 85% occupancy. Meanwhile the Columbus Parking Garage is less than 50% occupied throughout the day; and is closed overnight. The Columbus Surface Parking Lot, 140 The Fenway Lot, Gainsborough Lot, and the North Lot are all well utilized throughout the day.

Table 5-10: South Campus Weekday Parking Demand by Location

Parking Area[1]	Supply (Spaces)	Demand (Occupied Spaces)				
		10:00 a.m.	12:00 p.m.	2:00 p.m.	6:00 p.m.	Overnight[2]
Columbus Parking Garage	995	326	468	465	350	-[5]
Renaissance Garage[4]	930	770	882	861	502	183
Burke Street Lot	58	47	44	47	29	14
Camden Parking Area	230	21	33	31	20	-[5]
Columbus Lot	482	270	362	411	450	147
Renaissance Lot	75	28	34	35	7	1
Total	2,770	1,462	1,823	1,850	1,358	345
% Utilization	-	53%	66%	67%	49%	13%

Grey cell shading indicates parking lot/garage is >= 85% occupied.

1 HSH counts, based on11/14/2012.

2 Overnight counts based on observations by Northeastern and HSH staff from 12:00 midnight to1 a.m. on 11/14/2012.

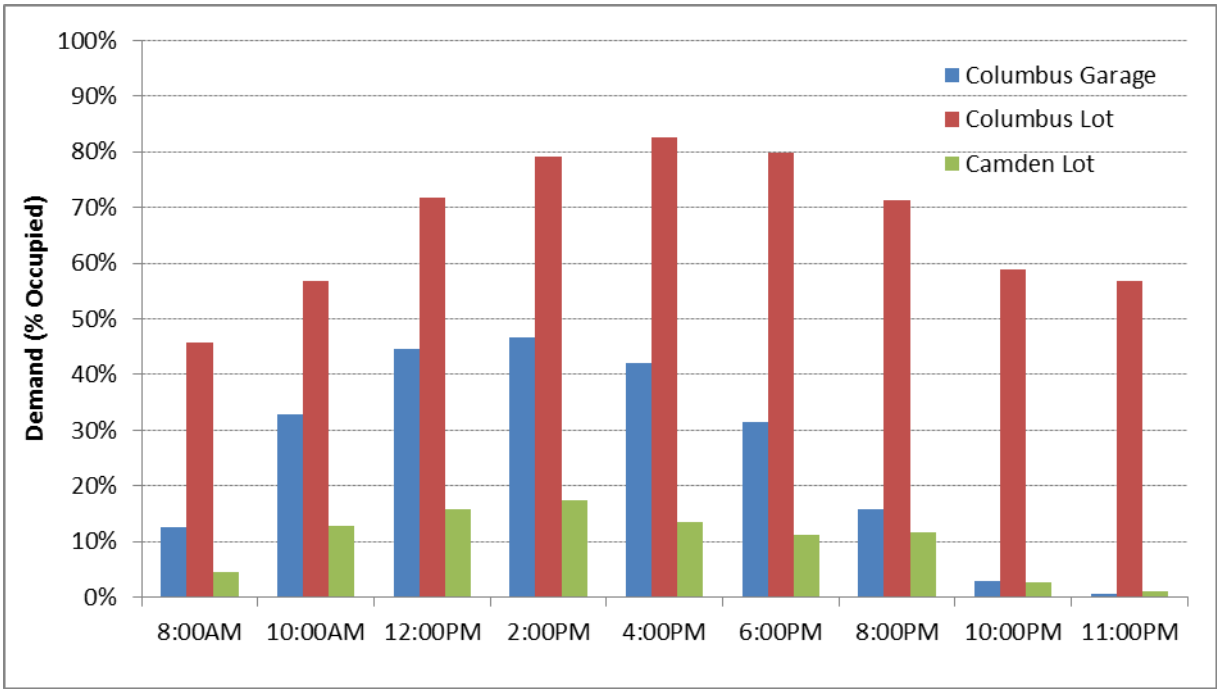
3 ATR data, 09/26/2012.

4 Includes 58 nested spaces reserved for Northeastern vans, special permits, and handicapped parking; 75% occupancy assumed in nested area throughout the day.

5 Closed and no car counts performed.

Figure 5-11 compares parking average weekday parking utilization at the Columbus Lot, Columbus Parking Garage, and Camden Lot, which are in the same general location on-campus and share access driveways. According to Northeastern Parking staff, students/faculty/staff general prefer to park in the Columbus Lot since it is easier/faster to access a parking space when compared to using the ramp system and stairs/elevator in the Columbus Parking Garage. It may also be a preference in terms of perceived safety/security.

Figure 5-11. Columbus Lot-Columbus Parking Garage-Camden Lot: Average Weekday Utilization



On-Street Parking Supply

Figure 5-12 illustrates the City of Boston on-street parking regulations in the vicinity of the Project site. As shown, on-street parking within the vicinity of the site is predominantly resident permit parking.

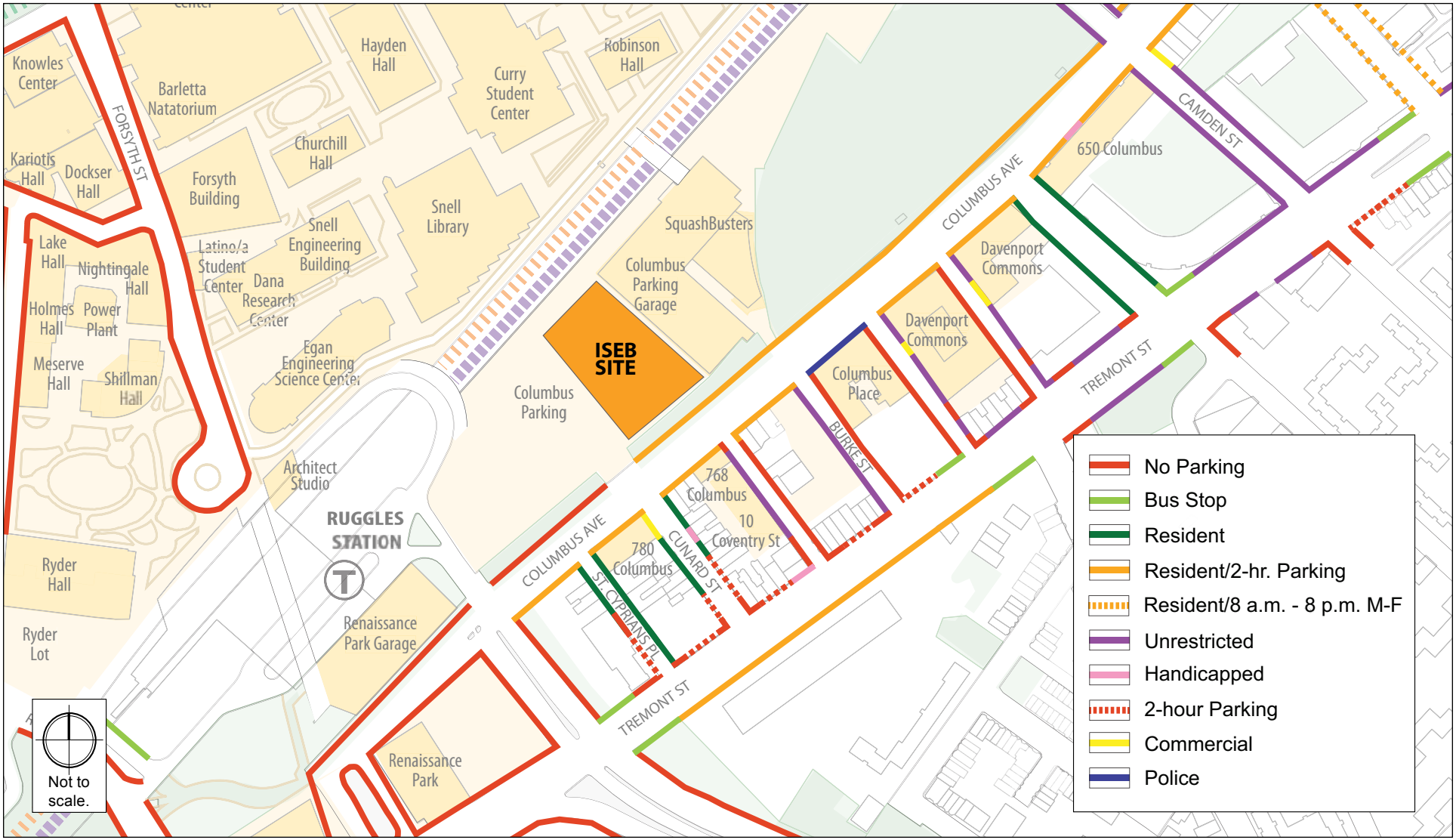


Figure 5-12.
On-Street Parking

5.2.9 Car Sharing

Increasingly popular car-sharing services provide easy access to vehicular transportation for urban residents who do not own cars (see **Table 5-11 and Figure 5-13**). The local car sharing providers, Zipcar and Hertz, 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.

In 2011, the University began using Hertz On Demand as a provider for shared cars on Campus, which currently has approximately seven on-demand vehicles in four different locations throughout the Campus. Hertz on-demand allows students with a Northeastern identification card ages 18 years or older to participate. Hertz On Demand is a car-sharing service, which was launched in December 2008 with over 500 locations and 700 vehicles. Hertz On Demand offers self-service hourly or daily car rentals to its members. Zipcar has approximately 48 vehicles at eight locations within the vicinity of the campus.

Table 5-11: Shared Car Summary

Location	Number of Vehicles
Zipcar[1]	
Gainsborough Street	15
Museum of Art	2
Harriett Tubman House	5
Huntington Avenue/Cumberland	4
Edgerly Road/Church Park Apts.	4
Hilton Back Bay	2
Belvidere St/Prudential Center Garage	15
235 West Newton Street	1
Total Zipcar	**48**
Hertz[2]	
North Lot [97 St. Stephen Street]	1
Matthew's Arena [262 St. Botolph St]	1
Columbus Surface Lot [795 Columbus Ave]	3
Ryder Lot [66 Leon St]	2
Total Hertz	**7**

1 Zipcar.com, April 2013.

2 Hertzondemand.com, April 2013.

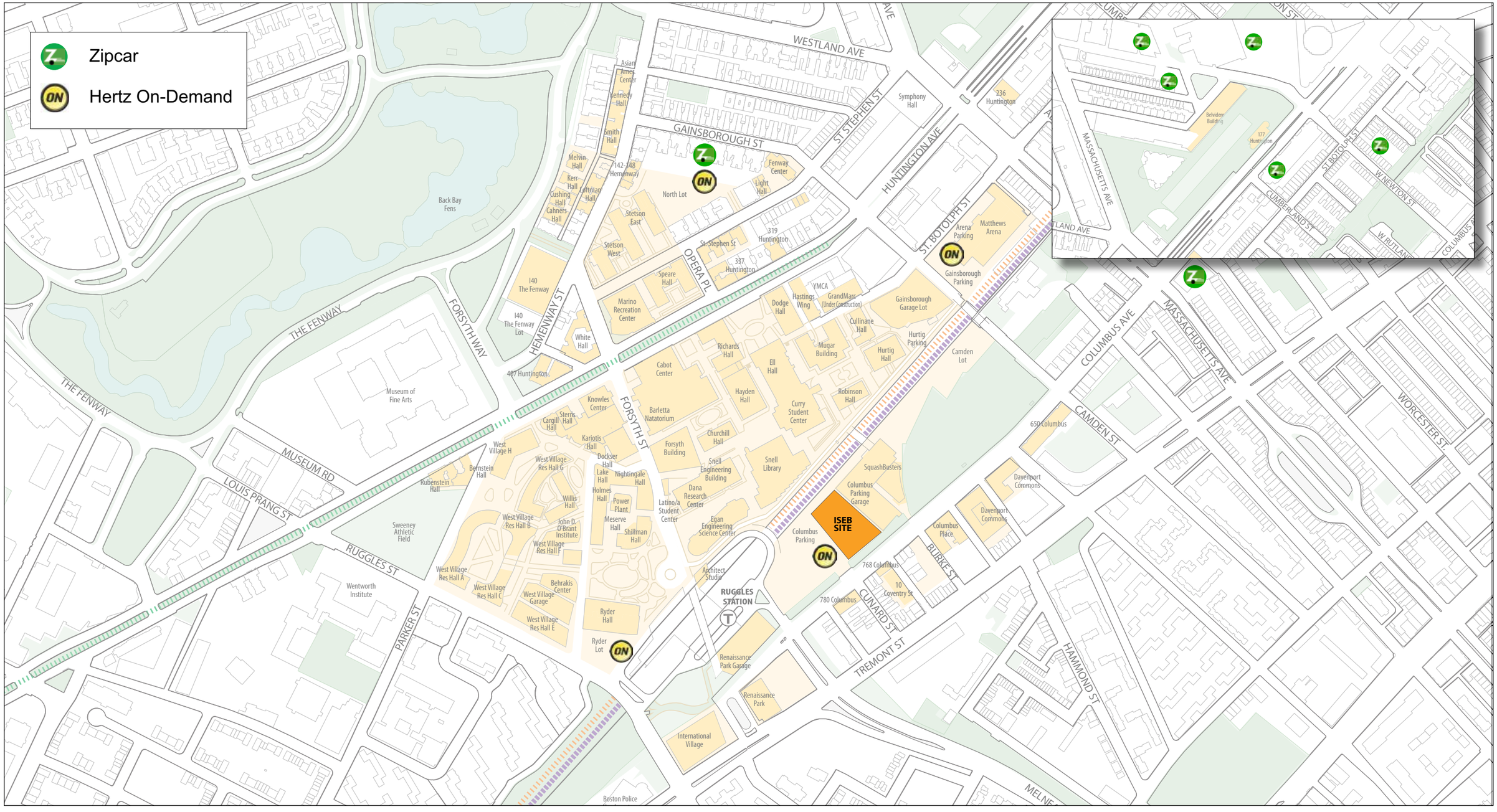


Figure 5-13.
Shared Car Locations

5.2.10 Loading, Service and Emergency Access

The University's Transportation, Receiving and Warehousing Department is responsible for administering the campus's central receiving and distribution system, which is run from a central warehouse in Jamaica Plain. The department receives vendor deliveries, stores equipment or materials as necessary, and completes the deliveries to on-campus locations, as well as completing internal deliveries from one campus location to another. Most buildings on campus also receive regular deliveries of mail, supplies and food, some of which, such as those by courier or express delivery, occur within the public way. As the Project Site is occupied by a parking lot, there is no loading or service activity on the site today. There is one dumpster on the Columbus Avenue end of the Columbus Parking Garage.

Emergency access to the campus is provided by the city street network, principally the arterial streets of Massachusetts Avenue, Huntington Avenue, Ruggles Street and Columbus Avenue. Access into the campus is provided by local streets and a network of service roadways and pathways throughout the campus.

5.2.11 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 11% for students and from 49% to only 28% 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 (TDM) 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 negotiate with the MBTA to adopt the Ruggles Station on the Orange Line, where maintenance and cleaning operations of the public access areas of the station would be done by NU. This effort will provide opportunities for partnership between the University and the MBTA to enhance the overall commuting experience at the station while the MBTA allocated limited resources to other critical transit needs.
- 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. NUPD's new voluntary bicycle registration program is available to any faculty, staff, or student for $5. NUPD records the information and provides a sticker. A bicycle repair station is being installed on campus for use by the entire Northeastern community. The NU bookstore offers an automatic 20% 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 information on commuting (bus and train schedules and carpooling information).
- Alternative Work Week during Summer Months. When classes are not in session, Northeastern offers a four day/forty hour work week (8:00 a.m. through 5:30 p.m., Monday through Thursday). This reduced work week eliminates one day of commuting per week per employee, reducing the demand the University places on the regional transportation system.
- Limited Overnight Parking for Campus Residents. The University's parking policies permit overnight parking for students only under limited conditions relating to cooperative work assignments, medical reasons, family obligations, and other exceptional circumstances. By far, the most common reason for providing overnight parking to students is cooperative education work assignments. Students with a cooperative education job located beyond reasonable MBTA service are permitted to park on campus on a semester basis.
- 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.

