Draft Environmental Impact Report/Project Notification Form
(A Joint State/City Filing)

Parcel P-12C

EEA# 16072

Submitted to:
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Boston Planning and Development Agency
One City Hall Square
Boston, MA 02201

Submitted by:
288 Tremont Street Partners LLC, A Partnership between Asian Community Development Corporation, Corcoran Jennison Company, Inc., MPB Tremont LLC (an affiliate of MP Boston) and Tufts Shared Services, Inc.
c/o MP Boston
33 Arch Street, Suite 2520
Boston, MA 02110

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

In Association with:
Stantec
DREAM Collaborative
Group One Partners
GROUND, Inc.
Cosentini Associates
Haley & Aldrich, Inc.
Howard Stein Hudson
Lambert Sustainability, LLC
Nitsch Engineering
DLA Piper

October 15, 2019

Epsilon
ASSOCIATES INC.

Draft Environmental Impact Report/Project Notification Form

Parcel P-12C

Boston, MA

EEA# 16072

Submitted to:
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Boston Planning and Development Agency
One City Hall Square
Boston, MA 02201

Submitted by:
288 Tremont Street Partners LLC, A Partnership between Asian Community Development Corporation, Corcoran Jennison Company, Inc., MPB Tremont LLC (an affiliate of MP Boston) and Tufts Shared Services, Inc.
c/o MP Boston
33 Arch Street, Suite 2520
Boston, MA 02110

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

In Association with:
Stantec
DREAM Collaborative
Group One Partners
GROUND, Inc.
Cosentini Associates
Haley & Aldrich, Inc.
Howard Stein Hudson
Lambert Sustainability, LLC
Nitsch Engineering
DLA Piper

October 15, 2019

Epsilon
ASSOCIATES INC.

Table of Contents

Table of Contents

1.0 GENERAL INFORMATION AND PROJECT DESCRIPTION 1-1

1.1 Introduction 1-1
1.2 Development Team 1-2
1.3 Project Description 1-4
1.3.1 Project Site 1-4
1.3.2 Area Context 1-4
1.3.3 Project Description 1-13
1.3.3.1 Project Program 1-13
1.3.3.2 Design 1-14
1.4 Changes to the Project Since the Filing of the Environmental Notification Form (ENF) 1-16
1.5 Public Benefits 1-29
1.6 Zoning and Regulatory Controls 1-30
1.7 Legal Information 1-31
1.7.1 Legal Judgments or Actions Pending Concerning the Proposed Project 1-31
1.7.2 History of Tax Arrears on Property Owned in Boston by the Proponent 1-31
1.7.3 Evidence of Site Control/Public Easements 1-31
1.8 Statutory and Regulatory Standards and Approvals 1-31
1.8.1 Federal 1-33
1.8.1.1 Federal Aviation Administration – Determination of No Hazard to Air Navigation 1-33
1.8.2 State 1-33
1.8.2.1 Massachusetts Historical Commission – State Register Review 1-33
1.8.2.2 Massachusetts Architectural Access Board – Variances 1-33
1.8.2.3 Massachusetts State Building Code (MSBC) Appeals Board – Variances from Building Code 1-33
1.8.2.4 Massachusetts Water Resources Authority Construction Dewatering Permit 1-33
1.8.3 Local 1-34
1.8.3.1 Boston Planning & Development Agency – Article 80 Review, Affordable Housing Agreements, Certificates of Compliance 1-34
1.8.3.2 Boston Civic Design Commission – Design Approval 1-34
1.8.3.3 Boston Transportation Department – Transportation Access Plan Agreement, Review and Approval of a Construction Management Plan 1-34

Table of Contents (Continued)

		1.8.3.4 Boston Air Pollution Control Commission – Parking Freeze Permit / Exemption	1-34
		1.8.3.5 Boston Water and Sewer Commission – Site Plan Approval, Cross Connection/Backflow Prevention Approval	1-34
		1.8.3.6 Boston Fire Department – Fuel Storage Permit, Approval of Fire Safety Equipment	1-35
		1.8.3.7 Boston Inspectional Service Department – Foundation Permit, Building Permit, Certificate of Occupancy	1-35
		1.8.3.8 Boston Public Improvement Commission / Department of Public Works – Specific Repair Approvals, Tieback/Earth Excavation Approvals, Sidewalk Occupancy Permit	1-35
		1.8.3.9 Boston Public Safety Commission, Committee on Licenses – Parking Garage Permit, License for Storage of Inflammables	1-35
	1.9 Community Outreach Overview		1-35
	1.10 Schedule		1-36
2.0 TRANSPORTATION			**2-1**
	2.1 Overview		2-1
	2.1.1 Project Description		2-1
	2.1.2 Transportation Summary		2-1
	2.1.3 Methodology		2-3
	2.1.4 Study Area		2-4
	2.2 Existing Condition		2-4
	2.2.1 Existing Roadway Conditions		2-4
	2.2.2 Existing Intersection Conditions		2-6
	2.2.3 Existing Parking		2-6
		2.2.3.1 On-Street Parking and Curb Usage	2-6
		2.2.3.2 Off-Street Parking	2-8
		2.2.3.3 Car Sharing Services	2-10
	2.2.4 Existing Public Transportation Services		2-10
	2.2.5 Existing Traffic Data		2-12
	2.2.6 Existing Vehicular Traffic Volumes		2-14
	2.2.7 Existing Bicycle Volumes and Accommodations		2-14
	2.2.8 Existing Pedestrian Volumes and Accommodations		2-14
	2.3 No-Build Condition		2-14
	2.3.1 Background Growth Traffic		2-19
	2.3.2 Specific Development Traffic Growth		2-19
	2.3.3 Proposed Infrastructure and Transit Improvements		2-21
	2.3.4 No-Build Traffic Volumes		2-21

Table of Contents (Continued)

	2.4	Build Condition		2-23
		2.4.1	Site Access and Circulation	2-23
		2.4.2	Project Parking	2-23
			2.4.2.1 Overview of the Tremont Street Garage	2-25
			2.4.2.2 Tufts Shared Services Parking Needs Assessment	2-25
		2.4.3	Loading and Service Accommodations	2-29
		2.4.4	Trip Generation Methodology	2-29
		2.4.5	Travel Mode Share	2-30
		2.4.6	Project Trip Generation	2-31
		2.4.7	Trip Distribution	2-33
		2.4.8	Build Traffic Volumes	2-33
		2.4.9	Bicycle Accommodations	2-33
	2.5	Transit Impact Analysis		2-37
		2.5.1	Existing Condition	2-37
			2.5.1.1 Existing MBTA Orange Line Operations	2-37
			2.5.1.2 Existing MBTA Green Line Operations	2-39
		2.5.2	No-Build Condition	2-40
			2.5.2.1 No-Build MBTA Orange Line Operations	2-40
			2.5.2.2 No-Build MBTA Green Line Operations	2-42
		2.5.3	Build Condition	2-43
			2.5.3.1 Build MBTA Orange Line Operations	2-43
			2.5.3.2 Build MBTA Green Line Operations	2-44
	2.6	Traffic Capacity Analysis		2-45
		2.6.1	Existing (2019) Condition	2-46
		2.6.2	No-Build (2026) Condition	2-46
		2.6.3	Build (2026) Condition	2-46
	2.7	Travel Demand Management		2-48
		2.7.1	Alternative Mode Benefits and Tactics	2-48
		2.7.2	Bicycle and Pedestrian Trips	2-48
		2.7.3	Public Transportation	2-49
	2.8	Transportation Mitigation Measures		2-49
	2.9	Evaluation of Short-term Construction Impacts		2-50
3.0	**ASSESSMENT OF DEVELOPMENT REVIEW COMPONENTS**			**3-1**
	3.1	Wind		3-1
		3.1.1	Introduction	3-1
		3.1.2	Project Description	3-1
		3.1.3	Objectives	3-3
		3.1.4	Background and Approach	3-3
			3.1.4.1 Wind Tunnel Study Model	3-3

Table of Contents (Continued)

		3.1.4.2	Meteorological Data	3-3
		3.1.4.3	BPDA Wind Criteria	3-8
	3.1.5	Results and Discussion		3-9
		3.1.5.1	No Build Configuration	3-9
		3.1.5.2	Build Configuration	3-11
	3.1.6	Conclusion		3-11
3.2	Shadow			3-15
	3.2.1	Introduction and Methodology		3-15
	3.2.2	Vernal Equinox (March 21)		3-15
	3.2.3	Summer Solstice (June 21)		3-16
	3.2.4	Autumnal Equinox (September 21)		3-16
	3.2.5	Winter Solstice (December 21)		3-16
	3.2.6	Conclusions		3-17
3.3	Daylight			3-17
	3.3.1	Results		3-18
	3.3.2	Conclusion		3-33
3.4	Solar Glare			3-33
3.5	Air Quality Analysis			3-33
	3.5.1	National Ambient Air Quality Standards and Background Concentrations		3-34
		3.5.1.1	National Ambient Air Quality Standards	3-34
		3.5.1.2	Background Concentrations	3-40
	3.5.2	Microscale Analysis		3-41
		3.5.2.1	Methodology	3-42
		3.5.2.2	Intersection Selection	3-43
		3.5.2.3	Emissions Calculations (MOVES)	3-44
		3.5.2.4	Receptors & Meteorology Inputs	3-44
		3.5.2.5	Impact Calculations (CAL3QHC)	3-46
		3.5.2.6	Microscale Results	3-46
		3.5.2.7	Microscale Conclusions	3-47
	3.5.3	Mesoscale Analysis		3-49
		3.5.3.1	Methodology	3-49
		3.5.3.2	Results	3-50
		3.5.3.3	Conclusions	3-51
	3.5.4	Stationary Sources of Air Pollution		3-51
		3.5.4.1	Permitting	3-51
3.6	Stormwater			3-51
3.7	Flood Hazard Zones/Wetlands			3-52
3.8	Geotechnical/Groundwater			3-52
	3.8.1	Existing Site Conditions		3-52
	3.8.2	Subsurface Soil and Bedrock Conditions		3-52

Table of Contents (Continued)

	3.8.3	Groundwater	3-52
	3.8.4	Foundation Construction	3-53
		3.8.4.1 Potential Impacts During Below Grade Construction	3-53
	3.8.5	Mitigation Measures	3-53
3.9	Solid and Hazardous Waste		3-54
	3.9.1	Operational Solid Waste	3-54
3.10	Noise Impacts		3-55
	3.10.1	Introduction	3-55
	3.10.2	Noise Terminology	3-55
	3.10.3	Noise Regulations and Criteria	3-57
	3.10.4	Existing Conditions	3-58
	3.10.5	Noise Monitoring Methodology	3-58
	3.10.6	Noise Monitoring Locations	3-58
	3.10.7	Noise Monitoring Equipment	3-60
	3.10.8	Measured Background Sound Levels	3-60
	3.10.9	Future Conditions – Overview of Potential Project Noise Sources	3-62
	3.10.10	Noise Modeling Methodology	3-63
	3.10.11	Future Sound Levels – Nighttime	3-64
	3.10.12	Future Sound Levels – Daytime	3-66
	3.10.13	Conclusions	3-67
3.11	Construction Impacts		3-67
	3.11.1	Construction Management and Public Safety/Traffic	3-67
	3.11.2	Construction Schedule	3-68
	3.11.3	Construction Staging/Access	3-68
	3.11.4	Construction Mitigation	3-69
	3.11.5	Construction Employment and Worker Transportation	3-69
	3.11.6	Construction Truck Routes and Deliveries	3-69
	3.11.7	Construction Air Quality	3-70
	3.11.8	Construction Noise	3-71
	3.11.9	Construction Vibration	3-71
	3.11.10	Water Quality and Stormwater	3-72
	3.11.11	Construction Waste Management	3-72
	3.11.12	Utility Protection During Construction	3-72
	3.11.13	Rodent Control	3-73
	3.11.14	Wildlife Habitat	3-73
	3.11.15	Construction Soil Management	3-73

Table of Contents (Continued)

4.0	**SUSTAINABLE DESIGN AND CLIMATE CHANGE RESILIENCE**		**4-1**
	4.1	Introduction	4-1
	4.2	Sustainable Design	4-2
	4.3	Zero Carbon Building Assessment	4-13
	4.4	Climate Change Resilience	4-15
		4.4.1 Introduction	4-15
		4.4.2 Extreme Heat Events	4-15
		4.4.3 Rain Events	4-16
		4.4.4 Drought Conditions	4-16
5.0	**URBAN DESIGN**		**5-1**
	5.1	Tremont Street Activities	5-1
	5.2	Massing and Façade Material	5-1
	5.3	Courtyard and Pedestrian Passage	5-6
	5.4	Façade Design Inspiration: Chinese Bamboo Slip	5-6
	5.5	Evolution of Design	5-9
6.0	**HISTORIC AND ARCHAEOLOGICAL RESOURCES**		**6-1**
	6.1	Project Site	6-1
	6.2	Historic Resources Within the Vicinity of the Project Site	6-1
	6.3	Archaeological Resources Within the Project Site	6-3
	6.4	Potential Impacts to Historic Resources	6-3
		6.4.1 Urban Design	6-3
		6.4.2 Visual Impacts to Historic Resources	6-5
		6.4.3 Shadow Impacts to Historic Resources	6-5
		6.4.4 Wind Impacts to Historic Resources	6-6
	6.5	Consistency with Other Historic Reviews	6-6
		6.5.1 Boston Landmarks Commission Article 80 Review	6-6
		6.5.2 Massachusetts Historical Commission	6-6
7.0	**INFRASTRUCTURE**		**7-1**
	7.1	Water Supply	7-1
		7.1.1 Existing Water Supply System	7-1
		7.1.2 Estimated Project Water Use	7-1
		7.1.3 Project Connections and Impacts	7-3
		7.1.4 Infrastructure Improvements and Water Conservation	7-3
	7.2	Wastewater	7-3
		7.2.1 Existing Wastewater System	7-3
		7.2.2 Estimated Project Wastewater Generation	7-4
		7.2.3 Sewage Capacity and Impacts	7-4
		7.2.4 Proposed Conditions and Infrastructure Improvements	7-6

Table of Contents (Continued)

	7.3	Stormwater Management	7-7
		7.3.1 Existing Conditions	7-7
		7.3.2 Proposed Stormwater Management	7-7
		7.3.3 Compliance with MassDEP Stormwater Management Standards	7-9
8.0	**GREENHOUSE GAS ANALYSIS**		**8-1**
	8.1	Introduction and Project Overview	8-1
		8.1.1 MEPA Greenhouse Gas Emissions Policy and Protocol	8-1
		8.1.2 Stationary Sources	8-1
		8.1.3 Mobile Sources	8-2
		8.1.4 Project Overview	8-2
		8.1.5 DOER Comments	8-3
		8.1.6 Electrification of Space and Water Heating	8-3
		8.1.7 Passive House	8-4
		8.1.8 High Performing Envelope Construction	8-6
		8.1.9 Energy recovery ventilation and waste-water systems	8-7
		8.1.10 LED lighting and integrated lighting controls	8-8
		8.1.11 Maximizing Rooftop Solar Photovoltaic (PV) Readiness	8-8
		8.1.12 Building Energy Modeling	8-8
		8.1.13 Incentives	8-9
		8.1.14 Green Vehicle Infrastructure	8-10
		8.1.15 Project GHG Mitigation Technologies	8-10
	8.2	Mobile Source of Greenhouse Gas Emissions	8-12
		8.2.1 Traffic GHG Analysis	8-12
		8.2.2 Traffic GHG Analysis Results	8-13
		8.2.3 Summary	8-13
	8.3	Summary and Mitigation Commitments	8-15
		8.3.1 Project GHG Summary	8-15
		8.3.2 Proponent’s Commitments to GHG Reduction	8-15
9.0	**COORDINATION WITH OTHER GOVERNMENTAL AGENCIES**		**9-1**
	9.1	Architectural Access Board Requirements	9-1
	9.2	Massachusetts Environmental Policy Act (MEPA)	9-1
	9.3	Massachusetts Historical Commission State Register Review	9-1
	9.4	Other Permits and Approvals	9-1
10.0	**PROPOSED SECTION 61 FINDINGS & MITIGATION SUMMARY**		**10-1**
	10.1	Introduction	10-1
	10.2	Anticipated State Permits and Approvals	10-1
	10.3	Proposed Section 61 Finding	10-2