- Linking the Corridors. The Emerald Necklace/Southwest Corridor 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. Working in partnership, the Boston Parks and Recreation Department and Northeastern are seeking to develop a bicycle/pedestrian connection linking the Back Bay Fens to the Southwest Corridor Park by way of public roads within and adjacent to the University.
- 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 – 48 assigned ZipCar spaces and 7 Hertz On Demand spaces. Several University departments have Zipcar accounts.
- Electric Vehicles. The University has acquired several small electric vehicles for use on campus by facilities personnel.
- 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.

5.2.12 Ongoing Transportation Initiatives Affecting South Campus

The University has been actively engaged with various City and State agencies on a number of initiatives to improve transportation conditions in and around the south campus, as follow:

- Ruggles Station Commuter Rail Platform Extension Project – in early 2013, the MBTA is in the preliminary design phase for the proposed construction of a new 800-foot long

commuter rail platform on Track 2. To support this effort, the MBTA anticipates using its "taking" authority under eminent domain laws to convert some portion of Northeastern University land within the Columbus Lot. Discussions are currently under way to determine how the MBTA and Northeastern University might support their respective plans within this locus: the new platform would enable commuter rail passengers to disembark on Track 2 and avoid the extra travel and transfer at Back Bay Station to get back to Ruggles; however, Northeastern University intends to use the entirety of the Columbus lots for academic and related purposes.

- Ruggles Station Partnership Program – Northeastern University is coordinating with the MTBA on possible partnership opportunities to improve Ruggles Station, which serves as a key pedestrian and transit connection to the Northeastern campus and the surrounding community.
- Southwest Corridor–Fenway Bicycle Path Connection – Northeastern continues to work with the City on evaluating alternatives for providing a connection between the Southwest Corridor Bicycle Path and the Fenway Bicycle Path along the Emerald Necklace. The City recently engaged a consultant to evaluate alternatives and the project is currently in the conceptual design phase. As currently envisioned, this important connection would provide designated bicycle accommodations along Ruggles Street, Parker Street and Forsyth Way.
- Southwest Corridor/Ruggles Station/International Village – The University has been in discussions with the City, Department of Conservation and Recreation (DCR), and the MBTA regarding possible improvements to this area to reduce pedestrian–cyclist conflicts through a combination of pavement marking, signage, traffic calming, and/or other geometric modifications; landscape and other aesthetic improvements; and increased pest control.

The Boston Transportation Department (BTD) is also actively monitoring and improving traffic conditions along roadways adjacent to the campus. On-going efforts include signal timing optimization along the Huntington Avenue, Massachusetts Avenue, and Melnea Cass Boulevard corridors. In addition, the City of Boston is currently in the preliminary design phase of the Melnea Cass Boulevard Redesign Project, which is evaluating the potential for a dedicated busway and improved bicycle and pedestrian accommodations.

The City of Boston and the Massachusetts Department of Transportation (MassDOT) are also evaluating improvement to Massachusetts Avenue between Westland Avenue and Huntington Avenue that will improve pedestrian access around the Symphony area and include improvements to traffic signal operation, traffic circulation, bicycle accommodations, sidewalks, landscaping, crosswalks, and other streetscape improvements. Construction of the Symphony Area Streetscape Project, which will improve the pedestrian environment for all residents and visitors in the area, is anticipated to begin in 2013.

5.3 Future (2018) Transportation Conditions

5.3.1 Introduction

Future conditions to the design year 2018 were analyzed under two conditions:

- A No-Build scenario analyzes the transportation system in the study area without the ISEB. The No-Build volumes include both generalized background traffic growth and specific growth estimated for planned and permitted projects near the campus.
- The Build scenario analyzes the impacts of projected graduate student and faculty growth specifically associated with the ISEB. The resulting traffic is added to the No-Build traffic to obtain Build conditions.

The analyses for each of these conditions are presented in the sections below.

5.3.2 2018 No-Build Conditions

No-Build conditions are typically projected on the basis of planned transportation infrastructure improvements and traffic volume changes that would occur in the event that the proposed project is not implemented. Infrastructure improvements include roadway, public transportation, pedestrian and bicycle improvements. Traffic volume changes are based on two factors: an annual growth rate and growth associated with specific developments near the campus.

Transportation Infrastructure Improvements

The following public infrastructure projects are planned to be implemented within the five-year time frame for project implementation.

- Massachusetts Avenue Improvement Program – In early 2013, the City of Boston is nearing the end of construction on a $14.5 million improvement program for Massachusetts Avenue from 150 feet south of Albany Street to 100 feet north of St. Botolph Street. The project includes repaving the roadway and fully modernizing all traffic signal equipment and interconnecting it with the City's traffic management center via a new fiber optic connection. Left turn bays have been installed at certain intersections to reduce congestion and improve traffic safety. New curbing, sidewalks, street lighting and trash receptacles are being installed and landscaping enhanced with trees and shrubbery. A critical element of the plan is bike accommodations in the corridor. In early 2013, signal timings along the corridor are still being adjusted by BTD and are thus not reflected in the No-Build and Build traffic analyses, although the new geometry, now in place, has been incorporated.
- Melnea Cass Boulevard Improvement Project – The Boston Transportation Department is working with the Roxbury community to redesign Melnea Cass Boulevard with the goal of making it a neighborhood friendly corridor. The scope includes the development of roadway and streetscape designs that create a pedestrian friendly environment, ensure efficient traffic flow, accommodate transit vehicles and bicycles and promote economic

development. The redesign plans will include dedicated bus lanes that can accommodate existing transit and future BRT service.

The design is progressing in collaboration with the Roxbury and other surrounding communities and with all relevant city and state agencies, neighborhood groups and corridor abutters. The BTD, as lead agency on the project, aims to incorporate the city's new "Complete Streets" strategy as well as the goals of the Roxbury Strategic Master Plan (RSMP) and the state-devised Urban Ring project. The Complete Streets approach focuses on the needs of pedestrians, bicyclists and transit users as well as drivers, and on environmentally sustainable design.

Because a design option has not yet been finalized, the existing geometry and signal timing were used as inputs to the No-Build and Build traffic analyses.

Background Traffic Growth

A comparison of area traffic volumes over the past ten years revealed flat or negative traffic growth near the south campus. **Table 5-12** compares total vehicles entering several key gateway intersections to the campus between 2000 and 2013.

Table 5-12: Traffic Volume Trends

Location	Traffic Volume per Hour (total vehicles entering)		% Change 2000 to 2013
	2000[1]	2013	
Columbus Avenue/Melnea Cass Boulevard			
a.m. Peak Hour	995	842	(15%)
p.m. Peak Hour	1,042	940	(10%)
Columbus Avenue/Massachusetts Avenue			
a.m. Peak Hour	3,180	2,817	(11%)
p.m. Peak Hour	3,790	3,064	(19%)

1. Source: Northeastern University IMP, February 22, 2000.

However, a review of specific projects in a wide area encompassing parts of Back Bay, the South End, Lower Roxbury, the West Fenway residential area, and the Longwood Medical and Academic Area led to the conclusion that together, their impacts would be appropriately covered by a background growth factor of 0.5% per year to 2018. These project impacts were not itemized specifically due to distance from the campus, scale of the project, timing, lack of specific volumes or findings of acceptable LOS under build conditions in impact studies conducted for the projects. Projects covered by the background growth rate include:

- 16-20 Peterborough Street, 20 residential units and 12 parking spaces;

- Simmons College Institutional Master Plan Notification Form;
- Wentworth Institute of Technology Institutional Master Plan;
- Roxbury Crossing Senior Building, 40 senior units;
- 1004-1012 Tremont Street, 2,000 GSF retail, 7 du, 6 parking spaces;
- Alexandra Hotel rehabilitation;
- 35 Northampton Street, 11 HP and 245 affordable units;
- New England Conservatory Residence Hall – 252 beds;
- 199 West Brookline Street, 9 units, 21 parking spaces
- Christian Science Plaza PDA;
- 41 Westland Avenue – 48 residential units and 31 parking spaces
- 44 Burbank Street – 45 residential units;
- Boston Conservatory;
- 1085 Boylston Street;
- Christian Science Plaza PDA Master Plan;
- Berklee College Institutional Master Plan;
- John Hancock Tower: restaurant, retail space and parking;
- Longwood Center – 350,000 GSF building including research lab, office, and clinical uses with ground floor retail/restaurant space and 290 parking spaces; and
- Brigham and Women's Hospital IMP/Massachusetts Mental Health Center building project.
- Basilica Court
- Prudential Redevelopment
- Copley Place
- 40 Trinity Place

Project-Specific Traffic Growth

Traffic volumes from the following projects, shown in **Figure 5-14**, were specifically assigned to study area intersections:

- 1282 Boylston Street (McDonald's) – 322 residential units, 15,000 GSF of ground floor retail space and 295 parking spaces;
- Fenway Triangle Mixed-Use Project – 700,000 GSF project, including 290 residential units, office and retail space and 575 parking spaces;
- 121 Brookline Avenue – 117,000 GSF, six-story hotel;

- The Point – a 22-story building with 33,000 GSF of commercial space and 320 residential units;
- Tremont Crossing (P-3) – 550,000 GSF of retail space, 200,000 GSF of office space, 240 residential units, 58,000 GSF of cultural space and 1,700 parking spaces;
- Parcel 9 – 145 hotel rooms, 50 housing units, and 7,935 GSF of ground-floor retail space, with approximately 118 parking spaces and covered secure storage for 70 bicycles;
- Madison Tropical Parcel 10 – a 40,000 GSF supermarket (Tropical Foods), 54,000 GSF office/retail building and the rehabilitation of a 44,000 GSF existing structure for the provision of residential units and retail space;
- 888 Boylston Street – 19-story office building; and
- BUMC IMP and Energy Facility – BUMC submitted a new 10-year IMP and PNF for a new 48,000 GSF Energy Facility. There are two other projects listed in the IMP including an administrative/clinical building and a new inpatient building.

2018 No-Build Traffic Volumes

The lists of development projects near Northeastern University presented above are believed to represent all of the major, active proposals for development in the area at the time this PNF was prepared. With the 0.5% annual growth rate for general traffic increases, the LOS analysis was conducted using the methodology described for the Existing Conditions, and the traffic associated with specific developments, the No-Build traffic conditions represent a conservative estimate of future traffic volumes for the 2018 horizon year. No-Build 2018 volumes are shown in **Figure 5-15** and **Figure 5-16**.