Table of Contents (Continued)

11.0	**RESPONSE TO COMMENTS**	**11-1**
11.1	Introduction	11-1

List of Attachments

Attachment A	Site Survey
Attachment B	Floor Plans
Attachment C	Transportation
Attachment D	Wind
Attachment E	Air Quality
Attachment F	Climate Change Checklist
Attachment G	Greenhouse Gas Analysis
Attachment H	Accessibility Checklist
Attachment I	Boston Smart Utilities Checklist
Attachment J	Circulation List
Attachment K	Broadband Ready Buildings Questionnaire

List of Figures

Figure 1-1	Proposed Project	1-4
Figure 1-2	Existing Conditions	1-5
Figure 1-3	Existing Conditions Site Plan	1-6
Figure 1-4	Existing Conditions Photo – On-site Looking East	1-7
Figure 1-5	Existing Conditions Photo – On-site Looking South	1-8
Figure 1-6	Existing Conditions Photo – Facing the Project Site from Tremont Street	1-9
Figure 1-7	Existing Conditions Photo – Facing the Project Site from Tremont Street	1-10
Figure 1-8	Existing Conditions Photo – View of the Eastern Portion of the Project Site Facing West	1-11
Figure 1-9	Stacking Diagram	1-13
Figure 1-10	Proposed Conditions Site Plan	1-15
Figure 1-11	Aerial View from West	1-16
Figure 1-12	Aerial View from Southwest	1-17
Figure 1-13	Aerial View from Southeast	1-18
Figure 1-14	Aerial View from Northeast	1-19
Figure 1-15	Tremont Street Elevation and South Elevation	1-20
Figure 1-16	Courtyard Elevation and North Elevation	1-21
Figure 1-17	View from Tremont Street Looking Towards the Inner Courtyard	1-22
Figure 1-18	View from the Inner Courtyard	1-24
Figure 1-19	View from Tremont Street looking North	1-25
Figure 1-20	View from Tremont Street Looking South	1-26
Figure 1-21	Landscape Plan	1-27

List of Figures (Continued)

Figure 3.2-1	Shadow Study, March 21, 9:00 a.m.	3-4
Figure 3.2-2	Shadow Study, March 21, 12:00 p.m.	3-5
Figure 3.2-3	Shadow Study, March 21, 3:00 p.m.	3-6
Figure 3.2-4	Shadow Study, June 21, 9:00 a.m.	3-7
Figure 3.2-5	Shadow Study, June 21, 12:00 p.m.	3-8
Figure 3.2-6	Shadow Study, June 21, 3:00 p.m.	3-9
Figure 3.2-7	Shadow Study, June 21, 6:00 p.m.	3-10
Figure 3.2-8	Shadow Study, September 21, 9:00 a.m.	3-11
Figure 3.2-9	Shadow Study, September 21, 12:00 p.m.	3-12
Figure 3.2-10	Shadow Study, September 21, 3:00 p.m.	3-13
Figure 3.2-11	Shadow Study, September 21, 6:00 p.m.	3-14
Figure 3.2-12	Shadow Study, December 21, 9:00 a.m.	3-15
Figure 3.2-13	Shadow Study, December 21, 12:00 p.m.	3-16
Figure 3.2-14	Shadow Study, December 21, 3:00 p.m.	3-17
Figure 3.3-1	Viewpoints and Area Context Locations	3-20
Figure 3.3-2	Existing and Proposed Conditions	3-21
Figure 3.3-3	Existing and Proposed Conditions	3-22
Figure 3.3-4	Area Context Viewpoints	3-23
Figure 3.3-5	Area Context Viewpoints	3-24
Figure 3.5-1	Intersection of Shawmut Avenue, Tremont Street and Oak Street West	3-32
Figure 5-1	View from Tremont Street Looking North	5-2
Figure 5-2	View from the Inner Courtyard	5-3
Figure 5-3	View from Tremont Street Looking South	5-4
Figure 5-4	Aerial Perspective of the Building	5-5
Figure 5-5	View from Tremont Street Looking Towards the Inner Courtyard	5-7
Figure 6-1	Historic Resources	6-4
Figure 6-2	Shadow Study, March 21, 9:00 a.m.	6-7
Figure 6-3	Shadow Study, March 21, 12:00 p.m.	6-8
Figure 6-4	Shadow Study, March 21, 3:00 p.m.	6-9
Figure 6-5	Shadow Study, June 21, 9:00 a.m.	6-10
Figure 6-6	Shadow Study, June 21, 12:00 p.m.	6-11
Figure 6-8	Shadow Study, June 21, 6:00 p.m.	6-13
Figure 6-9	Shadow Study, September 21, 9:00 a.m.	6-14
Figure 6-10	Shadow Study, September 21, 12:00 p.m.	6-15
Figure 6-11	Shadow Study, September 21, 3:00 p.m.	6-16
Figure 6-12	Shadow Study, September 21, 6:00 p.m.	6-17
Figure 6-13	Shadow Study, December 21, 9:00 a.m.	6-18
Figure 6-14	Shadow Study, December 21, 12:00 p.m.	6-19

List of Figures (Continued)

Figure 6-15	Shadow Study, December 21, 3:00 p.m.	6-20
Figure 7-1	Existing Water System	7-2
Figure 7-2	Existing Water System	7-5
Figure 7-3	Existing Drainage System	7-8

List of Tables

Table 1-1	Project Program	1-12
Table 1-2	Anticipated Permits and Approvals	1-30
Table 3.3-1	Daylight Obstruction Values	3-18
Table 3.5-1	National (NAAQS) and Massachusetts (MAAQS) Ambient Air Quality Standards	3-26
Table 3.5-2	Observed Ambient Air Quality Concentrations and Selected Background Levels	3-27
Table 3.5-3	MOVES Carbon Monoxide Emission Factors	3-30
Table 3.5-4	Summary of Microscale Modeling Analysis (Existing 2019)	3-33
Table 3.5-5	Summary of Microscale Modeling Analysis (No-Build 2026)	3-34
Table 3.5-6	Summary of Microscale Modeling Analysis (Build 2026)	3-34
Table 3.5-7	Regional Mesoscale (Indirect) Emissions Analysis Summary (No Build)	3-36
Table 3.5-8	Regional Mesoscale (Indirect) Emissions Analysis Summary (Build)	3-37
Table 3.8-1	Subsurface Soil and Bedrock Conditions	3-38
Table 6-1	Historic Resources in the Vicinity of the Project Site	6-1
Table 7-1	Proposed Maximum Project Wastewater Generation	7-4
Table 7-2	Sewer Hydraulic Capacity Analysis	7-6
Table 11-1	Secretary's Certificate and Comment Letters	11-1

Chapter 1

General Information and Project Description

1.0 GENERAL INFORMATION AND PROJECT DESCRIPTION

1.1 Introduction

Located at 286-290 Tremont Street, Boston, (the Project site) is a mixed-use development that efficiently expands neighboring commercial uses into the site and building to help facilitate the construction of up to 171 affordable home ownership and rental housing units in the transit friendly and economically diverse Chinatown neighborhood of Boston. Approximately 110 units are a direct result of the Inclusionary Development Policy requirements in the Winthrop Center Project currently under construction in Downtown Boston. All of the housing units will be deed restricted and the City, State, and the Proponent are working together so as to target households earning from 30% to 80% of the Area Mean Income (AMI). The Project's site currently operates as a surface parking lot. See Figure 1-1 and a site survey in Attachment A.

The Project will include up to 426,500 square feet (sf) of gross floor area reaching up to 350 feet high (as measured in accordance with the Boston Zoning Code) and also includes, in addition to the residential units, a midmarket limited services hotel of up to 200 rooms, up to 340 parking spaces, and retail space. In addition, the Proponent will deliver a core and shell community space of over 8,000 square feet on the ground level of the Project. Due to the expansive ceiling heights in the majority of the ground floor community space, the future user has the ability to mezzanine over the ground floor to create a second story and increase their total square footage to up to 14,000 square feet of space which the Proponent hopes will become a 14,000 square foot Chinatown branch of the Boston Public Library.

The Project is being developed by 288 Tremont Street Partners LLC, a collaborative partnership of the Asian Community Development Corporation (ACDC), Corcoran Jennison Company, Inc. (CJ), MPB Tremont LLC (an affiliate of MP Boston), and Tufts Shared Services (TSS), Inc. (Tufts Shared Services, Inc., is a joint venture between Tufts University and Tufts Medical Center) (the Proponent).

1.2 Development Team

The following lists the key members of the development team for the proposed Project.

Address/Location:	286-290 Tremont Street
Developer:	288 Tremont Street Partners LLC, A Partnership between Asian Community Development Corporation, Corcoran Jennison Company, Inc., MPB Tremont LLC (an affiliate of MP Boston) and Tufts Shared Services, Inc. c/o MP Boston 33 Arch Street, Suite 2520 Boston, MA 02210 (617) 451-0300 Angie Liou (Asian CDC) Kyle Sullivan (Asian CDC) Michael Corcoran (CJ) Dharshi Dupee (CJ) John Karnath (TSS) James Foley (TSS) Joe A. Larkin (MPB Tremont LLC) Halle A. Thomas (MPB Tremont LLC)
Architect:	Stantec 311 Summer Street Boston, MA 02110 (617) 234-3100 James Gray DREAM Collaborative 31 St. James Avenue, 6th Floor Boston, MA 02116 (617) 606 7029 Gregory Minott AIA, LEED AP Group One Partners 21 W 3rd Street Boston, MA 02127 (617) 268-7000 Harry Wheeler. AIA

Landscape Architect:	GROUND, Inc. 285 Washington Street, Suite G Somerville, MA 02143 (617) 718-0889 Shauna Gillies-Smith
Legal Counsel:	DLA Piper 33 Arch Street, 26th Floor Boston, MA 02110 (617) 406-6000 John Rattigan Brian Awe Nancy Welsh
Permitting Consultant:	Epsilon Associates, Inc. 3 Mill & Main Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Cindy Schlessinger Fiona Vardy
Transportation Consultant:	Howard Stein Hudson 11 Beacon Street, Suite 1010 Boston, MA 02108 (617) 482-7080 Elizabeth Peart Melissa Restrepo
Civil Engineer:	Nitsch Engineering 2 Center Plaza, Suite 430 Boston, MA 02108 (617) 338-0063 Christopher Hodney
Geotechnical Consultant:	Haley & Aldrich, Inc. 425 Medford Street, #2200 Charlestown, MA 02129 (617) 886-7400 Rebecca Higgins

Sustainability Consultant	Lambert Sustainability 176 Brattle Street Arlington, MA 02474 (781) 801-0233 Michelle Lambert
Mechanical Engineering and Plumbing Consultant	Cosentini Associates 101 Federal Street, 6th Floor Boston, MA 02110 Vladimir Yarmarkovich, PE, LEED AP Jake Derlaga, CEM, BEMP, LEED AP

1.3 Project Description

1.3.1 Project Site

The approximately 0.67-acre site is located in the South Cove Urban Renewal Area in Boston, Massachusetts at 286-290 Tremont Street and is currently used as a surface parking lot. The site is bounded by the Tufts Shared Services parking garage to the north, the Double Tree hotel to the south, Tremont Street to the west and an adjacent lot not owned by the Proponent to the east. Access to the site is from Tremont Street. Please see Figures 1-2 and 1-3 for an aerial and a site plan indicating the existing conditions on the site, respectively. Existing site photos are included in Figures 1-4 through 1-8.

1.3.2 Area Context

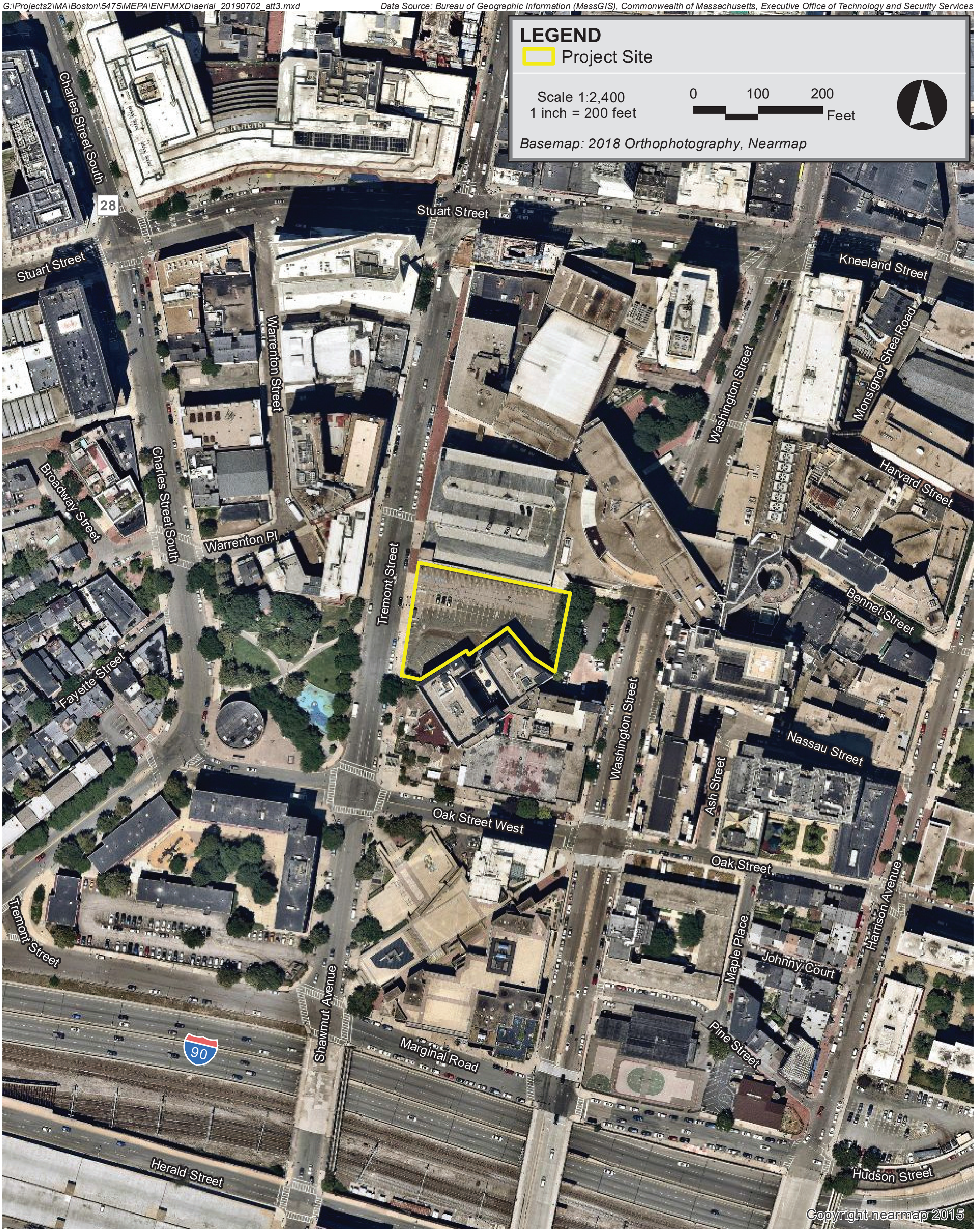
The Project is located at the western edge of the Chinatown neighborhood of Boston, and is located in or near several of the City's most active neighborhoods including Park Plaza, South Cove Bay Village, the Midtown Cultural District and downtown Boston. The surrounding area includes a mix of residential, institutional, cultural and commercial space, as well as ground floor retail and small plazas and open spaces.