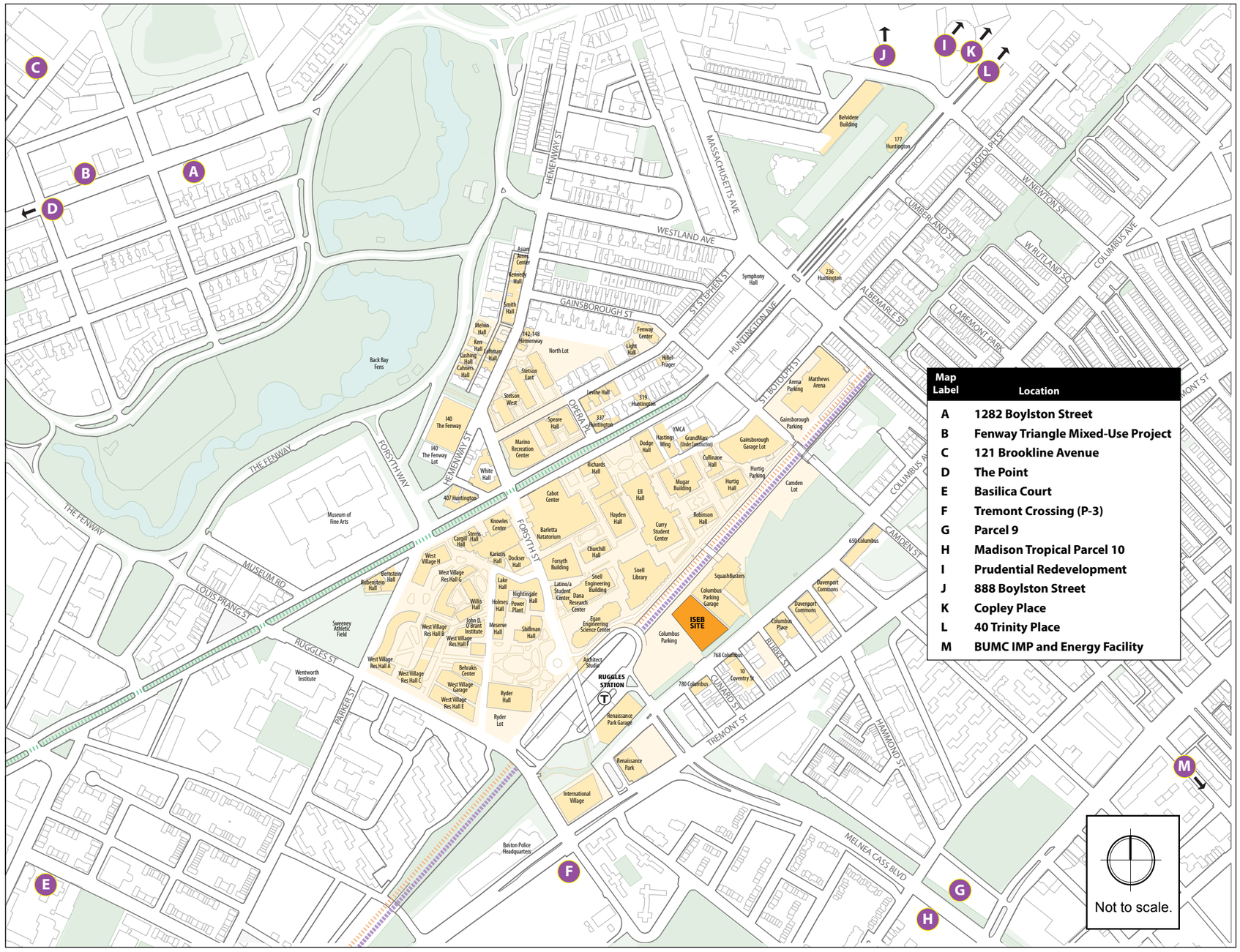


Figure 5-14.
Area Development Projects

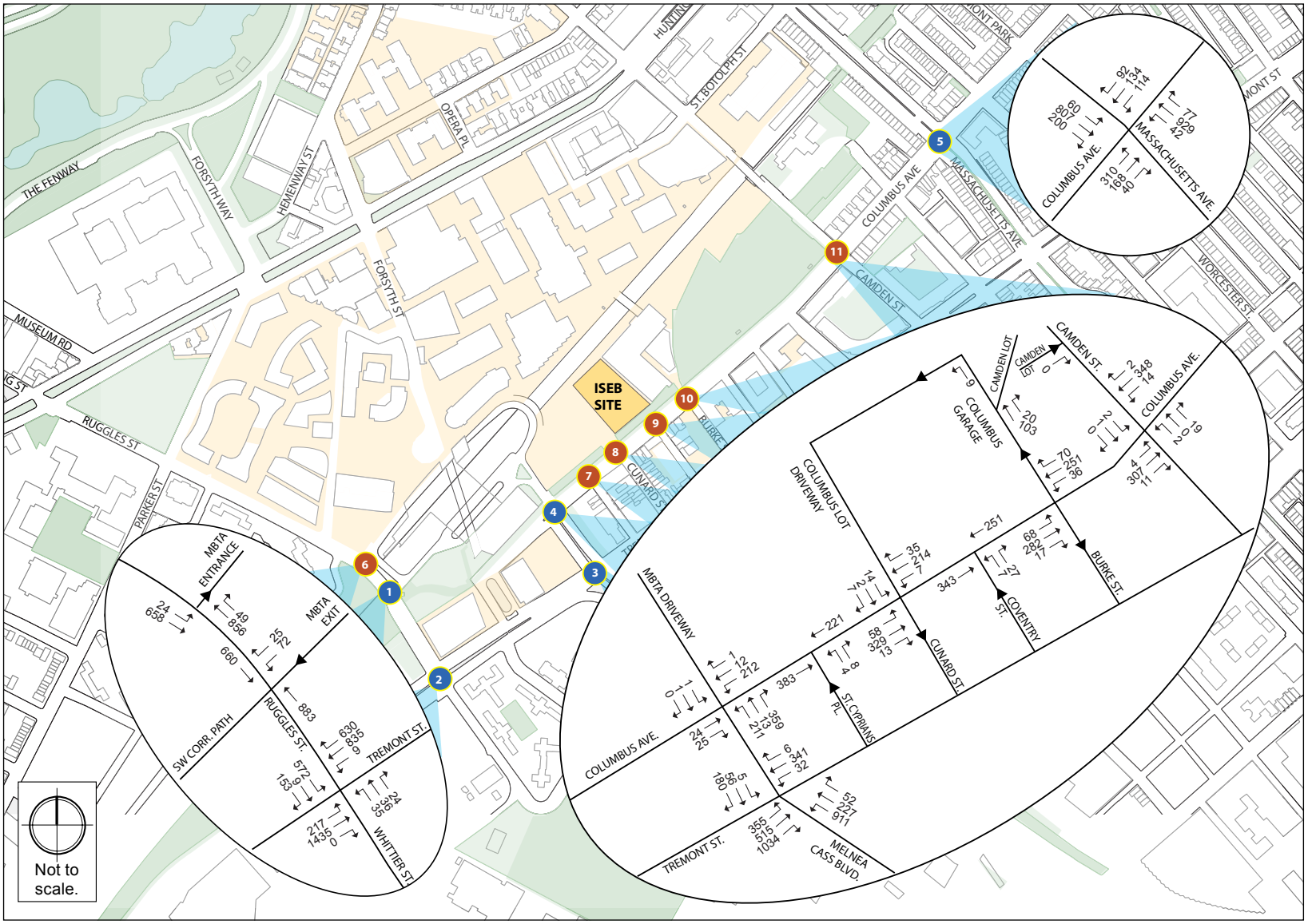


Figure 5-15.
No-Build Conditions (2018) Traffic Volumes, a.m. Peak Hour

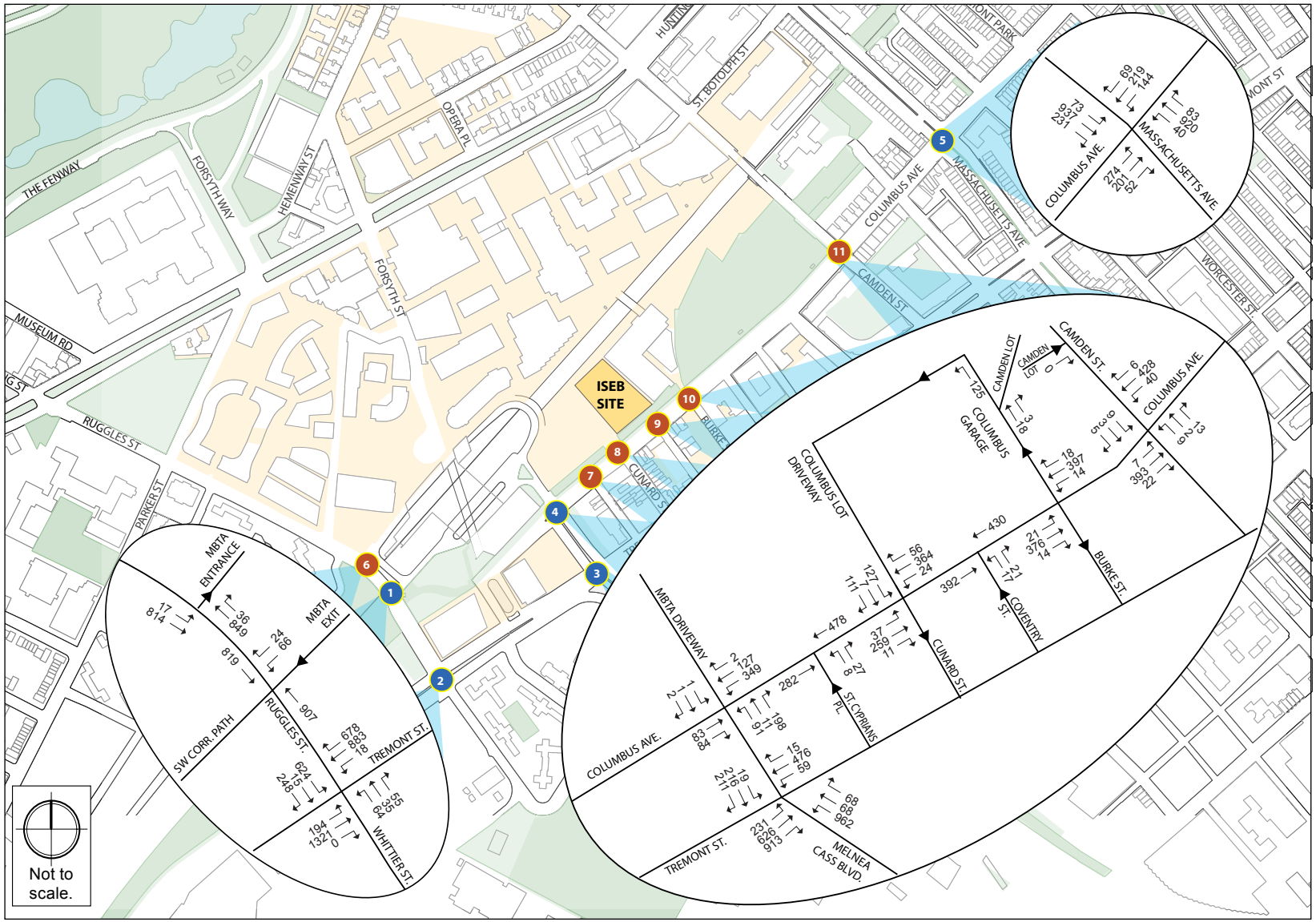


Figure 5-16.
No-Build Conditions (2018) Traffic Volumes, p.m. Peak Hour

2018 No-Build Traffic Operations

Traffic operations under No-Build conditions were analyzed at all study area intersections. No-Build 2018 operations are summarized in **Table 5-14** and **Table 5-15.**

Table 5-14: No-Build Conditions (2018) Capacity Analysis Summary, a.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (ft.)
Signalized Intersections				
1. RugglesStreet/MBTA Exit	**B**	**18.9**	-	-
MBTA Exit WB left	D	40.3	0.53	70
MBTA Exit WB right	B	12.9	0.17	20
RugglesStreet NB thru	C	26.8	0.86	m#1526
RugglesStreet SB thru	A	6.2	0.34	122
2. RugglesStreet/Tremont Street/ Whittier Street	**D**	**35.3**	-	-
Tremont Street EB left	F	>80.0	0.90	#347
Tremont Street EB thru	B	18.4	0.58	414
Tremont Street WB thru	D	40.8	0.72	#550
Tremont Street WB right	C	26.1	0.80	#840
Whittier Street NB left	E	66.3	0.31	67
Whittier Street NB thru/right	E	56.8	0.49	87
Ruggles Street SB left	E	61.7	0.83	262
Ruggles Street SB right	A	7.2	0.24	67
3. Tremont Street/Melnea Cass Boulevard	**F**	>80.0	-	-
Tremont Street EB left/thru | thru	F	>80.0	>1.00	#536
Tremont Street EB right	A	5.4	0.81	0
Tremont Street WB left/thru | thru/right	C	34.0	0.63	#214
Melnea Cass Blvd NB left	F	>80.0	>1.00	#697
Melnea Cass Blvd NB left/thru | thru/right	F	>80.0	>1.00	#467
Melnea Cass Boulevard SB left/thru	C	29.5	0.35	m90
Melnea Cass Boulevard SB right	B	19.9	0.61	m158
4. Melnea Cass Boulevard/Columbus Avenue/MBTA Ruggles Station Driveway	**B**	**17.8**	-	-
Columbus Avenue EB left/thru | thru/right	C	26.9	0.22	27
Columbus Avenue WB left/thru/right	C	22.5	0.38	m#223
Melnea Cass Boulevard NB left/thru	D	36.7	0.82	m88
Melnea Cass Boulevard NB right	A	1.5	0.34	m5
MBTA Ruggles Station Driveway SB left/thru/right	C	21.0	0.01	6

5. Massachusetts Avenue/ Columbus Avenue	**C**	**33.3**	-	-
Columbus Avenue EB left	F	>80.0	>1.00	m#417
Columbus Avenue EB thru | thru/right	C	30.7	0.31	m84
Columbus Avenue WB left	C	29.9	0.48	93
Columbus Avenue WB thru/right	E	64.4	0.85	#249
Massachusetts Avenue NB left	B	15.4	0.29	m20
Massachusetts Avenue NB thru | thru/right	C	21.2	0.81	#461
Massachusetts Avenue SB left	C	22.9	0.45	m23
Massachusetts Avenue SB thru | thru/right	B	13.5	0.80	#465
Unsignalized Intersections				
6. Ruggles Street/ MBTA Entrance				
Ruggles Street NB thru/right	A	0.0	0.58	0
Ruggles Street SB left/thru | thru	B	10.9	0.22	20
7. Columbus Avenue/St. Cyprians Place				
Columbus Avenue EB thru	A	0.0	0.24	0
Columbus Avenue WB thru	A	0.0	0.14	0
St. Cyprians Place NB left/right	B	11.7	0.02	2
8. Columbus Avenue/Cunard Street/Columbus Lot Driveway				
Columbus Avenue EB left/thru/right	A	1.9	0.06	5
Columbus Avenue WB left/thru/right	A	0.3	0.01	1
Columbus Parking Area SB left/thru/right	C	23.4	0.11	9
9. Columbus Avenue/Coventry Street				
Columbus Avenue EB thru	A	0.0	0.22	0
Columbus Avenue WB thru	A	0.0	0.16	0
Coventry Street NB left/right	B	11.4	0.06	5
10. Columbus Avenue/Burke Street/Columbus Garage Driveway				
Columbus Avenue EB left/thru/right	A	2.1	0.07	5
Columbus Avenue WB left/thru/right	A	1.2	0.04	3
11. Columbus Avenue/Camden Street				
Columbus Avenue EB left/thru/right	A	0.1	0.00	0
Columbus Avenue WB left/thru/right	A	0.5	0.01	1
Camden Street NB left/thru/right	B	13.1	0.05	4
Camden Street SB left/thru/right	C	20.6	0.01	1

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

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

Grey shading indicates change in LOS from Existing Condition.

Table 5-15: No-Build Conditions (2018) Capacity Analysis Summary, p.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (ft.)
Signalized Intersections				
1. Ruggles Street/MBTA Exit	**B**	**16.7**	-	-
MBTA Exit WB left	D	38.9	0.49	68
MBTA Exit WB right	B	13.2	0.16	20
Ruggles Street NB thru	C	24.2	0.85	m#1528
Ruggles Street SB thru	A	6.8	0.41	141
2. Ruggles Street/Tremont Street/ Whittier Street	**F**	**>80.0**	-	-
Tremont Street EB left	F	>80.0	0.93	#342
Tremont Street EB thru	C	23.6	0.59	397
Tremont Street WB thru	F	>80.0	0.83	#593
Tremont Street WB right	E	66.8	0.80	#707
Whittier Street NB left	E	68.4	0.46	109
Whittier Street NB thru/right	E	67.2	0.66	128
Ruggles Street SB left	E	69.2	0.79	323
Ruggles Street SB right	A	6.0	0.36	74
3. Tremont Street/Melnea Cass Boulevard	**F**	**>80.0**	-	-
Tremont Street EB left/thru | thru	F	>80.0	>1.00	#542
Tremont Street EB right	A	3.0	0.71	0
Tremont Street WB left/thru | thru/right	F	>80.0	>1.00	m#369
Melnea Cass Boulevard NB left	F	>80.0	>1.00	#721
Melnea Cass Boulevard NB left/thru | thru/right	E	60.8	>1.00	#352
Melnea Cass Boulevard SB left/thru	E	57.5	0.90	m#281
Melnea Cass Boulevard SB right	A	7.5	0.54	m32
4. Melnea Cass Boulevard/Columbus Avenue/MBTA Ruggles Station Driveway	**C**	**22.0**	-	-
Columbus Avenue EB left/thru | thru/right	C	28.0	0.54	63
Columbus Avenue WB left/thru/right	C	22.5	0.63	m#474
Melnea Cass Boulevard NB left/thru	D	47.1	0.86	m49
Melnea Cass Boulevard NB right	A	0.9	0.19	m0
MBTA Ruggles Station Driveway SB left/thru/right	C	27.2	0.02	11

5. Massachusetts Avenue/ Columbus Avenue	**D**	**39.6**	-	-
Columbus Avenue EB left	F	>80.0	>1.00	#351
Columbus Avenue EB thru | thru/right	C	32.9	0.39	106
Columbus Avenue WB left	C	35.0	0.58	123
Columbus Avenue WB thru/right	E	69.9	0.92	#342
Massachusetts Avenue NB left	B	15.6	0.29	m13
Massachusetts Avenue NB thru | thru/right	B	13.0	0.73	154
Massachusetts Avenue SB left	B	14.4	0.42	m14
Massachusetts Avenue SB thru | thru/right	B	16.1	0.88	#541
Unsignalized Intersections				
6. Ruggles Street/ MBTA Entrance				
Ruggles Street NB thru/right	A	0.0	0.59	0
Ruggles Street SB left/thru | thru	C	22.4	0.26	23
7. Columbus Avenue/St. Cyprians Place				
Columbus Avenue EB thru	A	0.0	0.18	0
Columbus Avenue WB thru	A	0.0	0.31	0
St. Cyprians Place NB left/right	B	11.7	0.07	5
8. Columbus Avenue/Cunard Street/Columbus Lot Driveway				
Columbus Avenue EB left/thru/right	A	1.5	0.04	3
Columbus Avenue WB left/thru/right	A	0.7	0.02	2
Columbus Lot Driveway SB left/thru/right	F	>50.0	>1.00	313
9. Columbus Avenue/Coventry Street				
Columbus Avenue EB thru	A	0.0	0.25	0
Columbus Avenue WB thru	A	0.0	0.27	0
Coventry Street NB left/right	B	14.1	0.09	8
10. Columbus Avenue/Burke Street/Columbus Garage Driveway				
Columbus Avenue EB left/thru/right	A	0.7	0.02	2
Columbus Avenue WB left/thru/right	A	0.5	0.02	1
11. Columbus Avenue/Camden Street				
Columbus Avenue EB left/thru/right	A	0.3	0.01	1
Columbus Avenue WB left/thru/right	A	1.4	0.05	4
Camden Street NB left/thru/right	C	20.4	0.10	8
Camden Street SB left/thru/right	C	22.0	0.08	6

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

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

Grey shading indicates change in LOS from Existing Condition.

In the a.m. peak hour, under 2018 No-Build conditions, all signalized intersections and unsignalized intersection approaches remain at the same LOS as the Existing condition except

Tremont Street/Melnea Cass Boulevard signalized intersection, which decreases from LOS E to LOS F given the growth in traffic.

In the p.m. peak hour, under 2018 No-Build conditions, all signalized intersections and unsignalized intersection approaches remain at the same LOS as the Existing conditions except the two intersections operating at LOS E under existing conditions – Ruggles Street/Tremont Street/Whittier Street and Tremont Street/Melnea Cass Boulevard – decrease to LOS F.

5.3.3 2018 Build Conditions

For the Build Condition, the impacts associated with the proposed Interdisciplinary Science and Engineering Building (ISEB) Project are added to the No Build Conditions, under the same 2018 horizon year. The proposed Project involves the development of a new building of approximately 197,000 (FAR) GSF on Columbus Lot. This new building will displace approximately 317 existing surface parking spaces and incorporate new pedestrian crossings over the Southwest Corridor train tracks, linking the north and south campuses.

Trip Generation

The new building is projected to accommodate both students and staff to be relocated from existing buildings on the campus, as well as an estimated 560 new graduate students and up to 140 new faculty and support staff. Trip generation estimates for the proposed new building are based on these projected changes in graduate student enrollment and the number of employees using a variety of sources specific to Northeastern University, including 2012 DEP Rideshare survey data, parking occupancy counts, parking lot/garage driveway counts, and parking permit data. Because no new housing is being provided on campus as part of this project, all trips being made by the new graduate students and employees are analyzed as commuter trips.

Commuter Mode Share

In just the past 10 to 15 years, the University has undergone a number of changes that have impacted commuting behavior. Changes include, but are not limited to, reducing overall enrollment as the University continues to focus on academic excellence; the addition of approximately 5,000 new beds on-campus (including GrandMarc); increased bicycle use; increased out-of-area cooperative education placements; a growing demand for online and distance learning; and increased opportunities for study abroad and similar experiential education programs outside Massachusetts.