The site is located within one-half mile of several MBTA stations providing service on the Orange, Green, Blue and Red Lines, including Tufts Medical Center Station, Chinatown Station, Boylston Street Station, Park Street Station, Downtown Crossing Station and Arlington Station. Several MBTA bus stops are also nearby, as well as the Silver Line. South Station also provides service on the Commuter Rail and Amtrak.

The site is also within close walking distance of several public open spaces, including the Boston Common and Public Garden, Eliot Norton Park, Bay Village Neighborhood Park, Statler Park, Lincoln Square, Mary Soo Hoo Park and the Rose Kennedy Greenway Chinatown Park.

Parcel P-12C **Boston, Massachusetts**

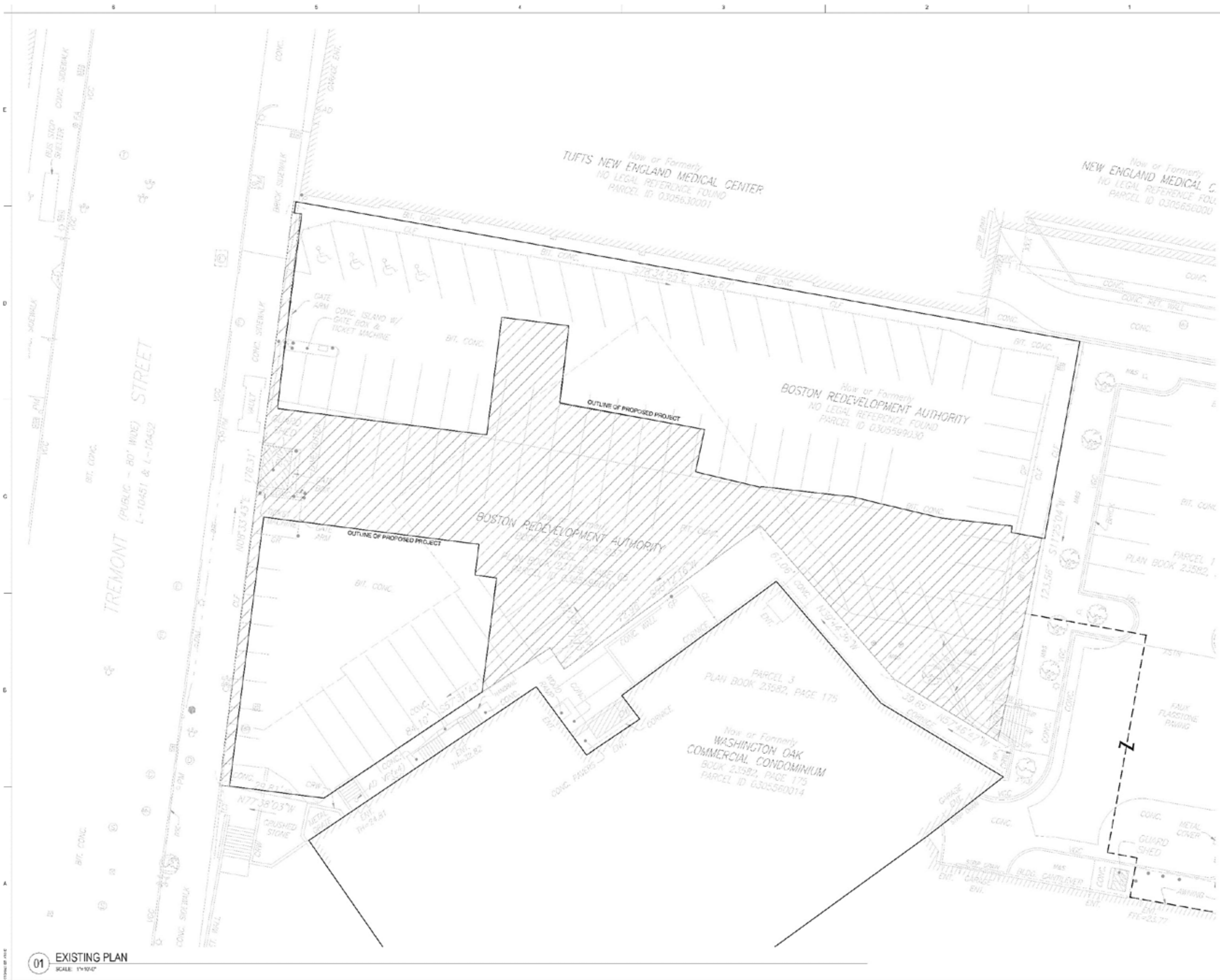
Figure 1-1
Aerial Perspective of the Building



Parcel P-12C Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 1-2
Existing Conditions Site Plan



Parcel P-12C **Boston, Massachusetts**

Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 1-4
On-site Looking East

Parcel P-12C　Boston, Massachusetts

Stantec　D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 1-5
On-site Looking South

Parcel P-12C Boston, Massachusetts

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 1-6
Facing the Project Site from Tremont Street

Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 1-7
Facing the Project Site from Tremont Street

Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 1-8
View of the Eastern Portion of the Project Site Facing West

1.3.3 Project Description

1.3.3.1 Project Program

As described above, the Project is a true mixed-use project that prioritizes affordable housing, while integrating neighborhood uses seamlessly into the Project to create a new and enlivened ground level experience through the center of the site, and a vibrant streetscape experience along Tremont Street. The Project will create up to 171 rental and home ownership units targeting residents earning 30% to 80% of AMI, and the Proponent is exploring ways to increase the affordability of the units[1].

The Project has a total area of up to approximately 426,500 gross square feet including a hotel and residential tower fronting Tremont Street and a garage extension connecting to the existing Tufts Shared Services, Inc. garage on the northwest edge of the site. Active uses will occupy the ground floor along Tremont Street with a pedestrian walkway to a landscaped courtyard at the center of the site. Ground floor uses include the residential lobby, a hotel lobby and café or retail space, an accessible pedestrian walkway (with limited access available to Project service vehicles), leading to a proposed courtyard, and a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library. The Proponent will deliver a core and shell community space of over 8,000 square feet on the ground level of the Project. Due to the expansive ceiling heights in the majority of the ground floor community space, the future user has the ability to mezzanine over the ground floor to create a second story and increase their total square footage to up to approximately 14,000 square feet of space.

Table 1-1 includes the Project program.

The accessible walkway from Tremont Street, combined with the courtyard at the center of the site, serves as an extension of the Eliot Norton Park and, with an anticipated continuation of the walkway immediately to the east of the site by that anticipated property owner, will complete the link between Bay Village and the Chinatown community.

Although not part of the Project site, it is anticipated that the property owner of the parcel to the northeast of the site will extend the pedestrian walkway to Washington Street in connection with a future development of that parcel to enhance the overall urban design of the neighborhood.

The second floor of the Project will be dedicated to active hotel amenity uses including dining and lounge areas and meeting room spaces for hotel guests with hotel rooms on floors 3 through 11. The residential portion of the building on levels 12 to 30 will be dedicated to affordable residential

---

[1] The overall unit count, unit mix and affordability levels for the residential portion of the Project are subject to State and City authorization and financial support.

units. The total height of the tower from the average site grade is approximately up to 350 feet, including the mechanical penthouse. The height of the garage behind the tower is approximately up to 122 feet. See Figure 1-9 for the Stacking Diagram.

Table 1-1 Project Program

Project Element*	Approximate Dimension/Number
Height	Up to 350’
Parking	Approximately 90,000 sf
Height	Up to 122’
Spaces	Up to 340
Residential	Approximately 190,000 sf
Total Units	Up to 171
Hotel	Approximately 130,000 sf**
Keys	Up to 200
Retail/Café	Approximately 2,500 sf
Seats, if restaurant	40
Community Space/Public Library	Up to 14,000 sf
Total Square Footage	Up to 426,500 sf

*Maximum number of parking spaces, residential units and hotel keys are provided.

**The hotel square footage includes a bar area for hotel guests only with 40 seats.

1.3.3.2 Design

The Proponent team has included the direct abutters from the earliest stages of planning and the design approach proposed is stronger and more responsive because of the collaboration. Corcoran Jennison owns the Double Tree Hotel, which shares most of the Project site’s southern property line, and the adjacent parcel to the east of the site. Tufts Shared Services shares the Project site’s entire northern property line. See Figure 1-10 for the proposed conditions site plan. Because of this collaboration, the Project team is able to:

- Position the Project’s parking structure away from Tremont Street and directly against the Tufts Shared Services garage, eliminating the need for a new parking garage entrance/exit on the site and allowing for new storefronts activating the ground level on Tremont Street and in the courtyard space;

- Provide an accessible walkway from Tremont Street, combined with the courtyard at the center of the site, and facilitate the continuation of the anticipated walkway to Washington Street; and

- Allow for the Project’s massing to maximize the light and air for the new affordable residences and hotel.

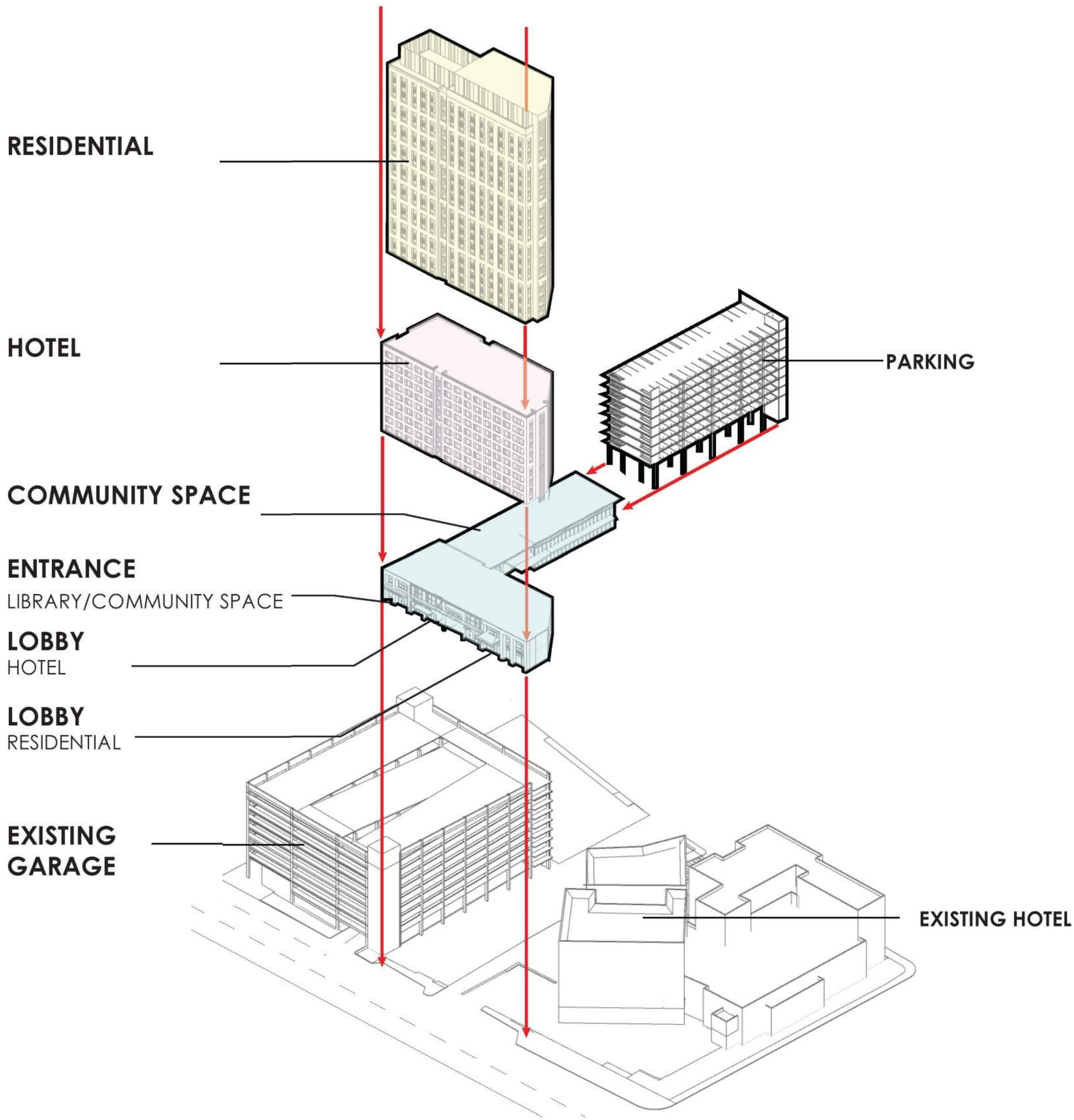


Figure 1-9
Stacking Diagram

Building Height and Massing

With a series of setbacks and podiums, the massing strategy creates a variety of scales when viewed from different vantage points. At Eliot Norton Park across Tremont Street, the Project provides a textured backdrop because of its active ground floor use, vertically rhythmed window openings and well-articulated precast concrete facades. Topped at approximately 350 feet, the slender 10,000 square foot tower floor plate becomes a recognizable addition to the Boston skyline from points south and west. See Figures 1-11 and 1-12 showing renderings of the building from Tremont Street and Figures 1-13 and 1-14 or additional renderings. Elevations are included in Figures 1-15 through 1-16. Sections and floor plans are included in Attachment B.

Accessing and Experiencing the Connectivity

At the street level, the façade steps back several feet to allow for more pedestrian activities. Active uses occupy the ground floor, including the lobby of the new hotel, the residential lobby, a café or retail space, a pedestrian walkway that connects Tremont Street to the landscaped courtyard, and an entry to a community space that the Proponent hopes will be the Chinatown branch of the Boston Public Library. As described above, the Project will provide an accessible walkway from Tremont Street, combined with the courtyard at the center of the site, and facilitate an anticipated continuation of the walkway to Washington Street. Please see Figures 1-17 through 1-20.

The courtyard landscape uses playful patterns made of porous pavement to draw interest to pedestrians, and to help facilitate ground water recharge. The courtyard includes a variety of street furniture, either fixed and integrated with landscape patterns, or flexible to accommodate various community programming. Plant species will be carefully selected to be incorporated into the courtyard landscape, so they can flourish in limited solar exposure. Designed for pedestrian uses, the courtyard and anticipated walkway to Washington Street significantly improve the public realm by creating a multi-use urban oasis that is fully accessible to its adjacent neighborhoods. See Figure 1-21 for the Landscape Plan.

1.4 Changes to the Project Since the Filing of the Environmental Notification Form (ENF)

There have been no substantive changes to the Project since the filing of the ENF, however, the square footage of the residential space has increased by 10,000 square feet from 180,000 sf to 190,000 sf. The increased square footage is a result of updates to the residential floor plan as well as accommodating spaces for building maintenance areas and bicycle storage areas in the basement. The residential lobby has also been enlarged slightly to support operational functions. The total square footage has increased accordingly from 416,500 sf to up to 426,500 sf. In addition, the ENF had included a range of parking space up to 374 spaces. The maximum number of parking spaces has been reduced to up to 340 spaces. The number of residential units and their square footage have not changed and hotel rooms (keys) have not changed. There are no changes in impacts since the submission of the ENF.

Parcel P-12C **Boston, Massachusetts**

Figure 1-10

Proposed Conditions Site Plan

Figure 1-11
Aerial View from West

Parcel P-12C Boston, Massachusetts

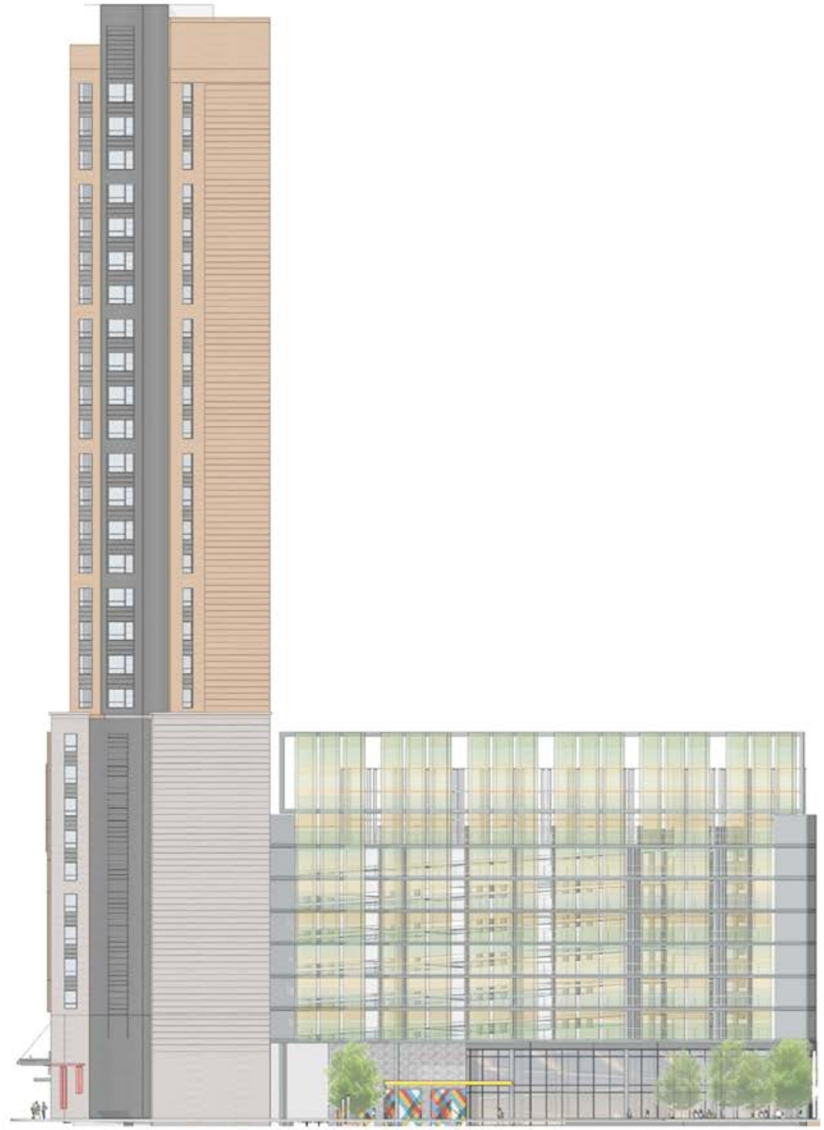
Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 1-12
Aerial View from Southwest

Figure 1-13
Aerial View from Southeast

Figure 1-14
Aerial View from Northeast

2 A201 TREMONT STREET ELEVATION



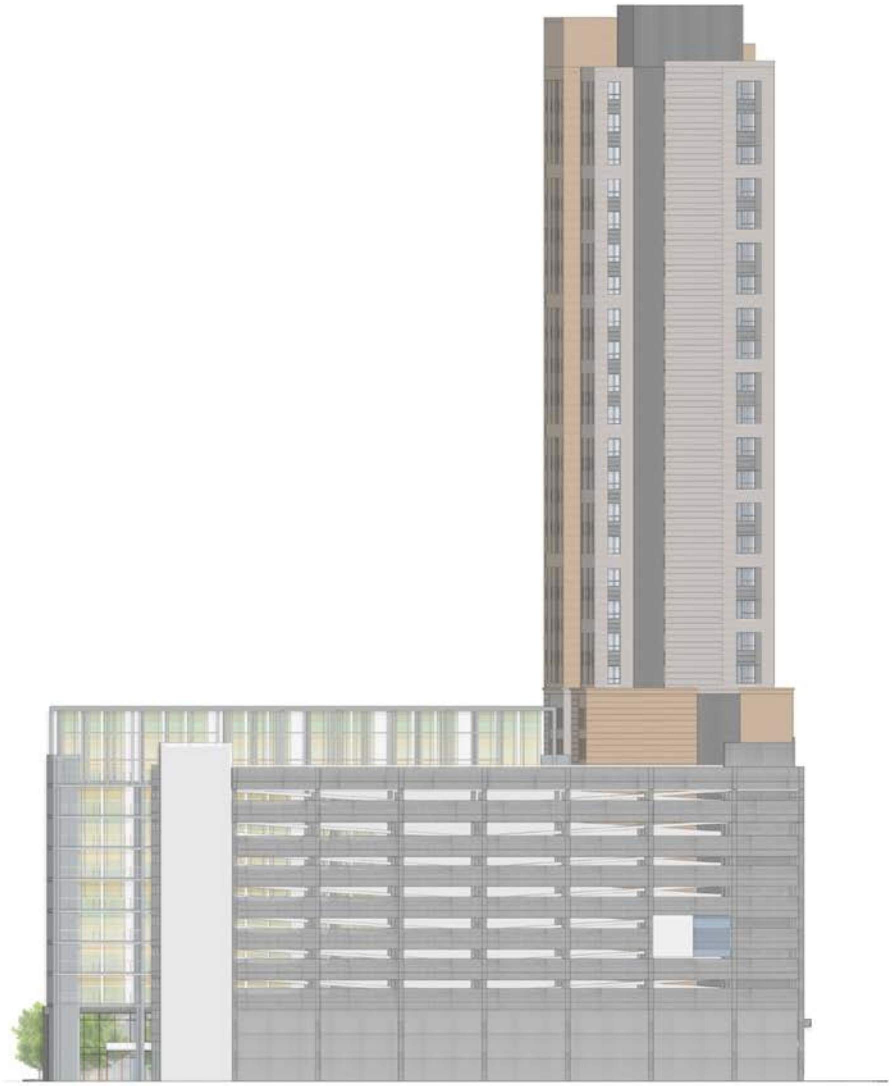
1 A201 SOUTH ELEVATION

Parcel P-12C Boston, Massachusetts

Figure 1-15

Tremont Street Elevation and South Elevation

2 A202 **COURTYARD ELEVATION**
1/16" = 1'-0"



1 A202 **NORTH ELEVATION**
1/16" = 1'-0"

Parcel P-12C Boston, Massachusetts

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 1-16
Courtyard Elevation and North Elevation

Figure 1-17
View from Tremont Street Looking Towards the Inner Courtyard

Figure 1-18
View from the Inner Courtyard

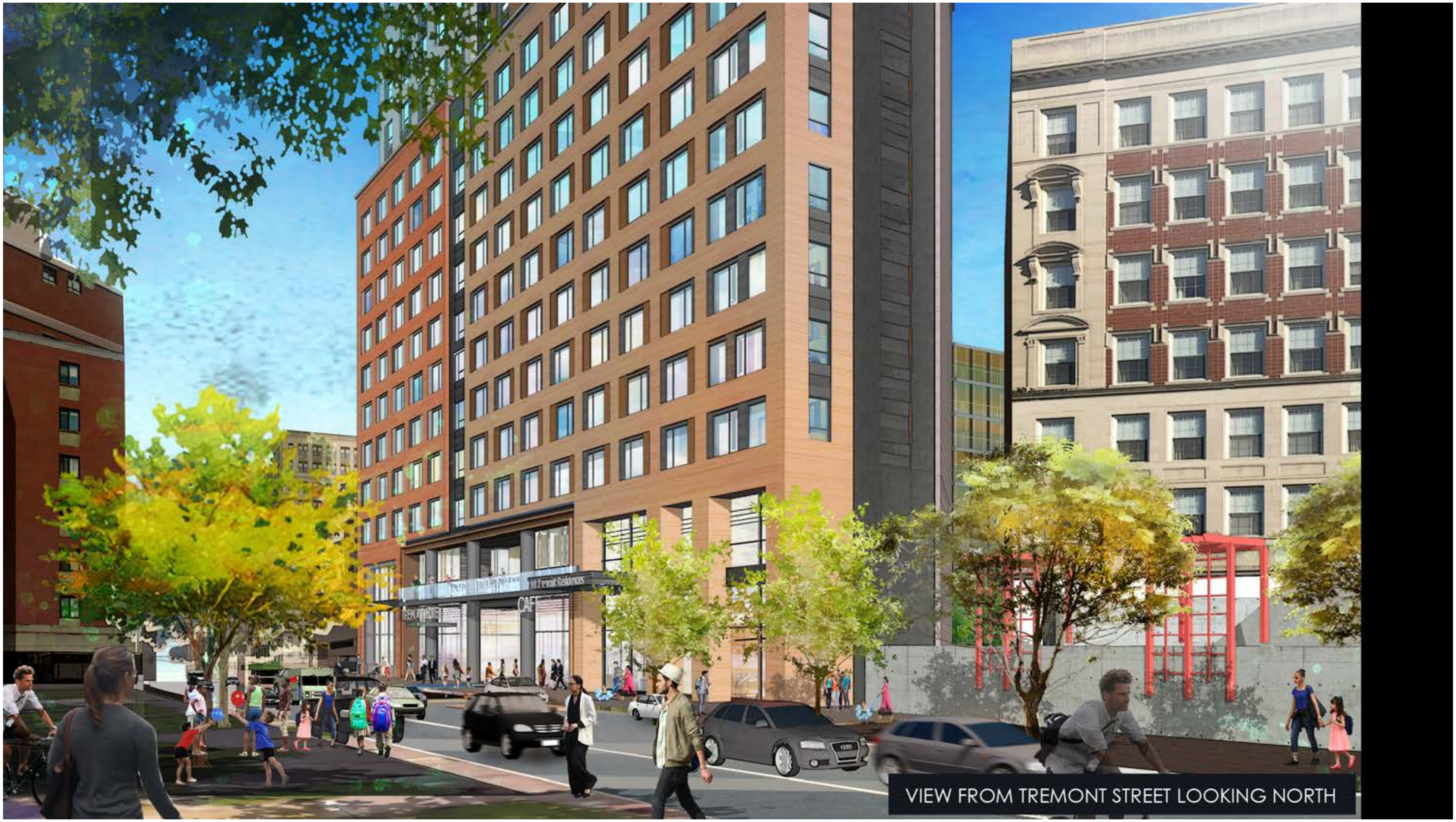
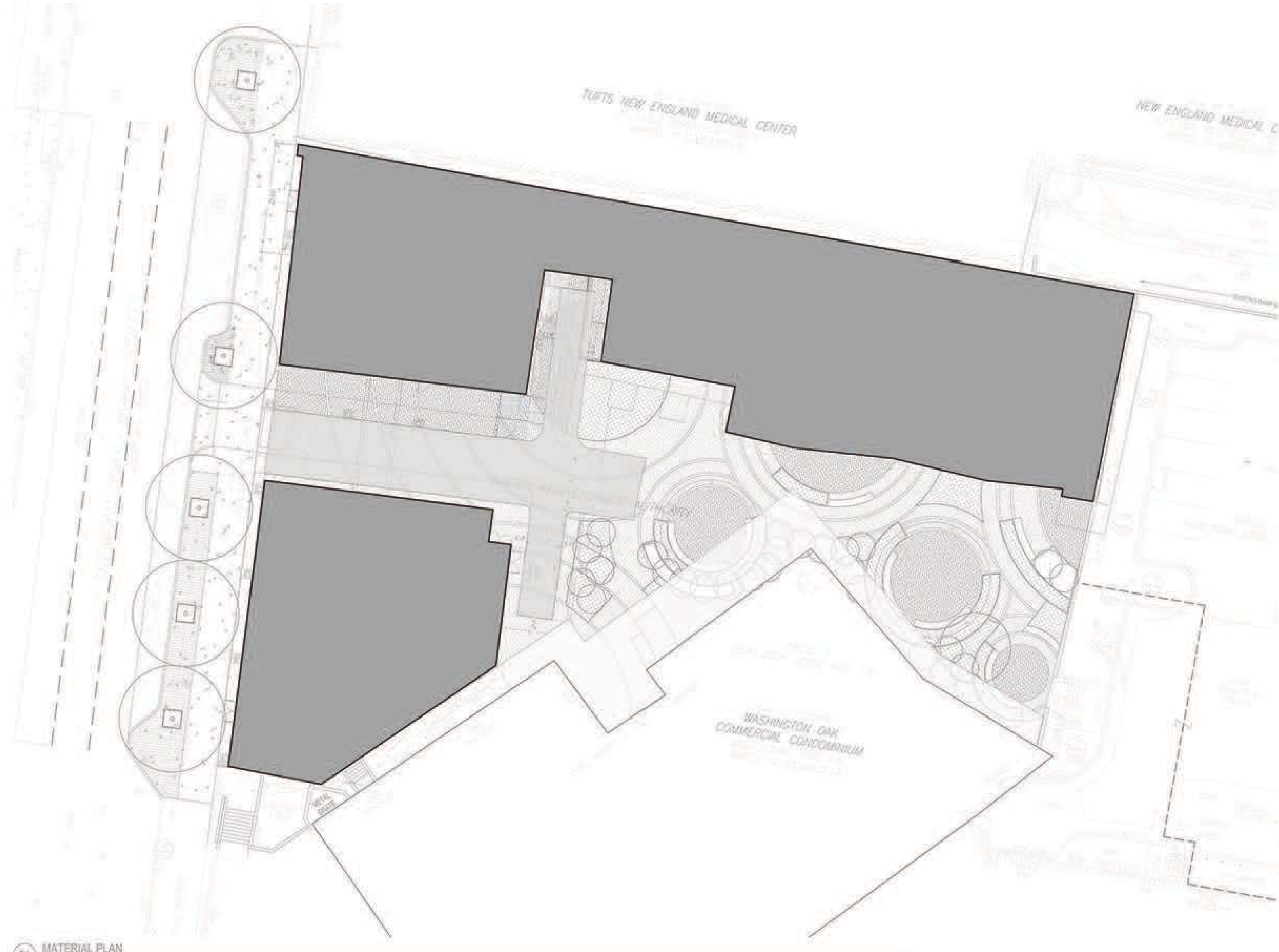


Figure 1-19
View from Tremont Street Looking North

Figure 1-20
View from Tremont Street Looking South



Parcel P-12C **Boston, Massachusetts**

Stantec ground

Figure 1-21
Landscape Plan

1.5 Public Benefits

As a mixed-use Project with 100% of the residential units being affordable, the Project itself is a Public Benefit and includes numerous additional public benefits as described below:

Affordable Housing:

- up to 171 affordable units ranging targeting residents earning 30% to 80% of AMI, and the Proponent is exploring ways to increase the affordability of the units;
- Creation of larger units for families serving a population estimated at over 400 people; and
- Rental and homeownership opportunities.

Public Realm

- Street enlivening uses throughout the day and evening on Tremont Street including hotel, residential and community space;
- Increased pedestrian and bicycle activity with widened sidewalks, bicycle parking and other site improvements resulting in a safer environment for pedestrians and bicyclists by providing improved facilities and fostering slower vehicle travel speeds;
- An accessible walkway from Tremont Street, combined with a courtyard at the center of the site, serves as an extension of the Eliot Norton Park and creates a multi-use urban oasis that is fully accessible to its adjacent neighborhoods; and
- A community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library.

Economic Benefits

- Create approximately 680 construction jobs;
- Create approximately 90 direct permanent jobs;
- Promote economic inclusion and equity in the development by providing Project participation, access and training opportunities to people of color, women and Minority and Women-Owned Business Enterprises (M/WBEs);
- Add a currently exempt property to the City tax rolls, and pay an estimated $1,000,000 within the retail, hotel, and affordable housing components in taxes annually after stabilization;

- MPB Tremont LLC, CJ and TSS will pay at construction completion over $14 million to the BPDA on a present value basis for the land, plus another $5 million from MPB Tremont LLC at construction completion for affordable housing; and

- Up to approximately $903,000 in housing linkage fees and $177,000 in jobs linkage fees paid by the commercial uses in the Project.