The 2012 DEP Rideshare Survey indicates trips made by automobile to/from campus (including single occupant cars and carpools) have declined dramatically since the 2000 IMP – from 31% to just 7% for students and from 58% to only 33% for faculty/staff, as shown in **Table 5-16,** below. Overall, as shown, drive trips accounted for only 14% of total commute trips to the campus in 2012.

Table 5-16: Percentage of Trips by Commute Mode			
Mode	Student Trips	Faculty/Staff Trips	Total Trips
Drive alone	6.1%	28.7%	12.1%
Carpool	1.0%	4.2%	1.8%
Public transportation	32.2%	53.3%	37.7%
Motorcycle	0.3%	0.6%	0.3%
Walk	49.4%	6.2%	38.0%
Bike	10.7%	4.1%	9.0%
Telecommute	0.0%	2.5%	0.7%
Flex-time	0.0%	0.3%	0.1%
Other	0.3%	0.1%	0.3%
Total	100.0%	100.0%	100.0%

Source: 2012 DEP Rideshare Survey, Office of Institutional Research (OIR), Northeastern University.

Also of note are the high proportion of walk trips for students – 49.4% -- and the high proportion of public transportation trips for faculty and staff – 53%. These two modes accounted for 75% of total campus commute trips. Bicycles accounted for 9% of overall commute trips.

These mode shares were applied to person trip estimates to obtain trips by vehicle, transit and walk/bike/other for use in the impact analyses.

Vehicle Occupancy Rate

Using 2012 DEP Rideshare data and a conservative assumption that each carpool accommodates two passengers and yields a Vehicle Occupancy Rate (VOR) of 1.13 for students and 1.12 for faculty/staff.

Summary of 2018 ISEB Trip Generation by Mode

Estimated morning and evening peak hour trip generation, by mode in 2018 for commuting graduate students and faculty/staff, generated by the ISEB project is summarized in **Table 5-17.**

Table 5-17: Summary of ISEB Trip Generation by Mode					
Period	Direction	Auto	Transit	Walk	Bike
Daily	In	126	413	475	110
	Out	126	413	475	110
	Total	252	826	950	220
a.m. Peak Hour	In	15	42	39	9
	Out	3	12	18	4
	Total	18	54	57	13
p.m. Peak Hour	In	9	42	63	14
	Out	19	55	55	13
	Total	28	97	118	27

On a daily basis, the new building is expected to generate 252 new vehicle trips (126 trips in and 126 trips out). During the a.m. and p.m. peak hours, the project is expected to generate only 18 and 28 vehicle trips, respectively – this corresponds to just one new vehicle trip every two to three minutes on area roadways. Overall, the project will have a negligible impact on area roadways during the peak hours.

Regional Trip Distribution

Vehicle trips approaching and leaving the campus were assigned to the following general travel routes and campus gateways:

- Westland Avenue at Hemenway Street – The intersection serves traffic coming off of Storrow Drive. Vehicles coming from the major highways, I-93 southbound and the Concord Turnpike access Northeastern via Storrow Drive.
- Huntington Avenue at Massachusetts Avenue – This intersection serves traffic from the Massachusetts Turnpike and Downtown Boston.
- Huntington Avenue at Ruggles Street/Louis Prang Street – This intersection serves traffic from Route 9 and the Riverway.
- Massachusetts Avenue at Westland Avenue – This intersection serves traffic from Storrow Drive via Westland Avenue and Cambridge via Massachusetts Avenue.
- Melnea Cass Boulevard at Tremont Street – This intersection serves traffic from the Southeast Expressway and parts of South Boston such as Dorchester and Roxbury.
- Tremont Street at Ruggles Street – This intersection serves mainly local traffic from the southwest using Route 28 northbound.
- Fenway at Louis Prang Street – This intersection serves traffic from Allston, Brighton, Brookline and Cambridge.

- Massachusetts Avenue at Columbus Avenue – This intersection serves traffic from the Southeast Expressway via Massachusetts Avenue and parts of the South End

Using parking permit data mixed with zip code data provided by Northeastern, the study team distributed peak hour vehicle trips to and from each route. The resulting overall trip distribution for trips entering and exiting the campus is shown in **Figure 5-17.**

To provide a conservative estimate of traffic increases at study area intersections, it was assumed that all new vehicle trips accessing the ISEB would park either at the remaining 165 spaces within Columbus Lot or within the Columbus Garage. This assumption is conservative in that some of these new vehicle trips may choose to park in one of the other parking garages or lots on the campus, which would act towards diffusing the overall impact of any such traffic increases.

Traffic Shifts due to Parking Consolidation

As part of the ISEB project, roughly one-half of Columbus Lot will be removed, leaving only approximately 165 surface spaces. The existing, but currently inactive, driveway opposite St. Cyprians Place would be re-utilized to serve the remaining spaces in the Columbus Lot. It is assumed for purposes of analysis that those parking in the approximately 317 spaces to be eliminated will in the future park in the Columbus Garage.

The analysis reflects a proportional relocation of peak hour trips from that lot to the Columbus Garage, which has adequate capacity to accommodate the relocated trips and the new demand. The relocation of the driveway and new trips to the Columbus Garage are expected to affect traffic operations only at intersections immediately surrounding the south campus borders.

2018 Build Conditions Traffic Volumes

To obtain Build volumes, trip generation estimates for the IMP projects and relocated trips resulting from parking space consolidation were added to the morning and evening peak hour traffic volumes at study area intersections for 2018 Build conditions as shown in **Figure 5-18** and **Figure 5-19**.

2018 Build Conditions Traffic Operations Analysis

Traffic operations under 2018 Build conditions were analyzed at all study area intersections. The results of the 2018 Build conditions traffic analysis at study area intersections are presented in **Table 5-18** and **Table 5-19** for the a.m. and p.m. peak hours.