Sustainability

The Project will incorporate a number of innovative sustainability strategies into the planning, design and construction and will strive for LEED Certifiability or higher. The Project design plans to incorporate climate change adaptation measures, including:

- High performance building envelopes;
- Light or reflective roofs;
- Heat or Energy Recovery;
- Demand-controlled ventilation;
- Reduced lighting power densities;
- High-efficiency HVAC equipment;
- High performance exterior lighting;
- Energy Star appliances;
- PV-Ready garage;
- Low-flow fixtures;
- Recycling collection areas; and
- Construction waste recycling.

The Proponent is also studying measures to further improve the building envelope to minimize the cooling needs of the building.

1.6 Zoning and Regulatory Controls

The site is located in (i) the Housing Priority Area of the Midtown Cultural Zoning District, which is governed principally by Article 38 of the Boston Zoning Code (the “Code”), (ii) the Groundwater Conservation Overlay District, which is governed principally by Article 32 of the Code, and (iii) a Restricted Parking Overlay District. The site is also located in the South Cove Urban Renewal Area, and is subject to "U*" Designation, indicating an Urban Renewal Area overlay district, pursuant to Map Amendment No. 351, effective October 23, 1998. The Proponent anticipates that the Project's use, dimensional, parking and loading zoning requirements will be memorialized in an agreement with the BPDA. The Proponent also expects to meet the recharge and other requirements of the Groundwater Conservation Overlay District, and obtain a conditional use permit for the Project with respect to those requirements.

1.7 Legal Information

1.7.1 Legal Judgments or Actions Pending Concerning the Proposed Project

There are no legal judgments or actions pending concerning the Project.

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

There is no history of tax arrears on property owned in Boston by the Proponent.

1.7.3 Evidence of Site Control/Public Easements

The site is owned by the BPDA. The Proponent has been tentatively designated developer of the site and will take control of the site pursuant to a ground lease or other agreement with the BPDA to be negotiated.

The Proponent is in the process of obtaining a title report and survey for the site to better understand the nature of any public easements into, through or surrounding the site.

1.8 Statutory and Regulatory Standards and Approvals

The Project is anticipated to require the following permits and approvals. As the Project program and design evolve, some of the below-listed permits/approvals may not be required and/or other permits/approvals may prove to be necessary.

Table 1-2 Anticipated Permits and Approvals

Agency Name	Permit / Approval	Status
Federal		
U.S. Environmental Protection Agency	NPDES General Permit Notices	
Federal Aviation Administration	Determination of No Hazard to Air Navigation	
State		
Executive Office of Energy and Environmental Affairs (MEPA Office)	Review under the Massachusetts Environmental Policy Act	In process
Massachusetts Historical Commission	Determination of No Adverse Effect	In process
Massachusetts Water Resources Agency	Construction Dewatering Permit	
Massachusetts State Building Code Appeals Board	Variances from Building Code	
Massachusetts Architectural Access Board	Variances from MAAB	
Local		
Boston Planning and Development Agency	Article 80 Review and Execution of Related Agreements; Affordable Housing Agreements Certificate of Compliance Article 80 review Certificate of Completion	In process
Boston Civic Design Commission	Design Approval	
Boston Transportation Department	Transportation Access Plan Agreement; Review and Approval of a Construction Management Plan	
Boston Air Pollution Control Commission	Parking Freeze Permit / Exemption	
Boston Water and Sewer Commission	Site Plan Approval; Cross Connection/Backflow Prevention Approval;	
Boston Zoning Board of Appeal	Conditional Use Permit for Groundwater Conservation District	
Boston Fire Department	Fuel Storage Permit; Approval of Fire Safety Equipment	
Boston Inspectional Service Department	Foundation Permit; Building Permit; Certificate of Occupancy	
Boston Parks and Recreation Commission	Design Review (if required)	
Boston Public Improvement Commission/Department of Public Works	Specific Repair Approvals (if required); Tieback/Earth Excavation Approvals (if required); Sidewalk Occupancy Permit (if required)	
Boston Public Safety Commission, Committee on Licenses	Parking Garage Permit; License for Storage of Inflammables	

1.8.1 Federal

1.8.1.1 Federal Aviation Administration – Determination of No Hazard to Air Navigation

The Federal Aviation Administration requires that Individuals/Organizations proposing certain construction or alterations must submit Form 7460-1, "Notice of Proposed Construction or Alteration." Information about the alteration and attachments showing the type and location of the alteration must also be submitted.

The Proponent will submit Form 7640-1 at least 45 days before the start date of the proposed construction or the date an application for a construction permit is filed, whichever is earliest.

1.8.2 State

1.8.2.1 Massachusetts Historical Commission – State Register Review

Projects that require state licenses, permits and/or approvals, or that utilize state financing, are subject to review by the Massachusetts Historical Commission (MHC) in accordance with M.G.L. Chapter 9, sections 26-27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00). The submission of the Environmental Notification Form to the MHC initiated State Register Review. This DEIR includes additional information requested by MHC.

1.8.2.2 Massachusetts Architectural Access Board – Variances

Pending the design of the kitchens, the knee-clearance and sink depth in accessible units may require a variance to comply with CMR 521, Sections 43.2 and 45.4. Pending the sill height design of the perimeter windows, a variance may be required for electrical outlet mounting heights to comply with both CMR 521Section 9.5.6 and NEC 210.52.A.2. Pending the placement and selection of appliances, regarding accessible use of freezers, a variance may be required to comply with CMR 521 Section 45.10.

1.8.2.3 Massachusetts State Building Code (MSBC) Appeals Board – Variances from Building Code

The proposed Project intends to maximize the building footprint by placing exterior walls along the north side of the site, adjacent to the existing property line. To do so, the Project will seek appropriate variances, including without limitation to the following: MSBC Table 602; MSBC 705.8.1; MSBC 705.5 and MSBC 706.1.1.

1.8.2.4 Massachusetts Water Resources Authority Construction Dewatering Permit

The Project will apply for an MWRA Construction Dewatering Permit and comply with the terms of the Permit.

1.8.3 Local

1.8.3.1 Boston Planning & Development Agency – Article 80 Review, Affordable Housing Agreements, Certificates of Compliance

The Project will comply with all requirements of the Boston Planning & Development Agency pursuant to Article 80 Large Project Review for the Project. The Proponent will also work closely with the Boston Planning & Development Agency to prepare the required Affordable Housing Agreements. The Project will comply with all requirements for issuance of certificates of compliance.

1.8.3.2 Boston Civic Design Commission – Design Approval

The Project will comply with all requirements of the Boston Civic Design Commission pursuant to Article 80 Large Project Review for the Project.

1.8.3.3 Boston Transportation Department – Transportation Access Plan Agreement, Review and Approval of a Construction Management Plan

The Proponent will prepare, in conjunction with the Boston Transportation Department, a Transportation Access Plan Agreement that analyzes the Project's impact on the transportation network, and that proposes measures intended to mitigate, limit, or minimize, to the extent economically feasible, any adverse impact on the transportation network reasonably attributable to the Project. The Transportation Access Plan Agreement will specify the measures necessary to mitigate and monitor the transportation impacts of the Project.

The Proponent will prepare for the Boston Transportation Department's review a Construction Management Plan identifying the impact from the timing and routes of truck movement and construction deliveries for the Project, proposed street closings, and the need for employee parking. The Construction Management Plan will provide a plan for implementing measures to mitigate, limit, or minimize, to the extent economically feasible, the construction impact of the Project.

1.8.3.4 Boston Air Pollution Control Commission – Parking Freeze Permit / Exemption

The Project will comply with all requirements of the Boston Air Pollution Control Commission with respect to a Parking Freeze Permit or Exemption for the Project.

1.8.3.5 Boston Water and Sewer Commission – Site Plan Approval, Cross Connection/Backflow Prevention Approval

The Project will comply with all requirements of the Boston Water and Sewer Commission with respect to a Site Plan Approval and Cross Connection/Backflow Prevention Approval pursuant to Article 80 for the Project.

1.8.3.6 Boston Fire Department – Fuel Storage Permit, Approval of Fire Safety Equipment

The Project will comply with all requirements of the Boston Fire Department with respect to the Fuel Storage Permit and Approval of Fire Safety Equipment for the Project.

1.8.3.7 Boston Inspectional Service Department – Foundation Permit, Building Permit, Certificate of Occupancy

The Project will comply with all requirements of the Boston Inspectional Service Department with respect to the Foundation Permit, Building Permit and Certificate of Occupancy for the Project.

1.8.3.8 Boston Public Improvement Commission / Department of Public Works – Specific Repair Approvals, Tieback/Earth Excavation Approvals, Sidewalk Occupancy Permit

If required, the Project will comply with all requirements of the Boston Public Improvements Commission and the Department of Public Works with respect to Specific Repair Approvals, Tieback/Earth Excavation Approvals and Sidewalk Occupancy Permits for the Project.

1.8.3.9 Boston Public Safety Commission, Committee on Licenses – Parking Garage Permit, License for Storage of Inflammables

The Project will comply with all requirements of the Boston Public Safety Commission with respect to Parking Garage Permit and License for Storage of Inflammables for the Project.

1.9 Community Outreach Overview

Prior to tentative designation the parcel has always been the subject of strong community interest. In 2015, the Asian CDC sponsored "Chinatown Community Visioning for Parcel 12". The BPDA and the Mayor's Office of Neighborhood Services also conducted a series of public meetings and workshops that encouraged community participation and input. A preliminary draft of the Development Guidelines that were the basis for the Request for Proposals was posted on the BPDA website for three weeks and public comments were invited and received.

The Parcel P-12C Request for Proposals was issued in November, 2017. As part of the RFP selection process, the team presented the proposed Project to the community, city officials and other interested parties.

Before filing the PNF on October 15, 2019 the Proponent filed a Letter of Intent (LOI) with the BPDA pursuant to the Executive Order Relative to the Provision of Mitigation by Development Projects in Boston issued on October 10, 2000, as amended. The LOI began the Project's formal public review process. The Proponent's filing of the ENF with the MEPA Office on July 25, 2019 also initiated the public environmental review period at the State level.

The Proponent has had numerous meetings with public agencies, elected officials, abutters, interested parties, advocacy groups, and others including the first Impact Advisory Group (IAG) meeting on October 1, 2019. The Proponent looks forward to continuing the comprehensive review process, including continuing meetings with neighbors, local groups, elected officials and other interested parties.

1.10 Schedule

Construction of the Project is estimated to commence in the second quarter of 2021, with initial occupancy by the second quarter of 2023.

Chapter 2

Transportation

2.0 TRANSPORTATION

2.1 Overview

The transportation study adheres to the Boston Transportation Department (BTD) Transportation Access Plan Guidelines and as discussed in subsequent meetings with BTD, Boston Planning and Development Agency (BPDA) Article 80 Large Project Review process, and MassDOT guidelines. This study includes an evaluation of the existing conditions, future conditions with and without the Project, projected parking demand, loading/delivery plan, transit services, pedestrian and bicycle activity, transportation demand management (TDM) strategies for the Project and construction-period impacts.

2.1.1 Project Description

The Project site is located at 286 - 290 Tremont Street and consists of an active parking lot with approximately 100 parking spaces. The Project will replace the existing lot with up to 171 residential units, an expansion of the Doubletree Hotel with up to 200 rooms, an extension of the adjacent Tremont Street Garage which is owned by Tufts Shared Services (TSS), and community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library.

Table 2-1 summarizes the development program.

Table 2-1 Project Development Program

Land Use	Proposed Project
Residential	Up to 171 units
Hotel	Up to 200 rooms
Community Space/Library	Up to 14,000 square feet (sf)
Parking (spaces)	up to 340[1] parking spaces *for Tufts Shared Services use*

1 Because the Project site currently contains 100 parking spaces, the resulting net increase in Project parking is 240 spaces.

2.1.2 Transportation Summary

None of the study intersections will experience a change in level of service (LOS) from the No-Build Condition to Build Condition, indicating that the Project will have no significant impact to area traffic operations. The convenience of the nearby MBTA subway stations at Tufts Medical Center and Boylston Station will encourage transit travel to and from the Project site by Project residents.

Key transportation characteristics of the Project and analysis results include:

- During the a.m. peak hour, the Project will generate 59 new entering vehicle trips and 30 new exiting vehicle trips and during the p.m. peak hour, the Project will generate 48 new entering trips and 93 new exiting trips. Vehicle trips include automobiles, taxicabs, and transportation network company services such as Uber and Lyft.

- During the a.m. peak hour, the Project will generate 48 new entering transit person trips and 15 new exiting transit person trips and during the p.m. peak hour, the Project will generate 29 new entering transit person trips and 88 new exiting transit person trips. Transit person trips will primarily use the nearby MBTA Tufts Medical Center Orange Line station and the Green Line Station at Boylston.

- The Project's planned extension of the Tremont Street Garage is intended to serve only the Tufts Health Sciences Campus. Garage capacity will increase by up to 340 spaces by expanding the existing garage levels horizontally with the possible use of triple stackers on one covered level. No new garage driveways are needed at the street level because the expansion will be built against the existing garage allowing direct access between the existing and new sections on each level. Vehicles destined to the Tremont Street garage will use the existing garage driveway in the Tremont Street garage and vehicles associated with the residential and hotel uses (such as taxis and Uber/Lyft vehicles) will use the drop-off/pick-up curb adjacent to the Project site.

- No on-site parking will be provided for Project residents or hotel guests. Auto-ownership is expected to be negligible among the Project's residents and many hotels in downtown Boston do not offer on-site parking, reflecting the fact that many tourists and business travelers do not have vehicles while visiting the City. Existing, nearby parking facilities provide over 7,000 public parking spaces, which could serve any residual demand.

- The Proponent will improve the pedestrian environment by reconstructing sidewalks and creating a future pedestrian walkway through the center of the site, facilitating the anticipated continuation of the walkway to Washington Street by the adjacent property owner. This new pedestrian connection will not only improve walking circulation but will ultimately create new access paths to the MBTA's Tufts Orange Line station and Silver Line bus stops on Washington Street when completed in connection with a future project in the adjacent site. The Proponent will construct new sidewalks in accordance with Boston Complete Streets guidelines and requirements of the Americans with Disabilities Act and Massachusetts Architectural Access Board (ADA/AAB) to the extent feasible.

- In accordance with the City of Boston Bicycle Guidelines, and to encourage bicycling as an alternative mode of transportation, the Proponent will provide secure bicycle storage capacity. Residential bicycle storage capacity will be provided at a ratio of one per residential unit. Lockers and showers will be provided for employees who walk or bicycle to work.

- The City of Boston is studying the potential of narrowing Tremont Street to two lanes (from the current three) and adding bicycle accommodations between Stuart Street to the north and Oak Street to the south. While these roadway improvement plans have not yet been finalized, the Proponent will continue to work with the City to create and/or preserve an adequate curb-to-curb width on Tremont Street, adjacent to the Project site, to support a bicycle lane, should the City implement it in the future.

- The Project will provide an off-street loading and service area accessed from the Project's passageway on Tremont Street. Residential and hotel activity will occur at these loading bays and be managed by an on-site transportation coordinator and subject to City regulation.

- The Proponent is committed to implementing Transportation Demand Management (TDM) measures to reduce residents' dependence on automobiles. TDM measures to be undertaken by the Proponent include: promoting transit services in marketing and orientation materials, providing adequate secure bicycle storage, and designating an on-site transportation coordinator.

- A Transportation Access Plan Agreement (TAPA) will be entered into between the Proponent and BTD and will set forth the specific TDM measures and agreements between the Proponent and the City of Boston.

2.1.3 Methodology

This transportation study and its supporting analyses were conducted in accordance with BTD and MassDOT guidelines as described below.

- The Existing (2019) Condition analysis includes an inventory of the existing transportation conditions such as traffic characteristics, parking, curb usage, transit, pedestrian circulation, bicycle facilities, loading, and site conditions. Existing counts for vehicles, bicycles, and pedestrians were collected at the study area intersections. A traffic data collection effort forms the basis for the transportation analysis conducted as part of this evaluation.