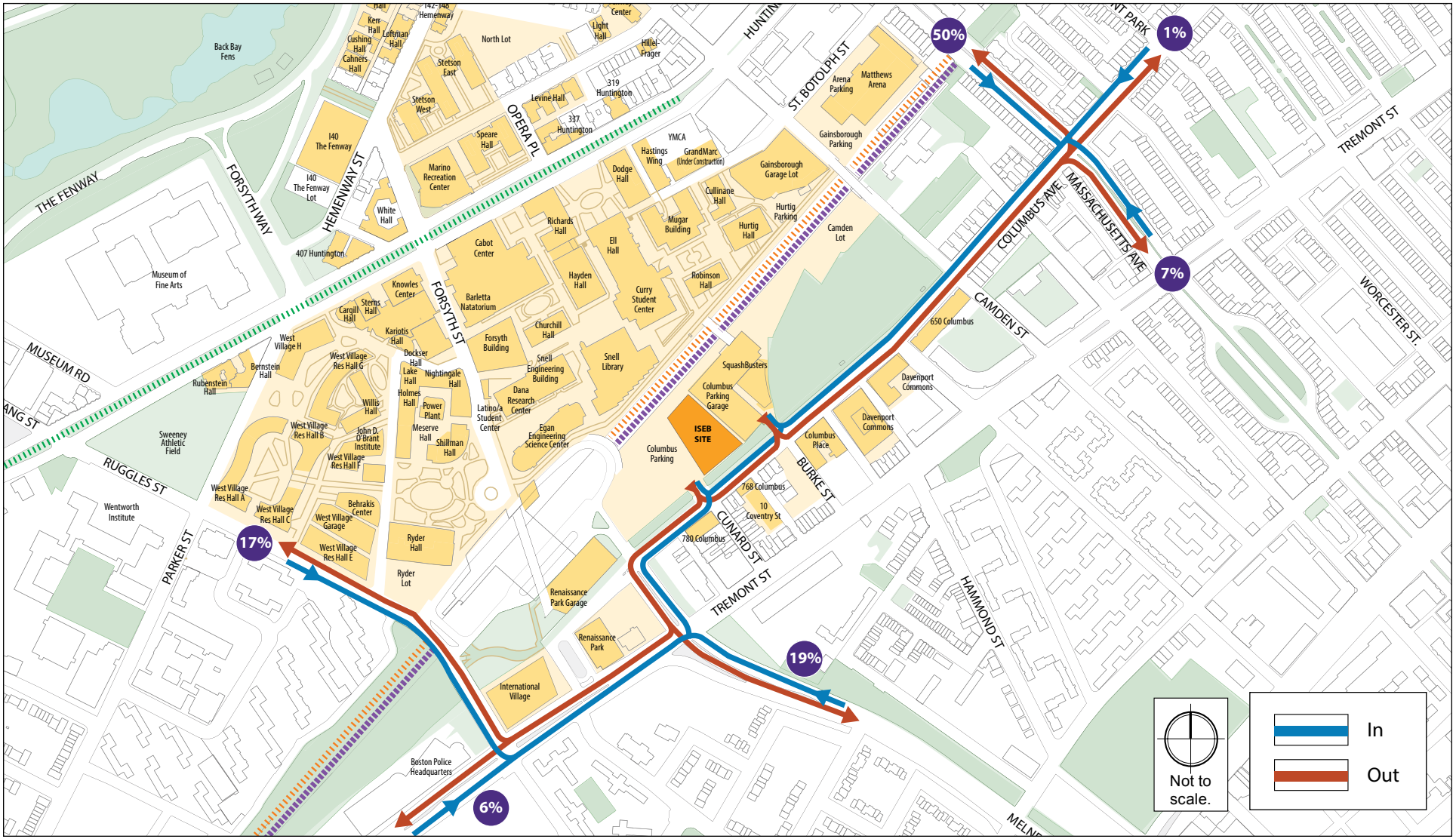


Figure 5-17.
Trip Distribution

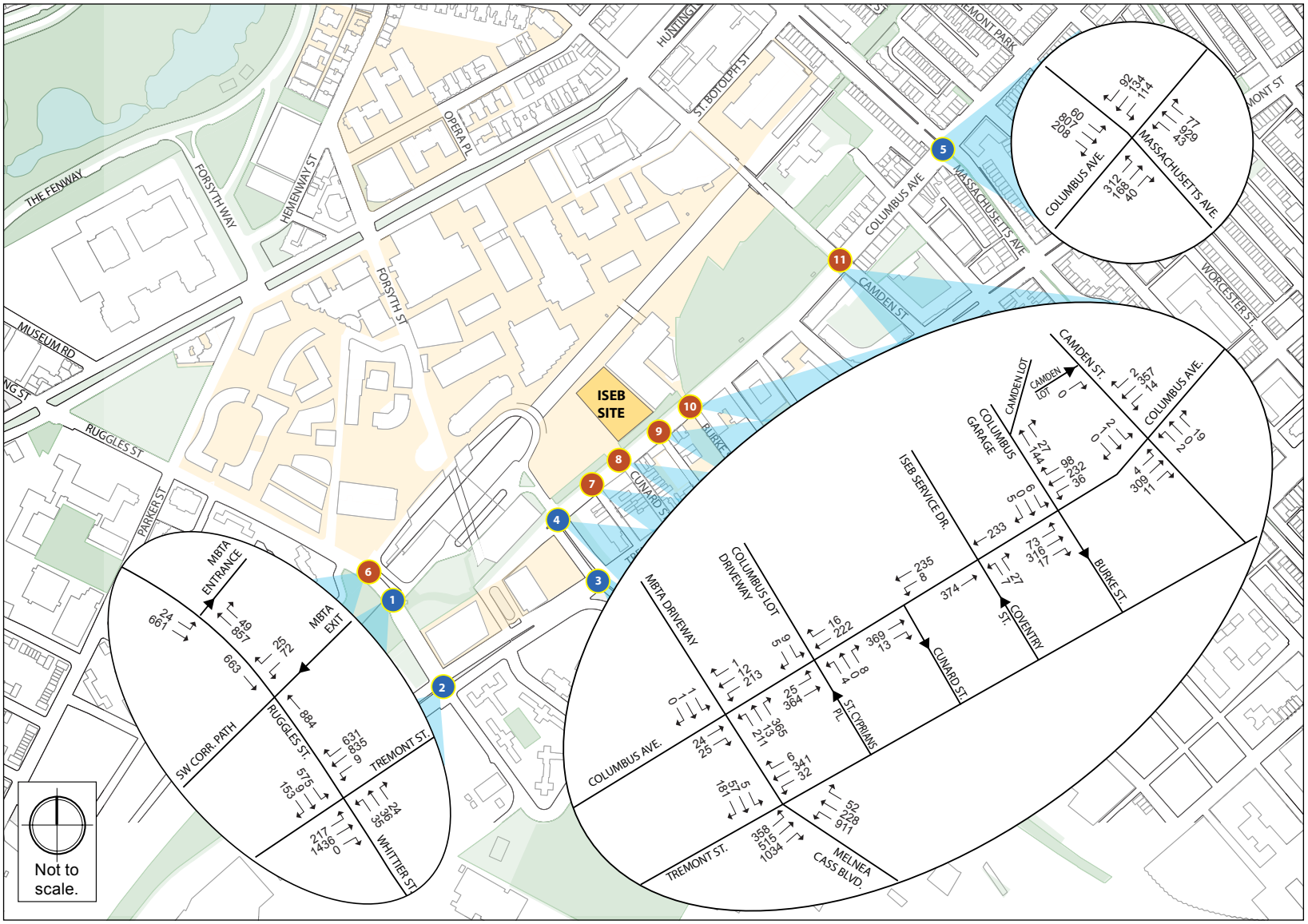


Figure 5-18.
Build Conditions (2018) Traffic Volumes, a.m. Peak Hour

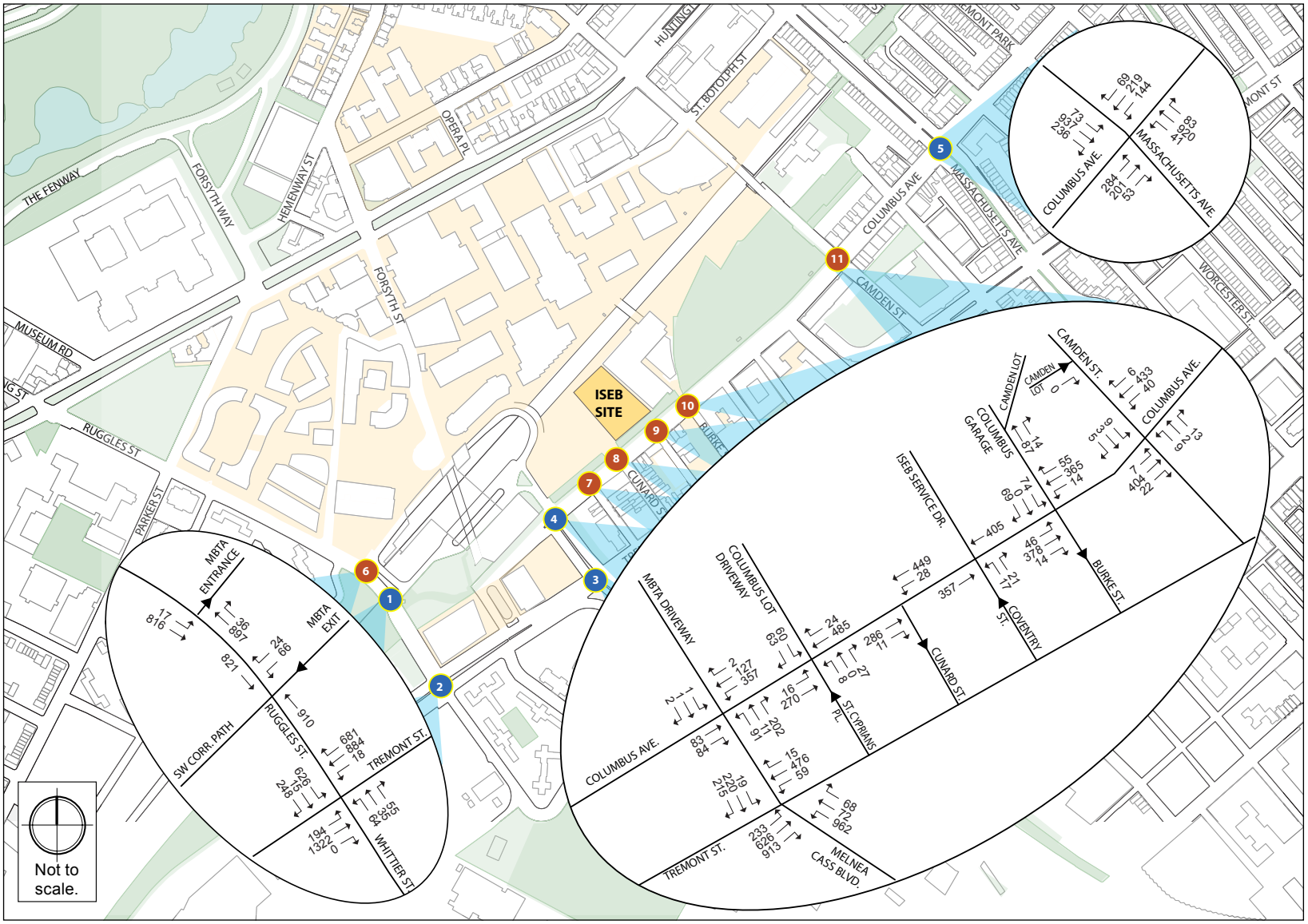


Figure 5-19.
Build Conditions (2018) Traffic Volumes, p.m. Peak Hour

Table 5-18: Build Conditions (2018) Capacity Analysis Summary, a.m. Peak Hour				
Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (feet)
Signalized Intersections				
1. RugglesStreet/MBTA Exit	**B**	**18.9**	-	-
MBTA Exit WB left	D	40.3	0.53	70
MBTA Exit WB right	B	12.9	0.17	20
RugglesStreet NB thru	C	26.8	0.86	m#1531
RugglesStreet SB thru	A	6.2	0.35	123
2. RugglesStreet/Tremont Street/ Whittier Street	**D**	**35.5**	-	-
Tremont Street EB left	F	>80.0	0.90	#347
Tremont Street EB thru	B	18.4	0.58	415
Tremont Street WB thru	D	40.9	0.72	#551
Tremont Street WB right	C	26.4	0.80	#844
Whittier Street NB left	E	66.3	0.31	67
Whittier Street NB thru/right	E	56.8	0.49	87
Ruggles Street SB left	E	62.5	0.83	#267
Ruggles Street SB right	A	7.2	0.24	67
3. Tremont Street/Melnea Cass Boulevard	**F**	>80.0	-	-
Tremont Street EB left/thru | thru	F	>80.0	>1.00	#538
Tremont Street EB right	A	5.4	0.81	0
Tremont Street WB left/thru | thru/right	C	34.1	0.63	#214
Melnea Cass Blvd NB left	F	>80.0	>1.00	#697
Melnea Cass Blvd NB left/thru | thru/right	F	>80.0	>1.00	#468
Melnea Cass Boulevard SB left/thru	C	29.5	0.35	m90
Melnea Cass Boulevard SB right	B	19.9	0.61	m159
4. Melnea Cass Boulevard/Columbus Avenue/MBTA Ruggles Station Driveway	**B**	**17.7**	-	-
Columbus Avenue EB left/thru | thru/right	C	26.9	0.22	27
Columbus Avenue WB left/thru/right	C	22.5	0.38	m#222
Melnea Cass Boulevard NB left/thru	D	36.8	0.82	m88
Melnea Cass Boulevard NB right	A	1.6	0.34	m5
MBTA Ruggles Station Driveway SB left/thru/right	C	21.0	0.01	6

5. Massachusetts Avenue/ Columbus Avenue	**C**	**33.7**	-	-
Columbus Avenue EB left	F	>80.0	>1.00	m#420
Columbus Avenue EB thru | thru/right	C	30.7	0.31	m84
Columbus Avenue WB left	C	29.9	0.48	93
Columbus Avenue WB thru/right	E	64.4	0.85	#249
Massachusetts Avenue NB left	B	16.3	0.30	m21
Massachusetts Avenue NB thru | thru/right	C	21.2	0.81	#461
Massachusetts Avenue SB left	C	22.8	0.45	m23
Massachusetts Avenue SB thru | thru/right	B	14.0	0.81	#472
Unsignalized Intersections				
6. Ruggles Street/ MBTA Entrance				
Ruggles Street NB thru/right	A	0.0	0.58	0
Ruggles Street SB left/thru | thru	B	11.0	0.28	20
7. Columbus Avenue/St. Cyprians Place				
Columbus Avenue EB left/thru	A	0.7	0.02	2
Columbus Avenue WB thru/right	A	0.0	0.15	0
St. Cyprians Place NB left/thru/right	B	12.3	0.03	2
Columbus Lot SB left/right	B	13.8	0.04	3
8. Columbus Avenue/Cunard Street/Columbus Lot Driveway				
Columbus Avenue EB thru/right	A	0.0	0.24	0
Columbus Avenue WB left/thru	A	0.4	0.01	1
9. Columbus Avenue/Coventry Street				
Columbus Avenue EB thru	A	0.0	0.24	0
Columbus Avenue WB thru	A	0.0	0.15	0
Coventry Street NB left/right	B	11.7	0.06	5
10. Columbus Avenue/Burke Street/Columbus Garage Driveway				
Columbus Avenue EB left/thru/right	A	2.4	0.08	7
Columbus Avenue WB left/thru/right	A	1.2	0.04	3
Columbus Garage SB left/thru/right	C	21.1	0.05	4
11. Columbus Avenue/Camden Street				
Columbus Avenue EB left/thru/right	A	0.1	0.00	0
Columbus Avenue WB left/thru/right	A	0.5	0.01	1
Camden Street NB left/thru/right	B	13.1	0.05	4
Camden Street SB left/thru/right	C	20.8	0.01	1

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

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

Grey shading indicates change in LOS operation from No-Build condition below LOS D.

Table 5-19: Build Conditions (2018) Capacity Analysis Summary, p.m. Peak Hour				
Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	95th Percentile Queue (feet)
Signalized Intersections				
1. Ruggles Street/MBTA Exit	**B**	**16.8**	-	-
MBTA Exit WB left	D	38.9	0.49	68
MBTA Exit WB right	B	13.2	0.16	20
Ruggles Street NB thru	C	24.4	0.85	m#1534
Ruggles Street SB thru	A	6.8	0.41	141
2. Ruggles Street/Tremont Street/ Whittier Street	**F**	**>80.0**	-	-
Tremont Street EB left	F	>80.0	0.93	#342
Tremont Street EB thru	C	23.7	0.59	397
Tremont Street WB thru	F	>80.0	0.83	#594
Tremont Street WB right	E	69.3	0.80	#720
Whittier Street NB left	E	68.4	0.46	109
Whittier Street NB thru/right	E	67.2	0.66	128
Ruggles Street SB left	E	69.2	0.79	324
Ruggles Street SB right	A	6.0	0.36	75
3. Tremont Street/Melnea Cass Boulevard	**F**	**>80.0**	-	-
Tremont Street EB left/thru | thru	F	>80.0	>1.00	#544
Tremont Street EB right	A	3.0	0.71	0
Tremont Street WB left/thru | thru/right	F	>80.0	>1.00	m#369
Melnea Cass Boulevard NB left	F	>80.0	>1.00	#721
Melnea Cass Boulevard NB left/thru | thru/right	E	61.6	>1.00	#354
Melnea Cass Boulevard SB left/thru	E	57.6	0.91	m#287
Melnea Cass Boulevard SB right	A	7.6	0.55	m34
4. Melnea Cass Boulevard/Columbus Avenue/MBTA Ruggles Station Driveway	**C**	**21.9**	-	-
Columbus Avenue EB left/thru | thru/right	C	28.0	0.54	63
Columbus Avenue WB left/thru/right	C	22.9	0.65	m#486
Melnea Cass Boulevard NB left/thru	D	45.3	0.83	m49
Melnea Cass Boulevard NB right	A	1.0	0.20	m0
MBTA Ruggles Station Driveway SB left/thru/right	C	27.2	0.02	11

5. Massachusetts Avenue/ Columbus Avenue	**D**	**42.1**	-	-
Columbus Avenue EB left	F	>80.0	>1.00	#369
Columbus Avenue EB thru | thru/right	C	32.9	0.39	106
Columbus Avenue WB left	C	35.0	0.58	123
Columbus Avenue WB thru/right	E	69.9	0.92	#342
Massachusetts Avenue NB left	B	16.9	0.31	m16
Massachusetts Avenue NB thru | thru/right	B	13.0	0.73	154
Massachusetts Avenue SB left	B	14.5	0.42	m14
Massachusetts Avenue SB thru | thru/right	B	16.5	0.88	#545
Unsignalized Intersections				
6. Ruggles Street/ MBTA Entrance				
Ruggles Street NB thru/right	A	0.0	0.60	0
Ruggles Street SB left/thru | thru	C	23.0	0.26	23
7. Columbus Avenue/St. Cyprians Place				
Columbus Avenue EB left/thru	A	0.6	0.02	1
Columbus Avenue WB thru/right	A	0.0	0.33	0
St. Cyprians Place NB left/thru/right	B	13.4	0.08	7
Columbus Lot SB left/right	C	22.7	0.40	46
8. Columbus Avenue/Cunard Street/Columbus Lot Driveway				
Columbus Avenue EB thru/right	A	0.0	0.19	0
Columbus Avenue WB left/thru	A	0.8	0.03	2
9. Columbus Avenue/Coventry Street				
Columbus Avenue EB thru	A	0.0	0.23	0
Columbus Avenue WB thru	A	0.0	0.26	0
Coventry Street NB left/right	B	13.4	0.09	7
10. Columbus Avenue/Burke Street/Columbus Garage Driveway				
Columbus Avenue EB left/thru/right	A	1.8	0.07	5
Columbus Avenue WB left/thru/right	A	0.5	0.02	1
Columbus Garage SB left/thru/right	F	>50.0	>1.00	209
11. Columbus Avenue/Camden Street				
Columbus Avenue EB left/thru/right	A	0.3	0.01	1
Columbus Avenue WB left/thru/right	A	1.4	0.05	4
Camden Street NB left/thru/right	C	20.6	0.10	8
Camden Street SB left/thru/right	C	22.2	0.08	7

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

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

Grey shading indicates change in LOS operation from No-Build condition below LOS D.

Under 2018 Build conditions, all study area intersections and approaches continue to operate at the same LOS as the No-Build condition due to the small changes in traffic volume.

At the intersection of Columbus Avenue/Burke Street/Columbus Garage Driveway, the Columbus Garage Driveway southbound stop-controlled approach will operate at LOS C during the weekday morning peak hour and LOS F during the weekday evening peak hour. It should be noted that this level of operations (LOS F) is typical for a stop controlled minor driveway that intersects a major arterial roadway.

Table 5-20 and **Table 5-21** summarize intersection LOS and delay for the all the conditions.

Table 5-20: Intersection Operations Summary: a.m. Peak Hour						
Intersection/Approach	2013 Existing Condition		2018 No-Build Condition		2018 Build Condition	
	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)
Signalized Intersections						
1. Ruggles Street/MBTA Exit	B	15.8	B	18.9	B	18.9
2. Ruggles Street/Tremont Street/ Whittier Street	D	36.9	D	35.3	D	35.5
3. Tremont Street/Melnea Cass Boulevard	E	72.6	F	>80.0	F	>80.0
4. Melnea Cass Boulevard/Columbus Avenue/MBTA Ruggles Station Driveway	B	18.2	B	17.8	B	17.7
5. Massachusetts Avenue/ Columbus Avenue	D	36.5	C	33.3	C	33.7
Unsignalized Intersections						
6. Ruggles Street/ MBTA Entrance	-	-	-	-	-	-
Ruggles Street SB left/thru l thru	A	4.7	B	10.9	B	11.0
7. Columbus Avenue/St. Cyprians Place	-	-	-	-	-	-
St. Cyprians Place NB left/right	B	11.4	B	11.7	B	12.3
Columbus Lot SB left/right	-	-	-	-	B[2]	13.8[2]
8. Columbus Avenue/Cunard Street/Columbus Lot Driveway	-	-	-	-	-	-
Columbus Lot SB left/thru/right	D	30.5	C	23.4	-[1]	-[1]
9. Columbus Avenue/Coventry Street	-	-	-	-	-	-
Coventry Street NB left/right	B	12.1	B	11.4	B	11.7
10. Columbus Avenue/Burke Street/Columbus Garage Driveway	-	-	-	-	-	-
Columbus Garage SB left/right	-	-	-	-	C[3]	21.1[3]
11. Columbus Avenue/Camden Street	-	-	-	-	-	-
Camden Street NB left/thru/right	B	14.2	B	13.1	B	13.1
Camden Street SB left/thru/right	C	23.1	C	20.6	C	20.8

Grey shading indicates LOS operates below LOS D in Existing Conditions or change below LOS D in No-Build or Build Conditions.

1 Driveway removed due to proposed building.

2 Columbus Lot Driveway re-opened and reconfigured.

3 Columbus Garage Driveway reconfigured to two-way flow.

Table 5-21: Intersection Operations Summary: p.m. Peak Hour						
Intersection/Approach	2013 Existing Condition		2018 No-Build Condition		2018 Build Condition	
	LOS	Delay (seconds)	LOS	Delay (seconds)	LOS	Delay (seconds)
Signalized Intersections						
1. Ruggles Street/MBTA Exit	B	14.2	B	16.7	B	16.8
2. Ruggles Street/Tremont Street/ Whittier Street	E	61.9	F	>80.0	F	>80.0
3. Tremont Street/Melnea Cass Boulevard	E	78.6	F	>80.0	F	>80.0
4. Melnea Cass Boulevard/Columbus Avenue/MBTA Ruggles Station Driveway	C	22.5	C	22.0	C	21.9
5. Massachusetts Avenue/ Columbus Avenue	D	41.5	D	39.6	D	42.1
Unsignalized Intersections						
6. Ruggles Street/ MBTA Entrance	-	-	-	-	-	-
Ruggles Street SB left/thru | thru	A	2.7	C	22.4	C	23.0
7. Columbus Avenue/St. Cyprians Place	-	-	-	-	-	-
St. Cyprians Place NB left/right	B	12.3	B	11.7	B	13.4
Columbus Lot SB left/right	-	-	-	-	C[2]	22.7[2]
8. Columbus Avenue/Cunard Street	-	-	-	-	-	-
Columbus Lot SB left/thru/right	F	>50.0	F	>50.0	-[1]	-[1]
9.. Columbus Avenue/Coventry Street	-	-	-	-	-	-
Coventry Street NB left/right	C	17.0	B	14.1	B	13.4
10. Columbus Avenue/Burke Street/Columbus Garage Driveway	-	-	-	-	-	-
Columbus Garage SB left/thru/right	-	-	-	-	F[3]	>50.0[3]
11. Columbus Avenue/Camden Street	-	-	-	-	-	-
Camden Street NB left/thru/right	C	20.0	C	20.4	C	20.6
Camden Street SB left/thru/right	C	21.4	C	22.0	C	22.2

Grey shading indicates LOS operates below LOS D in Existing Conditions or change below LOS D in No-Build or Build Conditions.

1 Driveway removed due to proposed building.

2 Columbus Lot Driveway re-opened and reconfigured.

3 Columbus Garage Driveway reconfigured to two-way flow.

Future (2018) Parking Supply and Demand

As discussed above, the University has undergone a number of changes in recent years that have impacted commuting behavior and parking demand. These changes have all reduced automobile use by faculty, staff and students, as well as parking demand on a per person basis. Since the 2000 IMP, Northeastern has added more than 2.3 million square feet of new construction but only added parking at a ratio of 0.32 parking spaces per 1,000 square feet, which has reduced the overall campus parking ratio from about 0.76 spaces per 1,000 square feet in 2000 to just 0.58 spaces per 1,000 square feet today.

As noted above, one of the major changes resulting from the proposed ISEB project will be the effects on campus parking, as there will be no new parking built in association with the proposed new building. In 2013, there is a peak period surplus of 1,065 spaces. At the time the building goes into construction, the overall campus supply will be reduced by 317 spaces, reducing the surplus to 748 spaces. The addition of the new graduate students and faculty/staff associated with the ISEB are expected to increase mid-day peak demand by only approximately 65 parking spaces, which will further reduce the parking surplus to approximately 683 spaces.