- The future transportation conditions analyses evaluate potential transportation impacts associated with the Project. The long-term transportation impacts are evaluated for the year 2026, based on a seven-year horizon from the year of the filing of this traffic study.

- The No-Build (2026) Condition analysis includes general background traffic growth, traffic growth associated with specific developments (not including this Project), and transportation improvements that are planned near the Project site.

- The Build (2026) Condition analysis includes the No-Build condition plus the net change in traffic volume due to the Project. Expected roadway, parking, transit, pedestrian, and bicycle accommodations, as well as loading facilities associated with the Project, are identified.

The final sections of the transportation study identify the transportation demand management measures to minimize automobile usage and Project-related impacts and outline the requirements of the Transportation Access Plan Agreement and Construction Management Plan (CMP).

2.1.4 Study Area

The study area, shown in Figure 2-1, consists of the following two intersections in the vicinity of the Project site.

- Tremont Street/Stuart Street (signalized); and
- Tremont Street/Oak Street W/Shawmut Street (signalized).

2.2 Existing Condition

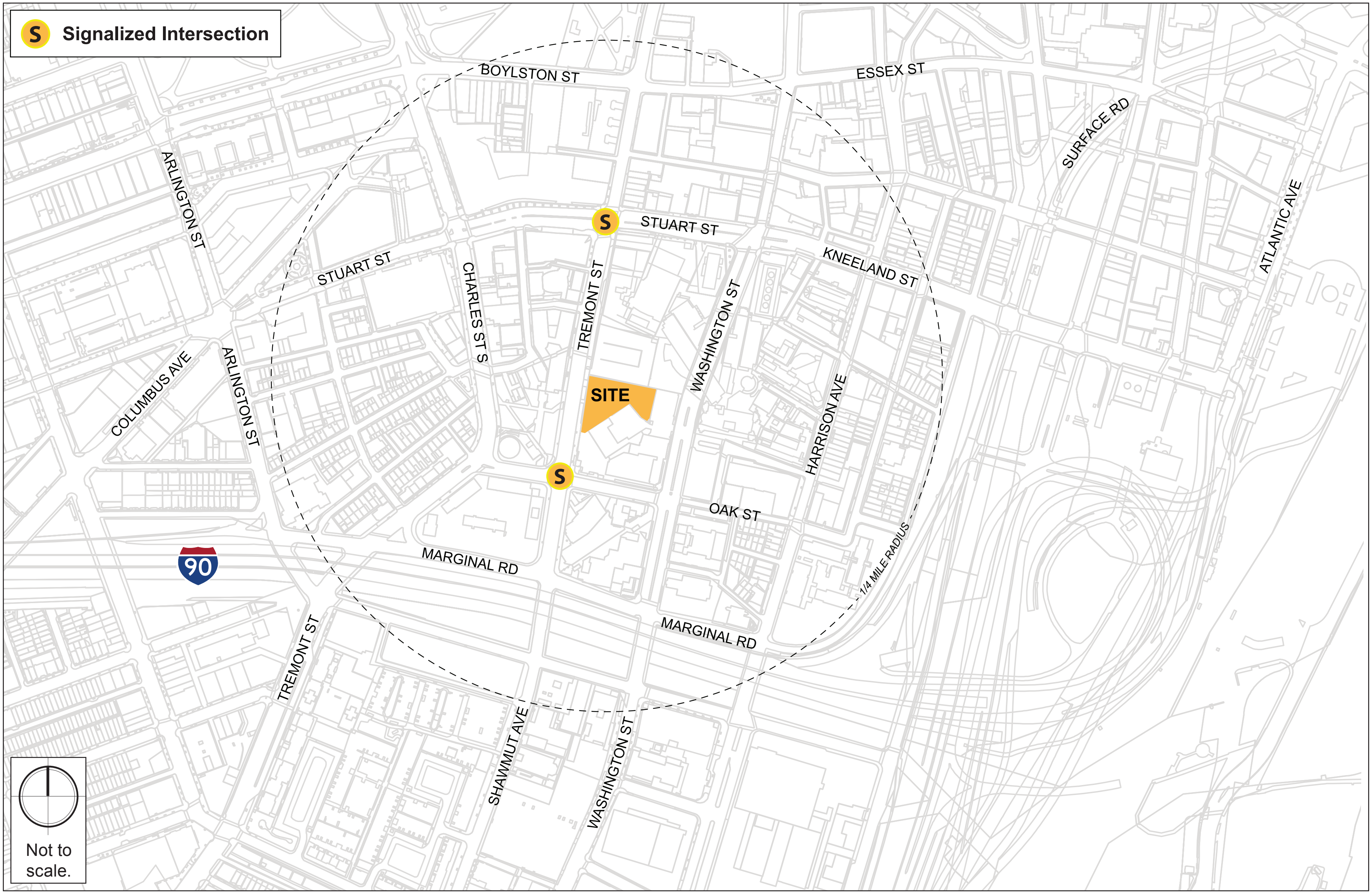
This section includes a description of existing study area roadway geometry, intersection geometry, intersection traffic control, curb usage (parking), public transportation services, peak-hour traffic volumes for vehicles, bicycles, and pedestrians, and intersection traffic operations.

2.2.1 Existing Roadway Conditions

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

Stuart Street is a two-way, four-lane roadway east of Charles Street, and a one-way eastbound, two-lane roadway west of Charles Street that runs in an east-west direction between Washington Street and Huntington Avenue. Stuart Street is located north of the Project site and is classified as an urban principal arterial under BTD jurisdiction. On-street parking and sidewalks are provided on both sides of Stuart Street.

Tremont Street is a one-way southbound, three lane roadway located to the west of the Project site. Tremont Street runs in a northeast-southwest direction between Court Street to the northeast and Huntington Avenue to the southwest. Tremont Street is classified as an urban principal arterial under BTD jurisdiction. On-street parking is only permitted on the east side of the roadway north of Boylston Street and is permitted on both sides of the roadway south of Stuart Street. Sidewalks are provided along both sides of the roadway.



Parcel P-12C **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-1
Study Area

Oak Street is a two-way, two lane roadway south of the Project site. Oak Street runs in an east-west direction between Tyler Street to the east and Tremont Street to the west. However, Oak Street becomes Oak Street West between Tremont Street and Washington Street. Oak Street is classified as an urban collector under BTD jurisdiction. On-street parking is permitted along one side of the roadway and sidewalks are provided along both sides of Oak Street.

2.2.2 Existing Intersection Conditions

Existing conditions at the study area intersections are described below.

Tremont Street/Stuart Street is a four-leg, signalized intersection with three approaches. The Stuart Street eastbound approach consists of two exclusive through lanes and a right-turn only lane. The Stuart Street westbound approach consists of a left-turn lane with approximately 130-feet of storage and two exclusive through lanes. The Tremont Street southbound approach consists of a left-turn only lane, two exclusive through lanes, and a right-turn only lane. Crosswalks, sidewalks, and pedestrian equipment are provided across all approaches to the intersection except for the southeast side of the intersection which is under construction. On-street parking is provided on both sides of Stuart Street eastbound approach and the north side of Stuart Street westbound approach.

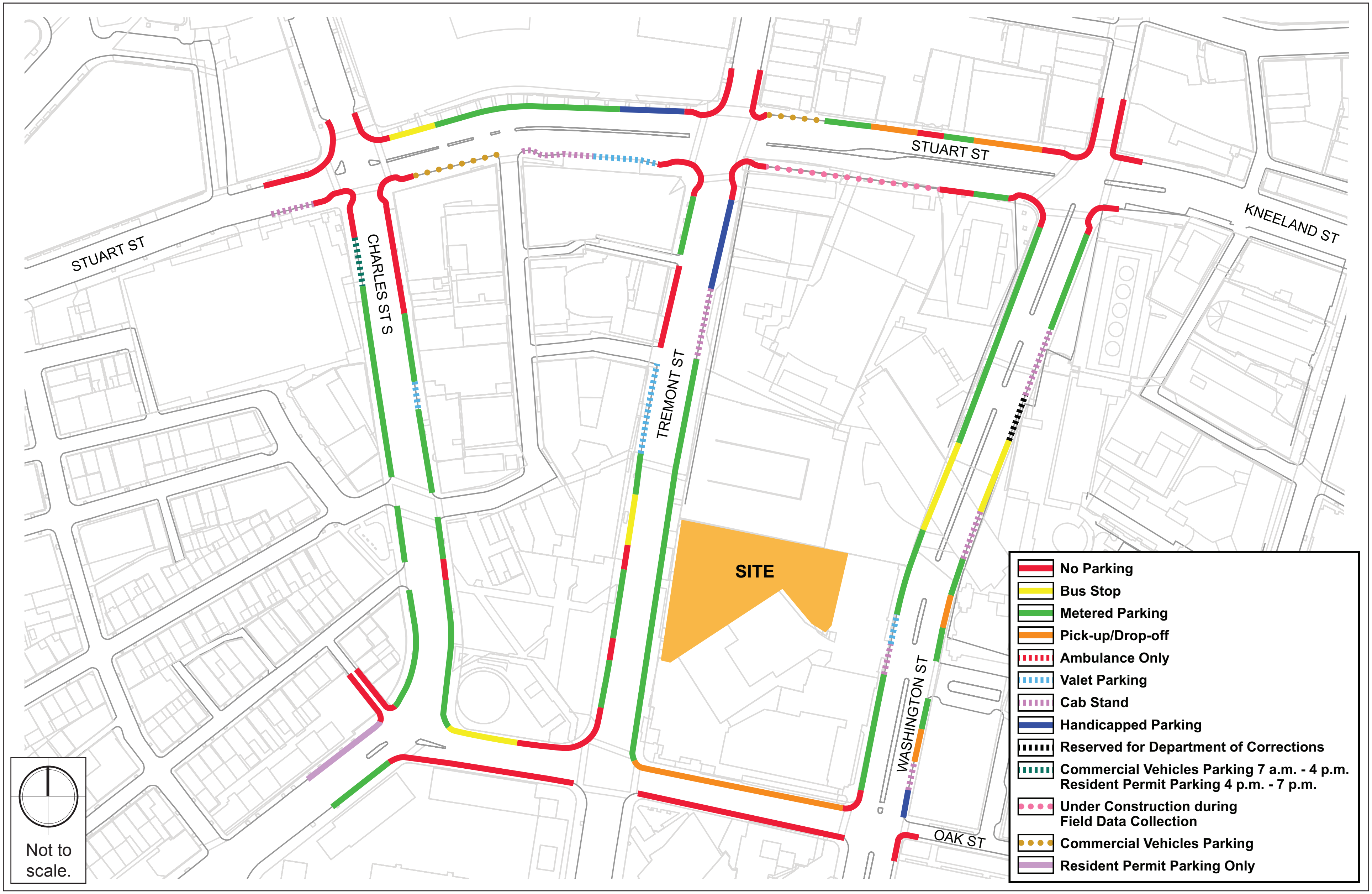
Tremont Street/Oak Street West/Shawmut Street is a four-leg, signalized intersection with three approaches. The Oak Street West eastbound and westbound approaches consists of a shared through/right-turn lane and shared left-turn/through lane, respectively. The Tremont Street southbound approach consists a shared left-turn/through lane, an exclusive through lane, and a shared through/right-turn lane. The MBTA Tufts Medical Center Orange Line Station is located on the northeast corner of the intersection. Crosswalks, sidewalks, and pedestrian equipment are provided across all approaches. On-street parking is provided along both sides of Tremont Street and along the north side of Oak Street West westbound approach.

2.2.3 Existing Parking

An inventory of the existing on-street parking and car sharing services in the vicinity of the Project was collected. A description of each follows.

2.2.3.1 On-Street Parking and Curb Usage

On-street parking surrounding the Project site consists of predominately of two-hour parking, handicapped parking, cab stands, and valet parking. The on-street parking regulations within the study area are shown in Figure 2-2.



Parcel P-12C **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-2
On-Street Parking

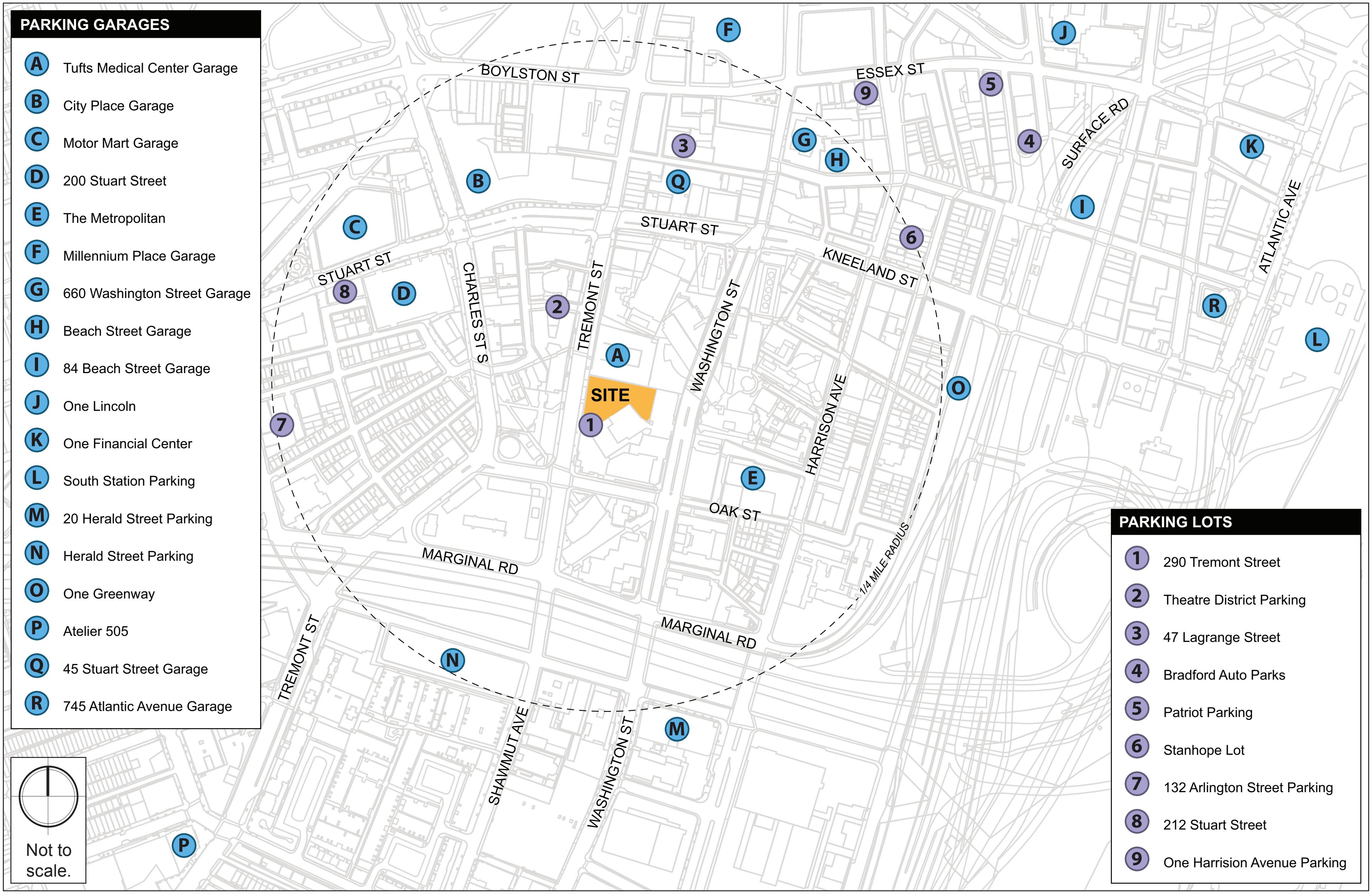
2.2.3.2 Off-Street Parking

Six parking lots and nine parking garages are located within a quarter mile or about a five-minute walk of the Project site. These facilities and others that are nearby but outside of a quarter mile are shown in Figure 2-3 and summarized in Table 2-2. In total, over 7,000 public parking spaces are available near the site.