As detailed in the IMP, this surplus will be utilized to accommodate other planned/proposed building projects, which all have no new parking, and in some cases further reduce the campus paring supply.

Public Transportation

The number of student transit trips to the campus has declined over the past ten years as the number of dormitory beds has increased. At the same time, the number of faculty/staff trips by transit has increased, so that transit accounts for 37.7% of total campus commute trips in 2013.

As shown above in **Table 5-16,** above, added peak hour transit trips resulting from the ISEB are not expected to add significantly to peak loads on MBTA trains or buses.

Pedestrian Improvements

The proposed ISEB Project includes several improvements to the pedestrian environment in the vicinity of the site:

- Construction of new pedestrian crossings over the Southwest Corridor train tracks, which will greatly improve intra-campus connectivity as well as an enhanced north – south pedestrian connection for the community.
- The addition of a new sidewalk in between the proposed ISEB and the Columbus Garage that would provide an enhanced pedestrian connection between the planned Ruggles Platform Extension and Columbus Avenue.
- Improvements to the streetscape and landscape within the site, which is currently a surface parking lot, which will enhance the overall pedestrian environment.

Bicycles

As described under Existing Conditions above, cycling has been increasing on campus as the increasing numbers of resident students are restricted from owning automobiles and employee parking demand has decreased over the years. In accordance with the City of Boston Bicycle parking Guidelines, the proposed ISEB will provide a dedicated bike storage room and shower facilities within the ground floor of the new building for use by students and employees. In addition, the Project would provide additional bicycle racks on-site for use by visitors and guests.

Loading and Service

The proposed ISEB will be served by off-street loading facilities. The details of the loading area will be worked out as the building proceeds through design.

The loading facilities will be generally used by single-unit trucks and vans dispatched from the University's central receiving area. They will operate according to existing Northeastern policies and procedures as described above under Existing Conditions.

Transportation Demand Management

Northeastern University is committed to continuing its active Transportation Demand Management Program. It is expected that enhanced bicycle storage, expansion of car-sharing opportunities, provisions for alternative fuel vehicles, and continued attention to parking availability and pricing will be priority efforts over the term of the IMP. As the parking supply on campus is reduced due to new building projects, parking ratios for students and staff will decrease. This reduced availability typically leads to higher fees, and in itself acts as a demand management measure. The proposed ISEB includes enhanced bicycle storage and shower facilities for students and employees, which will further facilitate commuting by bicycle.

Northeastern is committed to working with BTD to continually update and add to TDM programs. Specific commitments with respect to the Project will be documented in a Transportation Access Plan Agreement (TAPA) with BTD.

Construction Period Impacts

As the project progresses into construction, Northeastern University will develop detailed evaluations of potential short-term construction-related impacts. Working with the Boston Transportation Department (BTD), the University will specify construction vehicle traffic routing, worker parking, and pedestrian access around construction sites. A detailed Construction Management Plan will be developed and submitted to BTD for the project. It is anticipated that Columbus Avenue and Melnea Cass Boulevard will be the primary access routes for construction vehicles. Construction workers will be encouraged to use public transportation to access the campus. Contractors will be encouraged to provide incentives for transit use. The University will work with the Boston Police Department and BTD to ensure that on-street parking regulations in the area and in designated Residential Parking areas are enforced.

6.0 INFRASTRUCTURE SYSTEMS COMPONENT

6.1 Introduction

The following analysis describes the existing utility systems in the Project area and their ability to service the Project. The analysis also discusses any likely Project-related impacts on the utilities and identifies mitigation measures to address these potential impacts.

When the Project moves into the Design Development phase, a detailed infrastructure analysis will be performed. The Project's team will coordinate with the appropriate utilities to assess the capacity of the area utilities to provide services for the new building. A BWSC Site Plan and General Service Application is required for the proposed new water, sewer, and drain connections. In addition, a Storm Water Pollution Prevention Plan will be submitted specifying best management measures for protecting the BWSC drainage system during construction.

A Drainage Discharge Permit Application will be submitted to the Boston Water and Sewer Commission ("BWSC") for any required construction dewatering. The appropriate approvals from the Massachusetts Water Resources Authority ("MWRA") and the U.S. Environmental Protection Agency ("EPA") will also be sought.

Other utility connections, such as gas, electric, and telephone will be installed in coordination with the respective utility providers

6.2 Wastewater

6.2.1 Existing Sewer System

Site sanitary sewage is currently discharged into the BWSC sewer main in Columbus Avenue. Sanitary sewage from this main is conveyed to the Massachusetts Water Resources Authority (MWRA) system for treatment.

The Project site currently is occupied by a surface parking lot alongside Columbus Avenue with an approximately 14,500 SF footprint. There is no existing sanitary discharge associated with this use. Columbus Avenue is served by a 42 x 44.5-inch sanitary sewer, which flows west, ultimately tying into the 120-inch MWRA System in Tremont Street (See **Figure 6-1**).

The proposed ISEB project is to be served by a new sanitary sewer connection.

6.2.2 Project-Generated Sewage Flow

The Project will generate an estimated 19,463 gallons per day (gpd) based on design sewer flows provided in 314 CMR 7.00-Sewer System Extension and Connection Permit Program as summarized in **Table 6-1.**

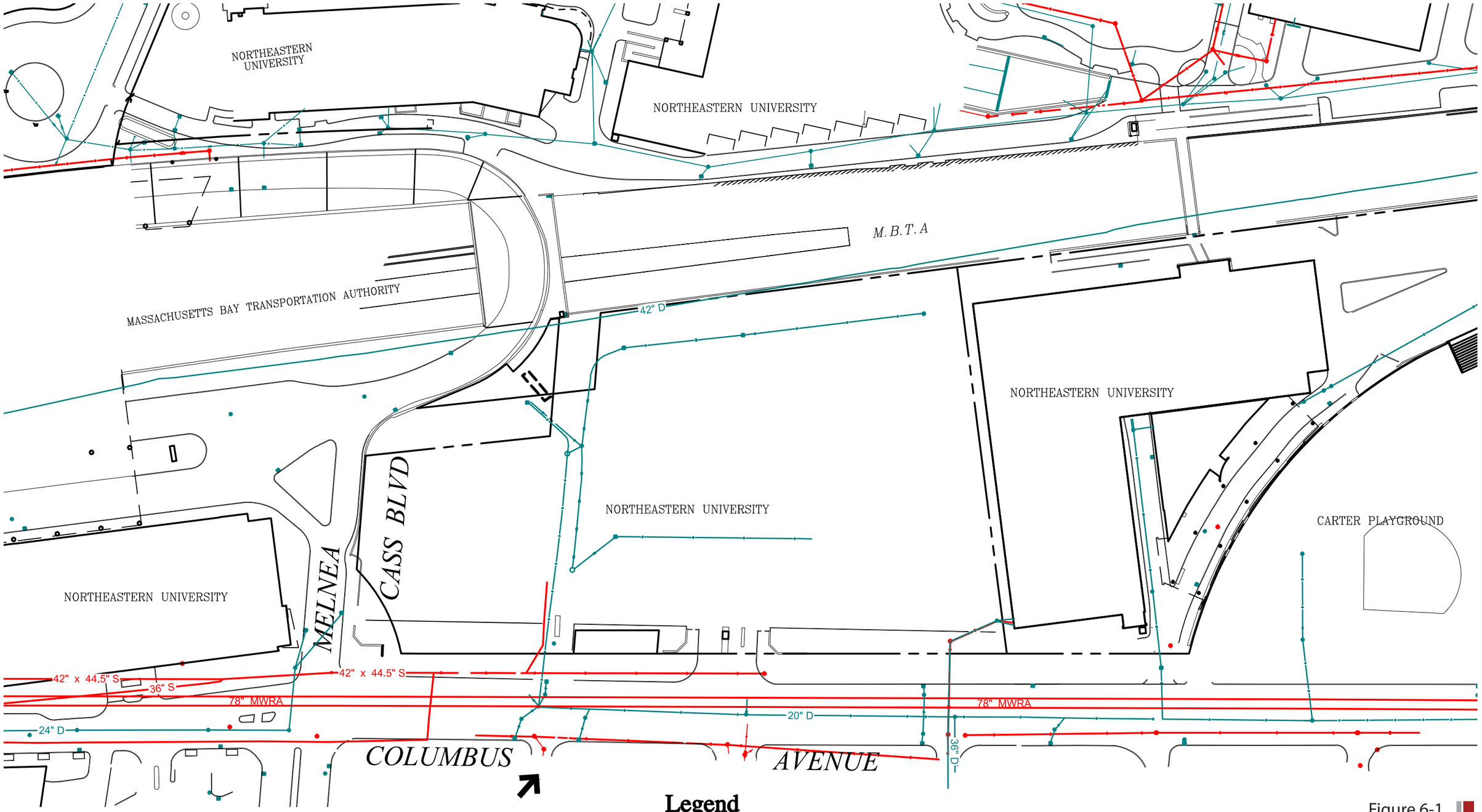


Figure 6-1.
Existing Sewer & Drain Utility Infrastructure

Table 6-1: Project Sewage Flows			
Use	**Quantity (GSF)**	**Title 5 Unit Design Flows**	**Estimated Maximum Daily Flow (gpd)**
Wet Lab	37,500	200 gpd/1,000 SF	7,500
Other Lab/Office Space	159,500	75 gpd/1,000 SF	11,963
Total	**197,000**	**-**	**19,463**

6.2.3 Sanitary Sewage Connection

It is expected that sanitary services for the Project will connect to the existing 42x44.5-inch sanitary sewer off the south side of the building, in Columbus Avenue. Preliminary meetings with BWSC did not identify any associated capacity constraints in the receiving sanitary system.

The Proponent will submit a Site Plan to the BWSC for review and approval. Based on the proposed estimated sanitary flow, a Sewer Connection Permit will not be required by the Massachusetts Department of Environmental Protection (DEP).

6.2.4 Effluent Quality

The Project will include discharge from laboratory sinks. If the use is anticipated to generate industrial wastes, the appropriate permits will be filed for by the Proponent. Flows from the floor drains of the loading area will be treated through an oil and grease separator before discharging to the municipal sewer system.

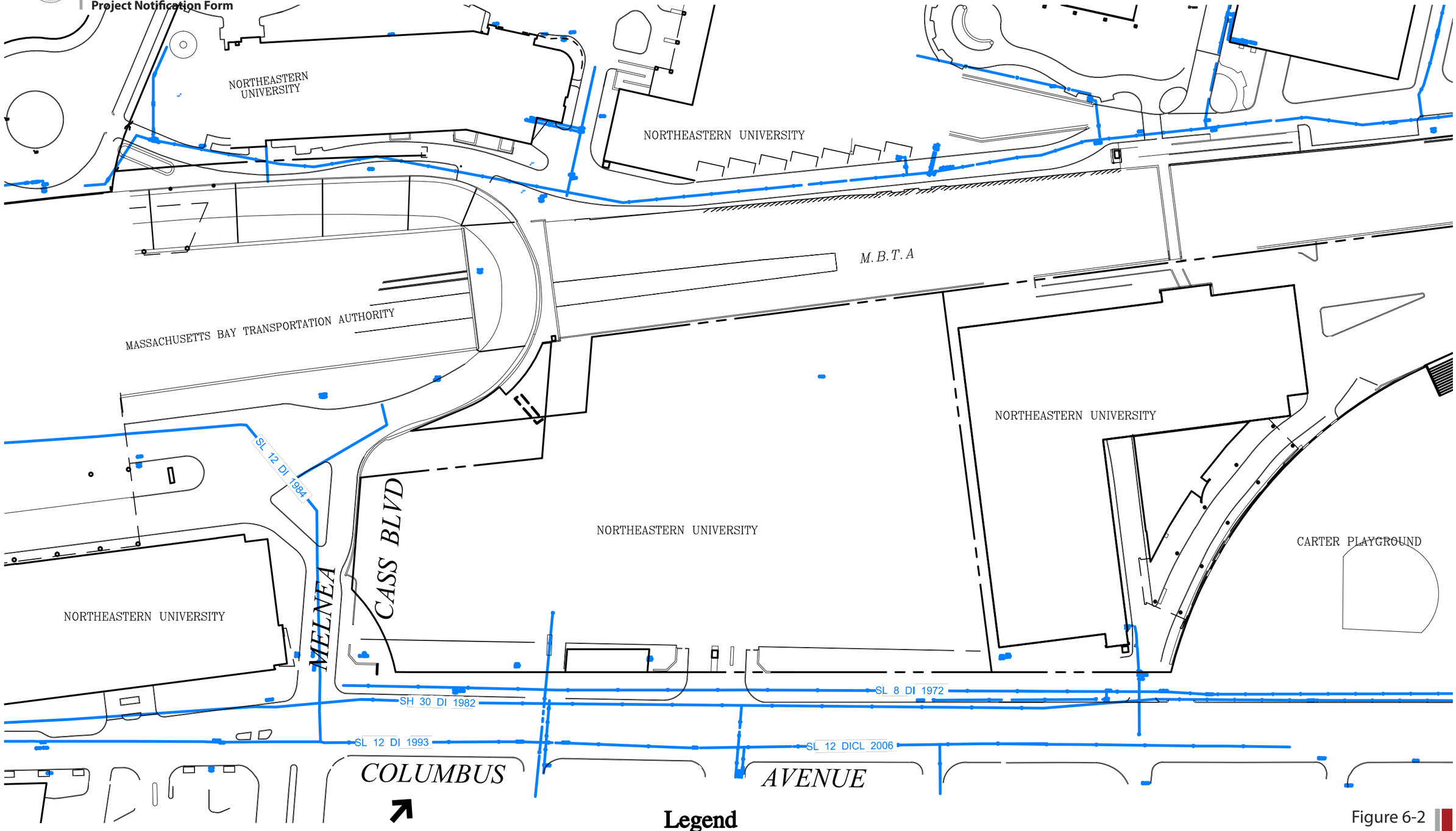
6.2.5 Sewer System Mitigation

To help conserve water and reduce the amount of wastewater generated by the Project, the Proponent will investigate the use of water conservation devices such as low-flow toilets and flow-restricting faucets.

6.3 Water Service

6.3.1 Existing Water Service

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. Domestic water and fire protection connections will be provided via the existing 12-inch southern low service mains in Columbus Avenue and Melnea Cass Boulevard (see **Figure 6-2**).



Vanasse Hangen Brustlin, Inc.

Figure 6-2
Existing Water Utility Infrastructure

It appears that sufficient fire hydrant coverage is provided by the existing water system. As the Project progresses, BWSC will be contacted to provide up to date hydrant flow information. This will be necessary to support the BWSC and Building Permit reviews.

6.3.2 Anticipated Water Consumption

The Project's water demand estimate for domestic services is based on the Project's estimated sewage generation, described below. A conservative factor of 1.1 is applied to the average daily wastewater flows to estimate average daily water demand. This factor accounts for consumption and other miscellaneous losses. The maximum daily water demand is estimated to be 21,410 gpd.

6.3.3 Proposed Water Service

The proposed ISEB will be serviced by separate domestic water and fire protection services that tie into the existing 12-inch southern low service mains in Columbus Avenue and Melnea Cass Boulevard via a looped configuration. The complete design, including connections to existing mains and master meter locations, will be coordinated with BWSC as necessary to obtain approval and a General Service Application prior to construction.

6.3.4 Water Supply Conservation and Mitigation Measures

The Proponent is considering the use of low-flow and low consumption plumbing fixtures and expects to achieve a 20% to 30% reduction in typical water usage.

6.4 Storm Drain System

6.4.1 Existing Storm Drainage System

Runoff from the Project Site is currently collected and conveyed to the surrounding municipal storm drain systems. There are no stormwater management systems that would attenuate peak flows and the Project Site provides little opportunity for recharge. Runoff from paved surfaces around the property is generally captured in catch basins with little or no sump. Very little water quality treatment is realized before these areas are drained to the municipal storm drain system.

The Project site currently is occupied by a surface parking lot alongside Columbus Avenue with an approximately 14,500 SF footprint. The project site currently has a storm drainage connection to the existing BWSC-owned system in Columbus Avenue (see **Figure 6-1**). The site drainage is conveyed to the Old Stony Brook Conduit in Forsyth Street.

6.4.2 Proposed Storm Drainage System

The proposed stormwater management system will be designed to improve existing conditions. The introduction of additional landscaping areas over existing conditions and a stormwater infiltration system will assist in reducing the phosphorous load to the Charles River, as well as attenuate peak stormwater rates and volumes. Infiltration systems will be sized to accommodate one inch of stormwater runoff over impervious site areas.

The catch basins within the project site area will be replaced with catch basins with deep sumps and outlet traps allowing removal of oil, sediment and debris before discharging to the municipal storm drain system. The Project will also include an operation and maintenance plan to ensure the long-term functionality of the stormwater management system.

6.4.3 Groundwater Conservation Overlay District

The project site is not located within the Groundwater Conservation Overlay District (GCOD), established pursuant to Article 32 of the Boston Zoning Code; therefore, approval will not be sought from the Groundwater Trust.

6.5 Mechanical, Electrical, Telecommunication and Plumbing Systems

NSTAR provides electric service in the City of Boston. The project team has met initially with NSTAR's engineering staff to confirm availability of adequate service at the project site and to review the proposed connection layout and configuration. The primary electric service to the proposed ISEB will be provided from an existing electric manhole in Columbus Avenue immediately in front of the site. The project will include a customer-owned substation located schematically at the rear of the site. As the design progresses, the project team will coordinate the design with NSTAR.

A life safety emergency/standby (diesel-fired) generator is proposed on the new building's roof. The fuel oil will be supplied by storage tanks located in the building.

Energy conservation measures are being investigated by the Project, such as the use of water-cooled equipment, controls to maximize free cooling/heat recovery, and variable frequency fans and pumps to minimize the Project's energy demands.

The street lighting system near the Project Site has not been identified as outdated or in need of repair. The street lighting system along Columbus Avenue will not be adversely impacted during construction. Construction may require the removal and storage of one or more street lights on Columbus Avenue, which will be replaced by the Proponent after construction. Proposed modifications to the City's street lighting system will be approved by the Public Works Department, Street Lighting Section.

6.5.1 Natural Gas Energy Systems

The ISEB will utilize natural gas for the proposed building mechanical system. National Grid provides natural gas service in the City of Boston. There is existing gas main in Columbus Avenue. It is expected that the project will connect to this existing gas main. The design team will closely coordinate with National Grid in the design of the final natural gas service for the ISEB.

6.5.2 Steam System

Northeastern maintains a steam system for its campus north of MBTA right-of-way. The Project is not expected to connect to this system.

6.5.3 Telephone/Fiber Optic Systems

Verizon maintains the telephone utilities in the project vicinity. The Project design anticipates new underground telephone services for the building from the Verizon system in Columbus Avenue.

6.5.4 Cable Systems

Comcast provides cable service in the Project area. There are existing underground cable lines and manholes in Columbus Avenue. It is expected that cable service to the ISEB will be provided from the Columbus Avenue.

6.6 Utility Protection during Construction

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

6.7 Coordination with the MBTA Ruggles Station Project

The ISEB site abuts the Massachusetts Bay Transportation Authority (MBTA) right-of-way to the north and is in close proximity to the existing Ruggles MBTA Commuter Rail/Rapid Transit Station to the west. MBTA owns the railroad right-of-way. This MBTA right-of-way contains tracks for the MBTA Rapid Transit (Orange Line), The Massachusetts Bay Commuter Rail (MBCR) Needham/Franklin/Providence lines and the Amtrak Northeast Corridor, which includes its ACELA high-speed electric line.

The MBTA is proposing to construct a new platform at Ruggles Station to improve inbound service on the MBCR lines. Portions of the new platform will be immediately adjacent to the ISEB site. It is expected that construction of the Ruggles Station platform may be coincident with the ISEB project. The project team has engaged the MBTA to begin discussion of the coordination of the two projects. As the projects progress, the project team will continue to coordinate with the MBTA to ensure the successful construction of the two projects.

The MBTA has an existing utility and maintenance easement within the ISEB site to service its right-of-way, and the platform project is anticipated to require relocation of this easement. . The project team will work with the MBTA to establish a new easement location as the design progresses.

7.0 HISTORIC RESOURCES

7.1 Introduction

This section identifies significant historic resources within ¼ mile of the proposed ISEB (see **Figure 7-1** and **Tables 7-1** and **7-2**), and assesses potential impacts of the Project on these resources. There are no known historic or archeological resources on the project site. The listing of State and National Register properties in **Table 7-1** contains six historic districts, six individual properties and one complex. The listing of properties that have been inventoried and have been recommended for National Register listing and/or for local landmark designation (see **Table 7-2**) contains three districts and two individual properties. The historic resources located on the site map shown in **Figure 7-1** also include the campus buildings constructed by Northeastern University between 1938 and 1968.

7.2 Existing Project Site

The approximate 3.5 acre Columbus Avenue surface parking lot located at 795 Columbus Avenue between the Renaissance Park Parking Garage and the Columbus Parking Garage, south of the MBTA tracks and on the north side of Columbus Avenue, is one of the last large potential development sites on the core campus. The irregularly-shaped parcel is almost fully paved with the exception of one line of trees and grass bordering the parking lot along Columbus Ave. and a narrow strip dividing the adjacent sidewalk.

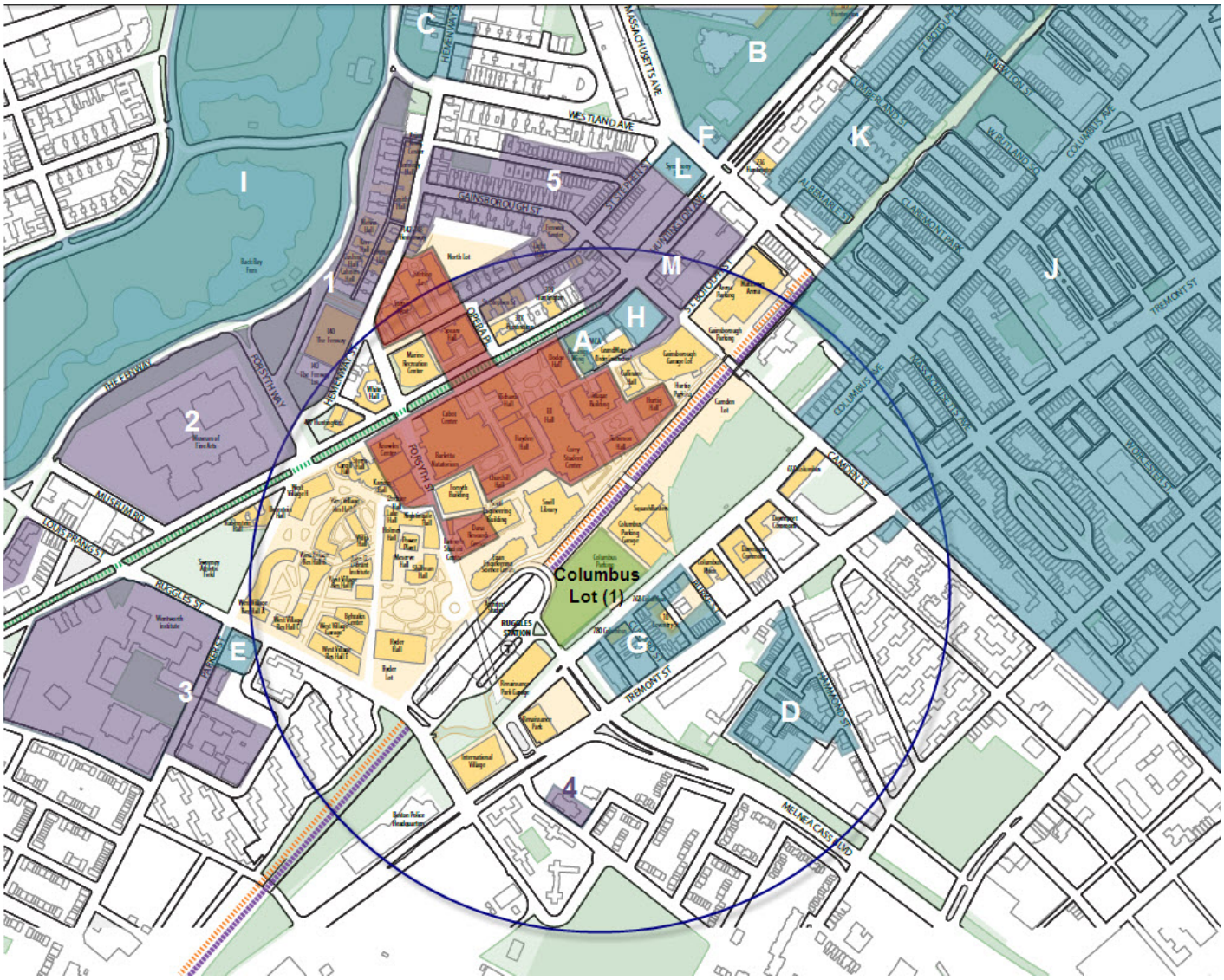
The site previously served as the location of the South End Grounds, called at one time the Boston Baseball Grounds. It was home to The Boston National League Baseball Co. team for over forty years beginning in the early 1870s. The grandstands and infield were located at the southwest end of the Columbus Avenue parking lot and the outfield and wooden bleachers were located where the Columbus Parking Garage is today. By 1922, the parcel had been purchased by the New York, New Haven & Hartford Railroad Company. Beginning in the early 1930s, New York, New Haven & Hartford RR started constructing buildings on the site. By 1938, there were three small attached three-story apartment buildings, a long narrow freight house along the tracks, and a concrete garage on Columbus Ave. From 1938 to at least 1951, Armour & Co. Wholesale Beef Company occupied the Project Site and the lot where the Columbus Parking garage is located today. None of the earlier buildings or structures remains above ground (see **Figure 7-2**).

Table 7 – 1: National and State Register Listed Properties and Districts

Letter on Figure 7-1	Building/District Name	Address	Designation
A	Boston Young Men's Christian Association	312 – 320 Huntington Avenue	NRIND
B	Christian Science Plaza	Huntington Avenue, Bellevidere St. & Massachusetts Ave.	LL
C	Fenway-Boylston Street Historic District	Roughly bounded by Boylston, Westland and Hemenway streets	NRDIS
D	Frederick Douglass Square Historic District	Roughly bounded by Hammond, Cabot, Windsor & Westminster streets	NRDIS
E	Greek Orthodox Cathedral of New England	520 Parker Street	NRIND
F	Horticultural Hall	300 Massachusetts Ave. & 247 Huntington Ave.	NRIND
G	Lower Roxbury Historic District	Roughly area surrounding Coventry, Cunard and Walpole streets	NRDIS
H	New England Conservatory of Music – Jordan Hall	290 Huntington Avenue	NRIND
I	Olmsted Park System	Back Bay Fens, Muddy River, Boston/Brookline	NRDIS
J	South End District, South End Landmark District	Roughly bounded by Penn Central RR, Camden St., Harrison Ave., and East Berkeley & Tremont streets	NRDIS
K	St. Botolph Street Architectural Conservation District	Roughly bounded be Harcourt St., Penn Central Railroad, alley north of Massachusetts Ave. and alley east of Huntington Ave.	LHD, NRDOE
L	Symphony Hall	301 Massachusetts Avenue & 249 Huntington Avenue	NRIND, NHL
M	The Riviera	270 Huntington Avenue	NRIND

LHD: Local Historic District
LL: Local Landmark
NHL National Historic Landmark
NRDIS: National Register District
NRDOE: National Register, Determination of Eligibility by the National Park Service, Dept. of the Interior
NRIND: National Register Individual Property

Table 7 – 2: Inventoried Properties and Districts Recommended for National Register and/or Local Landmark Listing			
Number on Figure 7-1	**Building/District Name**	**Address**	**Survey Recommendation**
1	Fenway	The Fenway to Hemenway from Forsyth Street to Westland Avenue	NR, LL
2	Museum of Fine Arts	465 Huntington Avenue	NR, LL
3	Ruggles Street/Parker Street District	Boston Trade School, Ira Allen Public School, Wentworth Institute – Ruggles & Parker streets, Huntington Avenue	NR, LL
4	Saint Francis de Sales Roman Catholic Church – Ruggles Street Baptist Church	159 Ruggles Street	
5	St. Stephen - Symphony Road	St. Stephen Street, Gainsborough Street, Symphony Road, Hemenway Street	NR



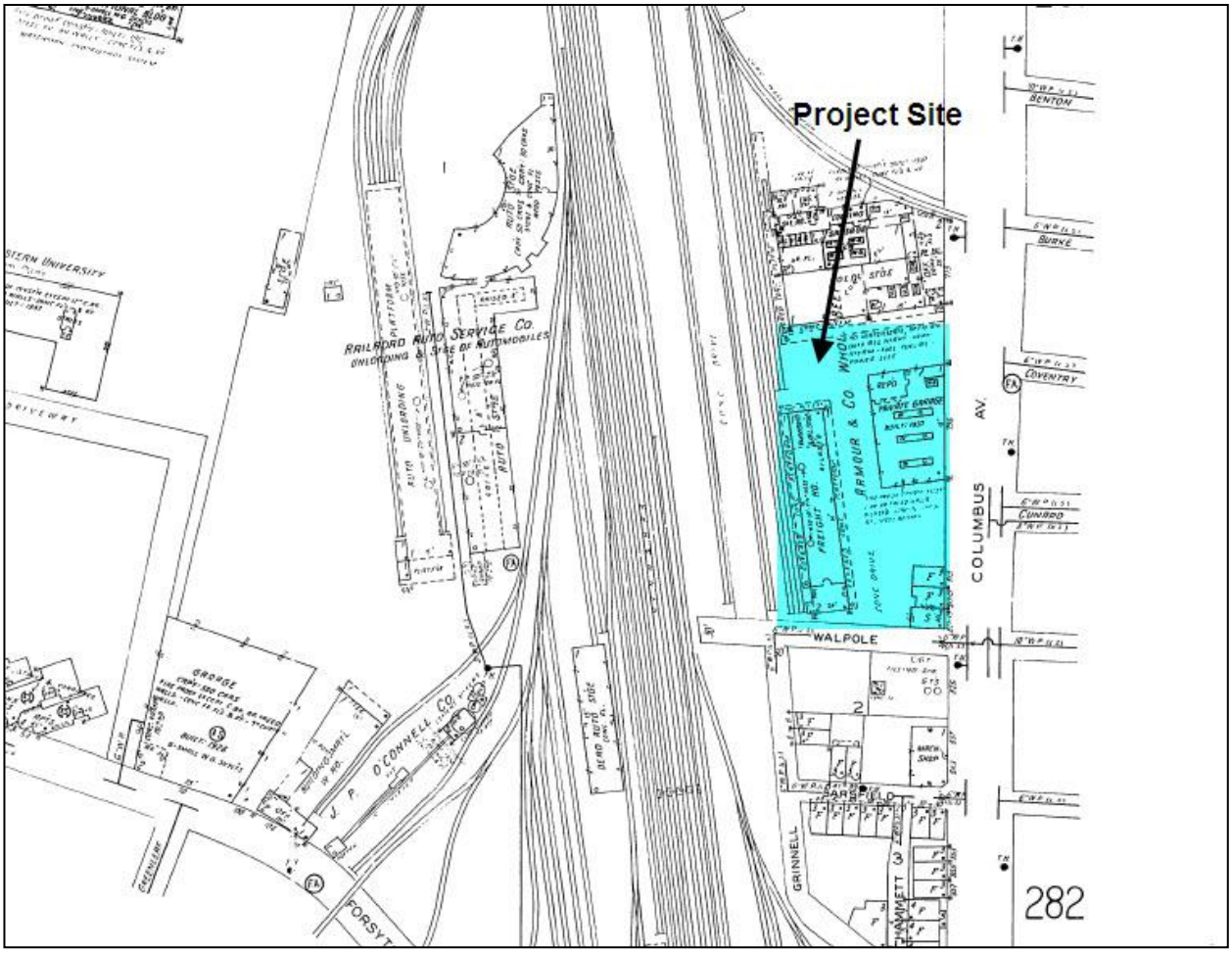
National Register and State Register Properties

Properties Included in the Inventory of Historic and Archeological Assets of the Commonwealth

Northeastern University Campus Complex 1938 - 1968

Figure 7-1.
Historic Resources ¼ mile radius
ISEB

Figure 7 – 2: Columbus Lot 1938



Sanborn Map Company, *Insurance Maps of Boston, Mass*. New York, New York. Vol. 2 Boston South. Plate 277. 1938.