Tufts Shared Services (one of the Proponents of the Project) owns and operates the Tremont Street Garage at 274 Tremont Street, which is adjacent to the Project site and would be expanded as part of the Project. (See Section 2.4.2 for a discussion of future parking conditions).

Table 2-2 Off-Street Parking Lots and Garages

Map # *(Figure 2-3)*	Address	Facility	Private Capacity	Public Capacity
Parking Lots				
1	290 Tremont Street	Tremont Street Lot	0	100
2	267 Tremont Street	Theatre District Parking	0	36
3	47-55 LaGrange Street	LaGrange Street Lot	0	50
4	130 Kingston Street	Bradford Auto Parks	0	4
5	22 Edinboro Street	Patriot Parking	0	32
6	17-21 Tyler Street	Stanhope/Tyler Lot	0	63
7	130-132 Arlington Street	Pinstripe Auto Park	0	61
8	212 Stuart Street	Billy's Service Lot	0	16
9	33-37 Essex Street	One Harrison Avenue Parking	0	54
Parking Lots – Subtotal			**0**	**416**
Parking Garages				
A	274 Tremont Street	Tremont Street Garage (Tufts Shared Services)	0	900
B	8 Park Plaza	City Place Garage	70	283
C	201 Stuart Street	Motor Mart Garage	144	528
D	200 Stuart Street	Revere Hotel Garage	0	776
E	1 Nassau Street	The Metropolitan	0	252
F	47 Boylston Street	Millennium Place Garage	62	831
G	660 Washington Street	Liberty Place Garage	15	449
H	40 Beach Street	Beach Street Garage	59	505
I	84 Beach Street[1]	Beach Street/Exeter Street Garage	0	0
J	One Lincoln Street	One Lincoln Street Garage	217	554
K	One Financial Center	One Financial Center Garage	0	250
L	640-720 Atlantic Avenue	South Station Garage	10	292
M	20 Herald Street	Teredyne Garage	70	275



Parcel P-12C **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-3
Off-Street Parking

Table 2-2 Off-Street Parking Lots and Garages (Continued)

Map # *(Figure 2-3)*	Address	Facility	Private Capacity	Public Capacity
Parking Garages (continued)				
N	120 Herald Street	Herald Street Garage	379	0
O	99 Kneeland Street	One Greenway	14	71
P	15 Warren Street	Atelier 505	0	156
Q	45 Stuart Street	45 Stuart Street Garage	0	198
R	745 Atlantic Avenue	745 Atlantic Avenue Garage	4	137
Parking Garages – Subtotal			**1,044**	**6,457**
Parking Lots + Garages - Total			**1,044**	**6,873**

1. This garage site is undergoing redevelopment review. Planned future capacity is shown.

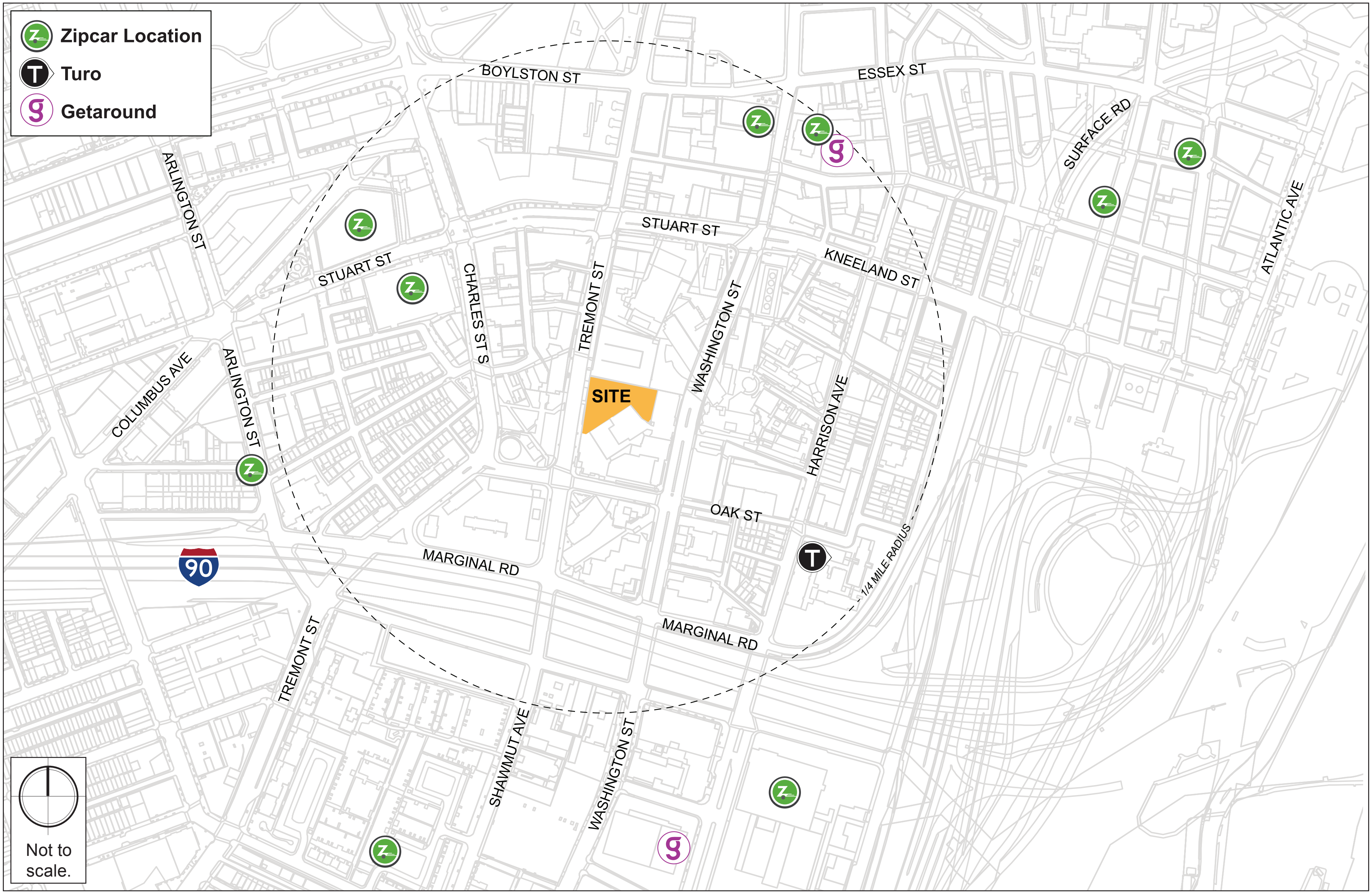
2.2.3.3 Car Sharing Services

Car sharing services enable easy access to short-term vehicular transportation. Vehicles are rented on an hourly or daily basis, and all vehicle costs (gas, maintenance, insurance, and parking) are included in the rental fee. Vehicles are checked out for a specific time period and returned to their designated location. Pick-up/drop-off locations are typically in existing parking lots or other parking areas throughout neighborhoods as a convenience to users of the services. Nearby car sharing services provide an important transportation option and reduce the need for private vehicle ownership.

Zipcar is the primary car share company in the Boston car sharing market, however other companies such as Turo and Getaround also operate within the city. Four Zipcar locations, one Turo location, and one Getaround location are located within a five-minute walk (one-quarter mile) of the Project site. Additionally, five Zipcar locations and one Getaround location exist within a ten-minute walk (one-half mile) from the Project site. The nearby car sharing locations are shown in Figure 2-4.

2.2.4 Existing Public Transportation Services

The Project site is in the South Cove section of Chinatown's neighborhood of Boston with many public transportation options. The MBTA subway stations within a five-minute walk (less than ¼ mile) of the Project site include Tufts Medical Center Station on the Orange Line and Boylston Street Station on the Green Line. The Silverline routes SL4 and SL5 operate between Dudley Station – South Station and Dudley Station – Downtown Crossing, respectively. Each Silverline routes stop at Tufts Medical Center on Washington Street in the inbound and outbound direction. The Project site is located approximately 15-minute walk (less than one mile) to South Station with access to regional bus services, efficient connection to Logan Airport via the Silver Line, Red Line, Silver Line, and Commuter Rail.



Parcel P-12C **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-4
Car Sharing Locations

Additionally, MBTA operate three bus routes in close proximity to the Project site. Nearby public transportation services are mapped in Figure 2-5 and listed in Table 2-3 below.

Table 2-3 Existing Public Transportation Service Summary

Transit Service	Description	Peak-Hour Headway (minutes)[1]
Rapid Transit Routes		
Orange Line	Forest Hills – Oak Grove	6
Silver Line SL4	Dudley Station – South Station	12
Silver Line SL5	Dudley Station – Downtown Crossing (Temple Place)	8
Green Line	Lechmere – Boston College, Cleveland Circle, Riverside, or Heath Street	6-7
Bus Routes		
Route 11	City Point – Bedford Street & Chauncy Street	10-12
Route 43	Ruggles Station – Park Street Station via Tremont Streets	20-30
Route 55	Jersey & Queensberry Streets – Park Street Station	15-30

1 Headway is the scheduled time between trains or buses. Headways are approximate.
Source: www.mbta.com, September 2019.

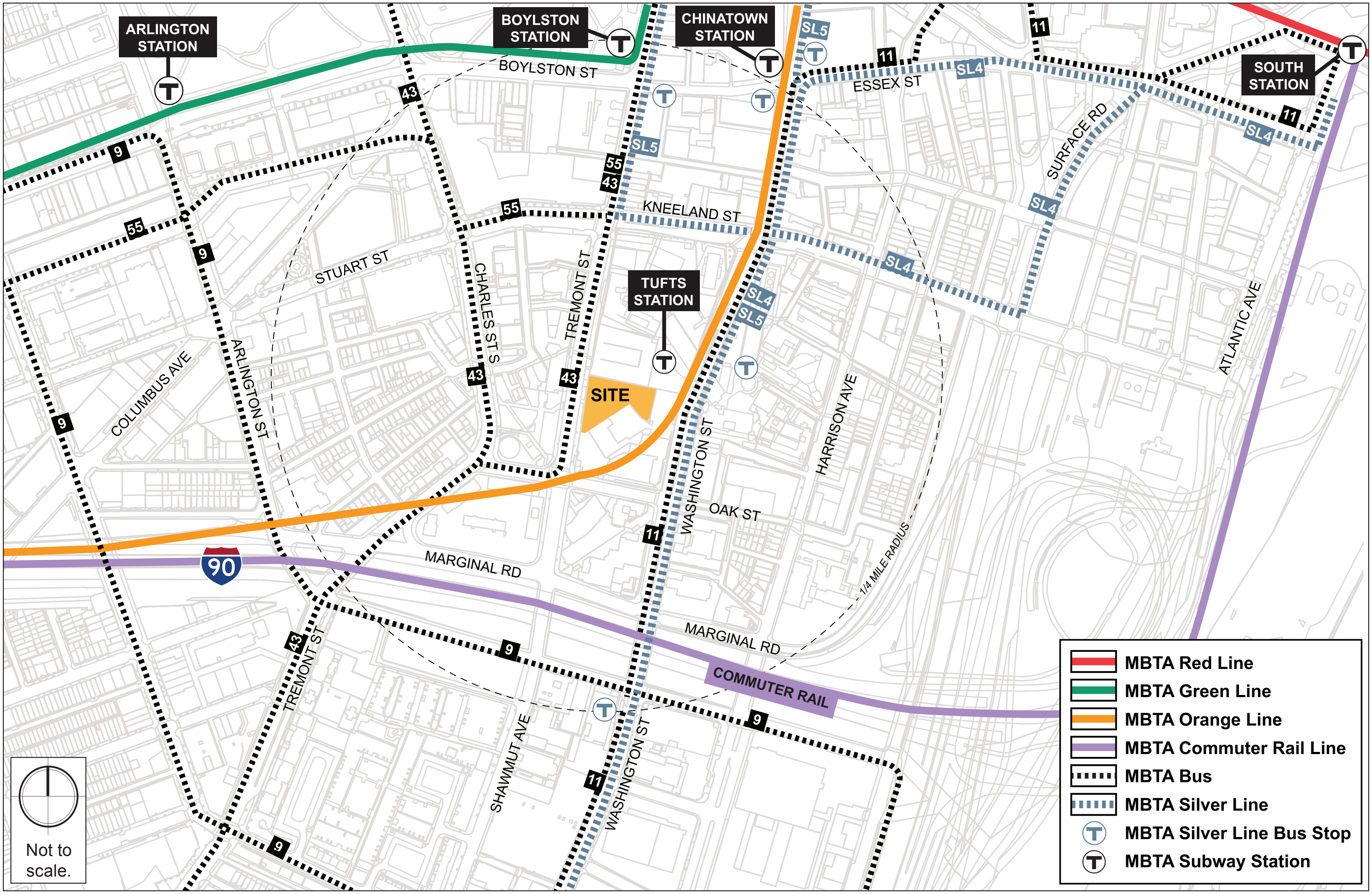
As part of the Project's impacts, the detailed future transit impact analysis is presented in Section 2.5.

2.2.5 Existing Traffic Data

Turning Movement Counts (TMCs) and vehicle classification counts were conducted at the study intersections during the weekday a.m. and weekday p.m. peak periods (7:00 – 9:00 a.m. and 4:00 – 6:00 p.m., respectively) on Wednesday, May 1, 2019. The traffic classification counts included car, heavy vehicle, pedestrian, and bicycle movements.

To supplement on-going City efforts, the BTD requested additional traffic data collection, but no associated analysis, for several locations other than the designated study intersections. Detailed traffic counts for all count locations are provided in Attachment C.

To account for seasonal variation in traffic volumes throughout the year, data provided by MassDOT was reviewed. The most recent (2017) MassDOT Weekday Seasonal Factors were used to determine the need for seasonal adjustments to the May 2018 TMCs. The seasonal adjustment factor for roadways similar to the study area (Group 6) in the month of May is 0.93. This indicates that average month traffic volumes are approximately seven percent less than the traffic volumes that were collected. Therefore, the traffic counts were not adjusted downward to reflect average month conditions in order to provide a conservatively high analysis consistent with the peak season traffic volumes. The MassDOT 2017 Weekday Seasonal Factors table is provided in Attachment C.



Parcel P-12C Boston, Massachusetts

Figure 2-5
Public Transportation

2.2.6 *Existing Vehicular Traffic Volumes*

The existing traffic volumes that were collected in May 2019 were used to develop the Existing (2019) Condition traffic volumes. The volumes were balanced where necessary across the roadway network within the study area.

The resulting Existing (2019) weekday a.m. peak hour and weekday p.m. peak hour traffic volumes are shown in Figure 2-6.

2.2.7 *Existing Bicycle Volumes and Accommodations*

Bicycle lanes and/or sharrows are not provided at any of the roadways within the immediate study area. In recent years, bicycle use has increased dramatically throughout the City of Boston. Bicycle counts, presented in Figure 2-7, were conducted concurrently with the vehicular TMCs and based on the counts, bicycle activity in the area was generally high along Stuart Street during the data collection period.

The Project site is also located in proximity to three bicycle sharing stations provided by BLUEbikes (formerly Hubway). BLUEbikes is the Boston area's largest bicycle sharing service, which was launched in 2011 and currently consists of more than 3,400 shared bicycles at more than 190 stations throughout Boston, Brookline, Cambridge, and Somerville. As shown in Figure 2-8, three BLUEbike stations are located within a quarter mile of the site.