7.3 Proposed ISEB Project

The proposed ISEB involves development of a new building of approximately 197,000 (FAR) GSF consisting of space for research, offices, classrooms, and for students. The building will be located on the east end of the Columbus Parking lot and Project plans call for a basement, six levels above grade, and a mechanical penthouse. Also included in the project is the construction of pedestrian track crossings that will span the MBTA Orange Line, Commuter Rail and Mainline Amtrak (all referred to as the railroad tracks), thereby linking the Project Site to the academic side of the campus. The Project will have a maximum height of 87 feet to the roof of the highest occupied floor as defined by the Boston Zoning Code and 128 feet at the highest point of the mechanical enclosure.

Exterior sheathing includes a metal-frame glass and spandrel glass curtain wall with brise soleil bands wrapping much of the exterior. The upper mechanical level is sheathed with insulated metal panels and louvers. (For the urban design drawings, see **Section 3- Figures 3-1** thru **3-30**.)

7.4 Agency Reviews

Potentially, the ISEB is subject to review with respect to impacts to historic and archeological resources in compliance with local, state and federal laws, and applicable regulations. Such laws call for specific reviews in the event that there is state or federal involvement in the project or if the project involves demolition of a structure in Boston that is more than 50 years old, if the project is located within a local landmark district or if the property has been designated a local landmark.

It is understood that there is likely to be state agency involvement in the ISEB related to obtaining an easement or right-of-way approval over the MBTA railroad tracks. ISEB is thus subject to review in compliance with M.G.L. Chapter 9, sections 26-27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00). The intent of the law is "to eliminate, minimize, or mitigate adverse effects to properties listed in the State Register of Historic Places." (950 CMR 71.02 (1))

In compliance with the Chapter 254 Regulations, a Project Notification Form will be submitted to the Massachusetts Historical Commission (MHC) for the ISEB. In addition to MHC, the State Body, Northeastern University, the Boston Landmarks Commission and other interested parties will participate in the consultation process if it is determined that there is potential for the Project to cause adverse effects to State Register-listed properties.

7.5 Historic Districts and Properties

As mentioned in the Introduction to this section there are several historic districts and individual properties within ¼ mile of the Project Site (see **Tables 7-1** and **7-2**). In addition, **Figure 7-1** geographically locates the historic buildings and districts identified within a ¼-mile radius of the Project Site.

Historic resources in the vicinity of the Project Site were identified by consulting comprehensive historic resource surveys undertaken by the City of Boston in the adjacent Fenway and Mission Hill/Parker Hill neighborhoods in the early 1980s. Since that time, several of the properties recommended for National Register listing have been listed, some additional properties have been surveyed or listed and the inventories remain an excellent source of information. A Preservation Plan was completed for Northeastern in 2005 (Northeastern University Preservation Plan, Epsilon Associates, September 2005), which included a survey of Northeastern-owned properties dating prior to 1961. In 2013, an update of the Preservation Plan included additional survey of Northeastern buildings dating prior to 1969 that had not yet been included in the inventory of historic resources.

For the ISEB, particular attention will be paid to the Lower Roxbury Historic District, which is listed in the State and National Registers of Historic Places (NRDIS, 12/09/1994) and is located directly across Columbus Avenue from the Project Site. The 3.2-acre Lower Roxbury Historic District, roughly in the area between Tremont Street and Columbus Ave. surrounding Coventry and Cunard Streets and St. Cyprians Place, is notable for its intact historic fabric and its density compared to the immediate

surroundings. The district is characterized by late-19th and early 20th-century brick structures from two to five stories, Revival styles, residential and mixed commercial and residential buildings. The district's buildings typically are ornamented with Classical Revival detail and exhibit varying expressions of their style. Residential apartment buildings generally are modest and smaller in scale. Also in the district are some industrial buildings: a former candy factory, a former ice cream factory, and a small storage warehouse. St. Cyprians Episcopal Church and Parish House are located at the southwest corner of the district. Other historic resources located within ¼ mile of the Project Site are indicated on **Figure 7-1**.

The Boston campus buildings constructed by Northeastern between 1938 and 1968 comprise a coherent group of buildings built as part of a master plan (which was updated over time) and a single building design executed by the firm of Shepley, Bulfinch Richardson & Abbott and their predecessor firm. Together, the Northeastern campus buildings 1938 - 1968 may be eligible for listing in the National Register of Historic Places.

7.6 Potential Impacts to Historic Resources

This section evaluates potential Project impacts relative to the building's design, visual, shadows, wind, and construction (geotechnical)

7.6.1 Design Impacts

The Project Site has physical and visual barriers to the northeast (the Columbus Parking Garage) and to the southwest (the Renaissance Park Garage) and the northwest boundary is cut off by the MBTA and Amtrak railroad tracks, north of which are Northeastern's Snell Library and the Egan Engineering Science Center. These surrounding structures serve as visual barriers, blocking views into the Project Site from grade. The Columbus Avenue border is the one side that is open to the surrounding neighborhood.

The contemporary proposed ISEB design relates to the Northeastern University buildings immediately on the north side of the railroad tracks. The Project is broken up into two main volumes, reducing the overall mass of the building. A description of the ISEB design is found in **Sections 3.31** and **3.32** of this PNF.

7.6.2 Visual Impacts

The orientation of the ISEB parallel to the Columbus Ave. Parking Garage presents its narrow elevation to Columbus Street, facing the brick buildings across the street. There is open space and public access through the lot and to the Ruggles MBTA station encouraging a pedestrian connection between the Project Site and the Lower Roxbury District. The open space immediately west of the ISEB and the pedestrian walkway through the site will be heavily landscaped with trees and plantings filtering views of the building façade from the west.

7.6.3 Shadow and Wind Impacts

Shadow (**Section 4.1** addresses the Project's shadow impacts)

Shadow studies provided by Payette (See **Section 4.1**) show the Project will create some new shadows over the MBTA and Amtrak rails and the Columbus Avenue Garage and minimal new shadows over the railroad under the new pedestrian bridge (see **Figures 4.1-1** thru **4.1-13**). The southern edge of Northeastern's Huntington Avenue campus including the Snell Library will also experience some new shadows that are most noticeable at 9:00 a.m. in December, where time of year shadows are greatest. Also, there will be new shadow on Columbus Avenue in June.

New shadows are expected on the north elevation of two buildings located at the corner of Columbus Avenue and Coventry Street (752 and 766-768 Columbus Avenue) during the evening (approx. 6:00 p.m.) in June. The shadows would occur at the front elevation and at the entrances of the buildings, which are contributing buildings in the Lower Roxbury Historic District. In the late afternoon in December, the east end of Carter Playground will also have shadows from the project.

Wind (**Section 4.2** addresses the Project's wind impacts)

A quantitative pedestrian level wind analysis will be submitted to the BRA by July 15, 2013.

7.6.4 Construction Period Impacts

Geotechnical Impacts

Existing subsurface conditions and geotechnical impacts of the Project are discussed in **Section 4.10.** The Project's geotechnical consultant will provide consulting services associated with foundation design recommendations, prepare geotechnical specifications, and review the Construction Contractor's proposed procedures. Project design criteria will be established to avoid potential negative impacts, from lowering, area groundwater levels.

Based on the design and construction methodology developed for the project, potential impacts to abutting facilities from foundation construction, such as ground movement, vibration, and groundwater lowering are anticipated to be negligible. Although impacts to adjacent structures are anticipated to be negligible, Northeastern will perform a geotechnical monitoring program at adjacent properties for documentation purposes.

7.6.5 Archaeological Resources

According to the USGS archaeological map on file at the Massachusetts Historical Commission, there are no known or designated archaeological properties on the Project Site. There are currently no buildings on the site. The Proposed Project is expected to have a one-story basement at approximately 16 to 18 feet below grade. Excavation is expected to extend approximately 20 feet below grade. The site has had development on some parts of the property (see **Figure 7-2**)

and it is expected that the footprints of the previous buildings will have caused some below-grade disturbance.

7.7 Summary

The ISEB is included in Northeastern's proposed Institutional Master Plan (IMP), in accordance with Article 80D of the Code. The IMP has been submitted under separate cover to the Boston Redevelopment Authority. The Proposed Project is consistent with the IMP's proposed build-out and open space configuration of the Columbus Lot, which could ultimately consist of three to five buildings for academic, student experience, and event use (with some future underground parking) and linked connections.

Measures will be proposed as needed to address potential impacts to historic resources from the Project. Construction impacts with respect to lowering of groundwater, vibration or ground movement due to excavation are expected to be negligible. A geotechnical instrumentation and monitoring program will be implemented at adjacent properties.

As design for ISEB moves forward, mitigation measures to protect adjacent historic buildings and to avoid, minimize or mitigate potential impacts to such buildings during construction will be incorporated as needed into project planning and design.

Appendix A. Letter of Intent to Submit PNF, May 17, 2013

Northeastern

May 18, 2013

Mr. Peter Meade, Director
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Subject: **Northeastern University**
Interdisciplinary Science and Engineering Building (ISEB)
Intent to File Project Notification Form (PNF)

Dear Director Meade:

Office of the Vice President
Facilities Division
140 Cullinane Hall
360 Huntington Avenue
Boston, MA 02115

617.373.2700
f 617.373.5700

In accordance with Article 80B Large Project review requirements of the Boston Zoning Code (the "Code"), please consider this letter as a notification to the Boston Redevelopment Authority that Northeastern University ("Project Proponent" or "Northeastern") intends to develop a new project, the Interdisciplinary Science and Engineering Building (ISEB), on a portion of Northeastern's 2.7 acre surface parking area (Columbus Lot) located at 795 Columbus Avenue between the Renaissance Park Parking Garage and the Columbus Parking Garage, south of the MBTA tracks within its Campus land area ("Project Site"). See attached **Figure 1: Site Locus, Northeastern University's Proposed ISEB Project**.

Northeastern's new Institutional Master Plan ("IMP"), in accordance with Article 80D of the Code, includes this Proposed Project as one of Northeastern's master plan projects.

The proposed ISEB Project involves development of a new building of approximately 220,000 GSF consisting of research and office space for new faculty, interdisciplinary research clusters / collaborative space, specialized teaching labs, classrooms, and student space. Also included in the project is the construction of pedestrian track crossings that will span the MBTA Orange Line, Commuter Rail and Mainline AMTRAK (all referred to as the "railroad tracks"), thereby linking the Project Site to the academic side of the campus ("Proposed Project").

The plans for the proposed ISEB include a basement, six levels above grade, and a mechanical penthouse. The first floor provides an on grade front door to the south at Columbus Avenue. The second floor provides access to the pedestrian track crossings and entry from the academic campus to the north.

The Proposed Project will require the reconfiguration of the Northeastern's Columbus Avenue Garage to re-route exiting traffic away from the rear of the ISEB and more directly onto Columbus Avenue.

The full build-out of Columbus Lot could ultimately consist of three to five buildings (with some underground parking) with linked connections and an open space developed in phases. This full build out would provide academic and research space for science, health sciences, engineering and cross-disciplinary research, teaching/classroom space, student experience and event spaces.

The Proposed Project has been discussed with the Northeastern Community Task Force at meetings earlier this year and Northeastern expects that an expanded Project Notification Form will be filed by late spring / early summer along with Northeastern's new Institutional Master Plan.

Please contact me or Jim Cahill, Associate Vice President, Planning Design and Construction with any questions concerning the Proposed Project.

On behalf of the entire project team, we look forward to working with you on this Project, which we believe will be a significant addition to Northeastern University and to the City of Boston.

Sincerely,

Nancy May, Vice President, Facilities Division

NORTHEASTERN UNIVERSITY

Attachment: **Figure 1. Site Locus, Northeastern University's ISEB Project**

Cc: Gerald Autler, Senior Planner/Institutional Project Manager, BRA
Ralph Martin, Northeastern University
Kathy Speigelman, Northeastern University
Steven Kadish, Northeastern University
James Cahill, Northeastern University
Steven Spear, Northeastern University
Mitchell L. Fischman, MLF Consulting LLC

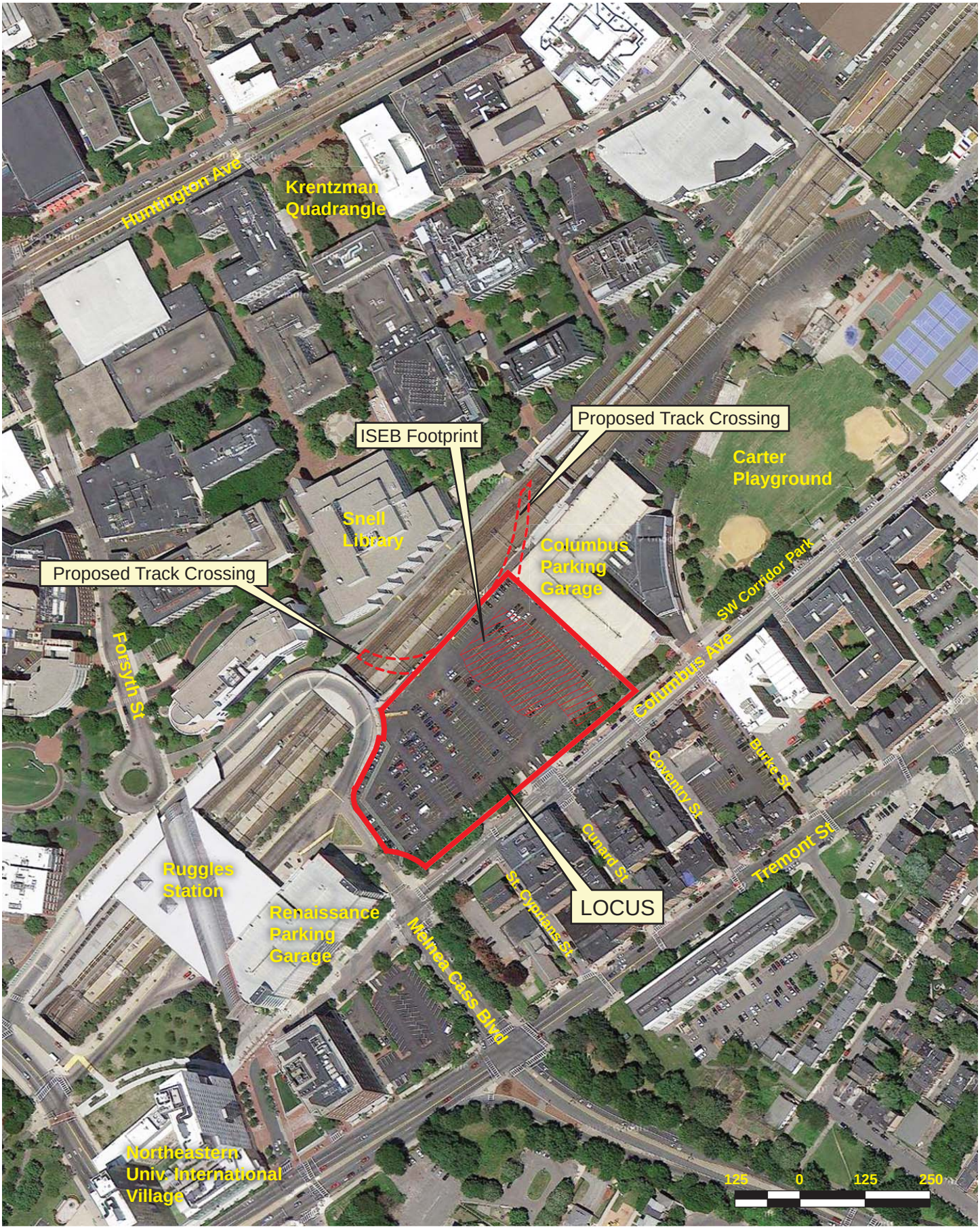


FIGURE 1: SITE LOCUS: NORTHEASTERN UNIVERSITY'S PROPOSED ISEB BUILDING
SCALE 1" = 250 FT

PAYETTE

Appendix B. Transportation Appendices

Available upon request under separate cover or on CD.

NORTHEASTERN UNIVERSITY
Boston Campus

Interdisciplinary Science and Engineering Building

Project Notification Form

Prepared by

Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115