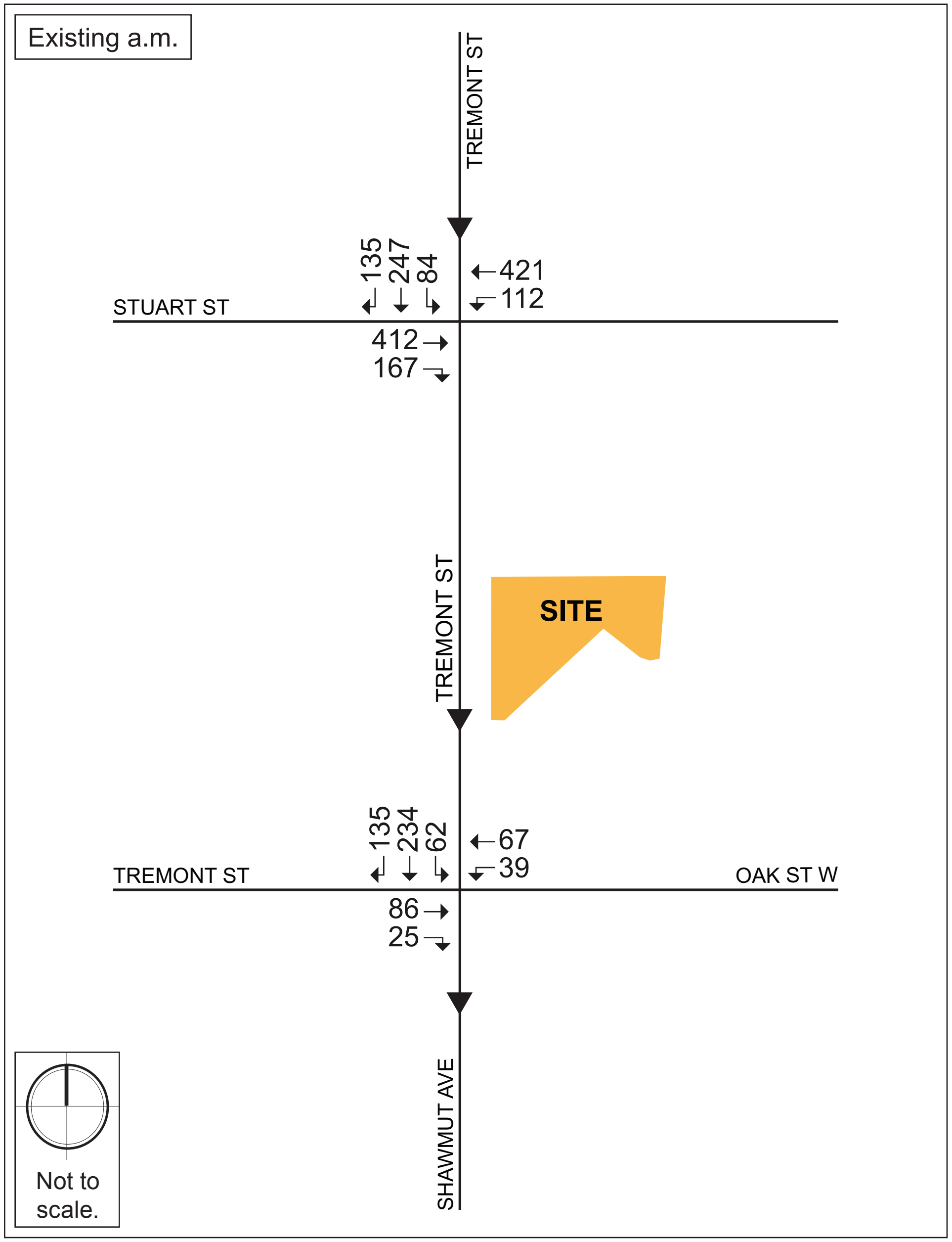
2.2.8 *Existing Pedestrian Volumes and Accommodations*

In general, sidewalks are provided along all roadways and are in good condition. Crosswalks and pedestrian signal equipment are provided at both signalized intersections.

To determine the amount of pedestrian activity within the study area, pedestrian counts were conducted concurrently with the TMCs at the two study area intersections. Per the City of Boston request, additional pedestrian counts were conducted at the crosswalk on Tremont Street, before the entrance to the Tufts Medical Center Garage on Wednesday, June 19, 2019. These additional counts include pedestrians using the crosswalk and pedestrians jaywalking near the crosswalk. The pedestrian activity along Tremont Street is presented in Figure 2-9.

2.3 No-Build Condition

The No-Build (2026) Condition reflects a future scenario that incorporates anticipated traffic volume changes associated with background traffic growth independent of any specific project, traffic associated with other planned specific developments, and planned infrastructure improvements that will affect travel patterns throughout the study area. These infrastructure improvements include roadway, public transportation, pedestrian facility, and bicycle facility improvements.



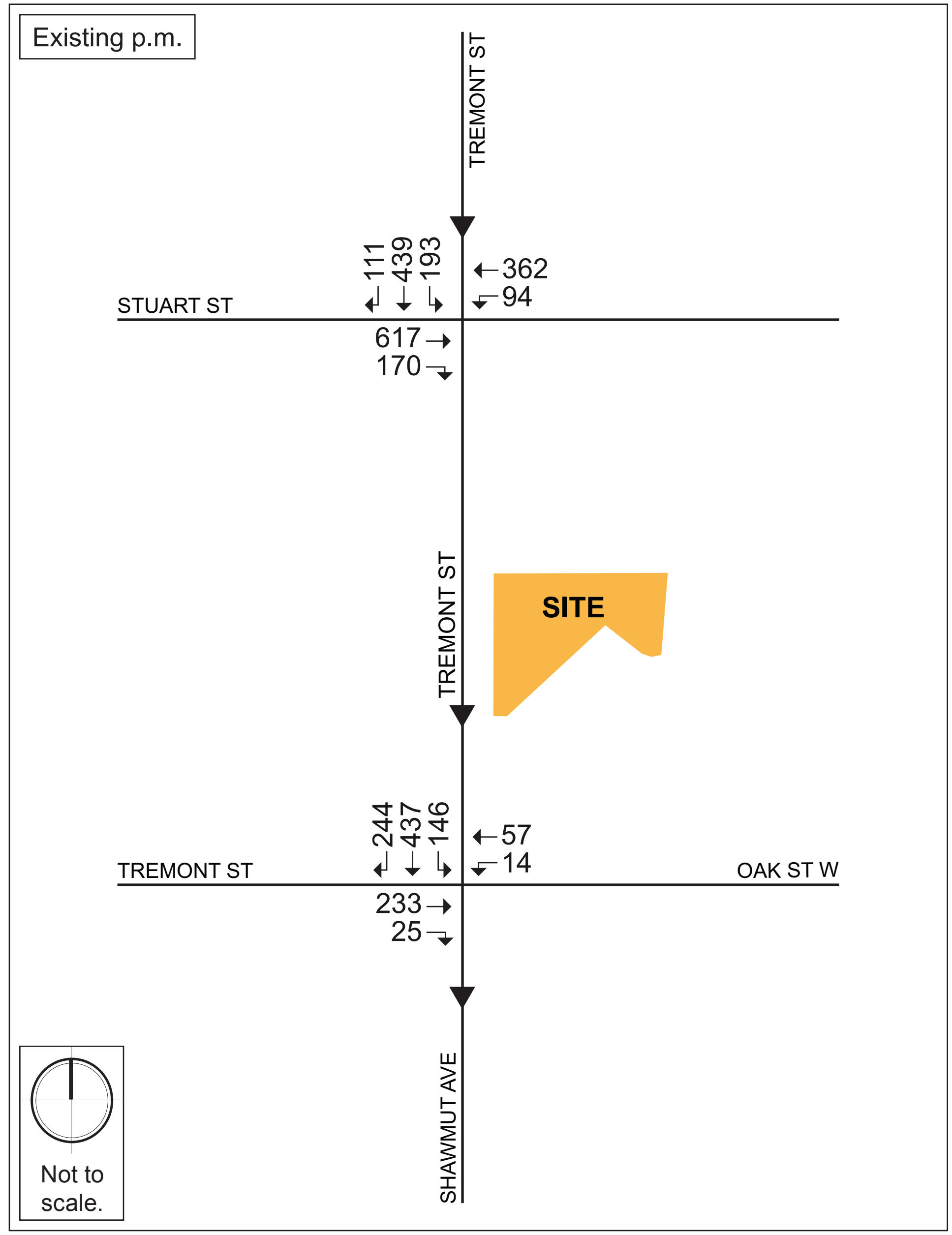
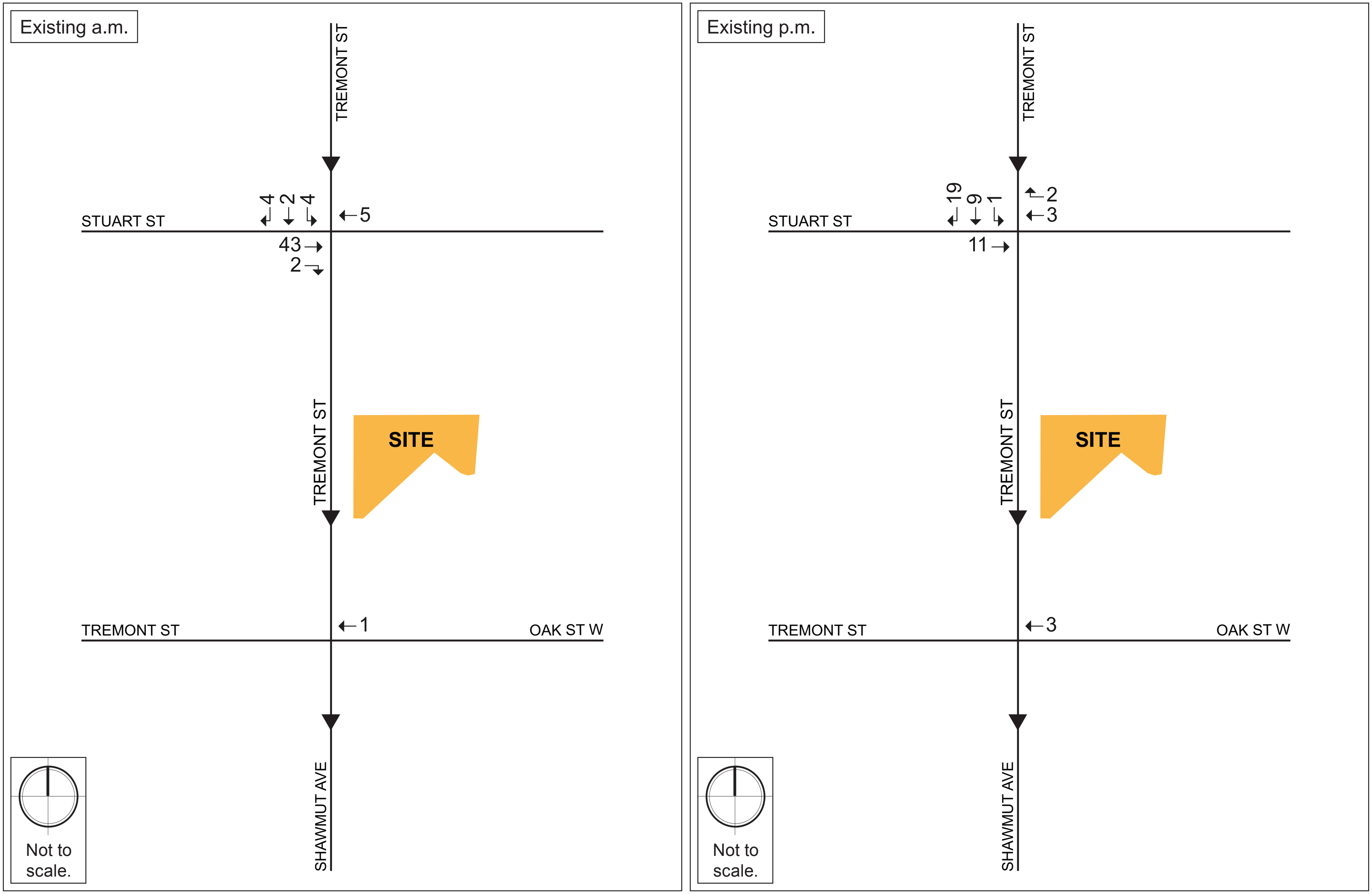


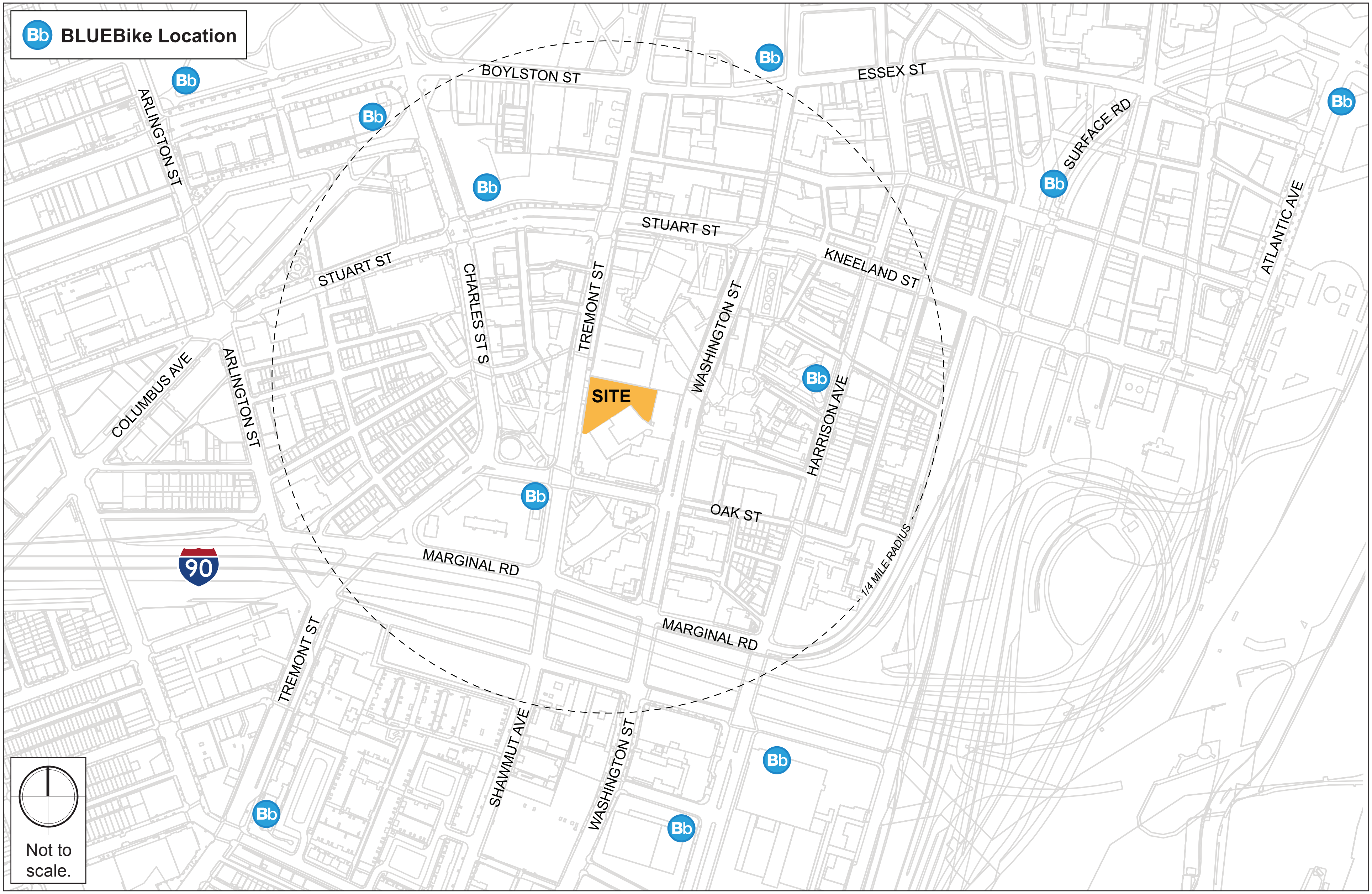
Figure 2-6
Existing (2019) Condition Traffic Volumes, Weekday a.m. and p.m. Peak Hours



Parcel P-12C **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

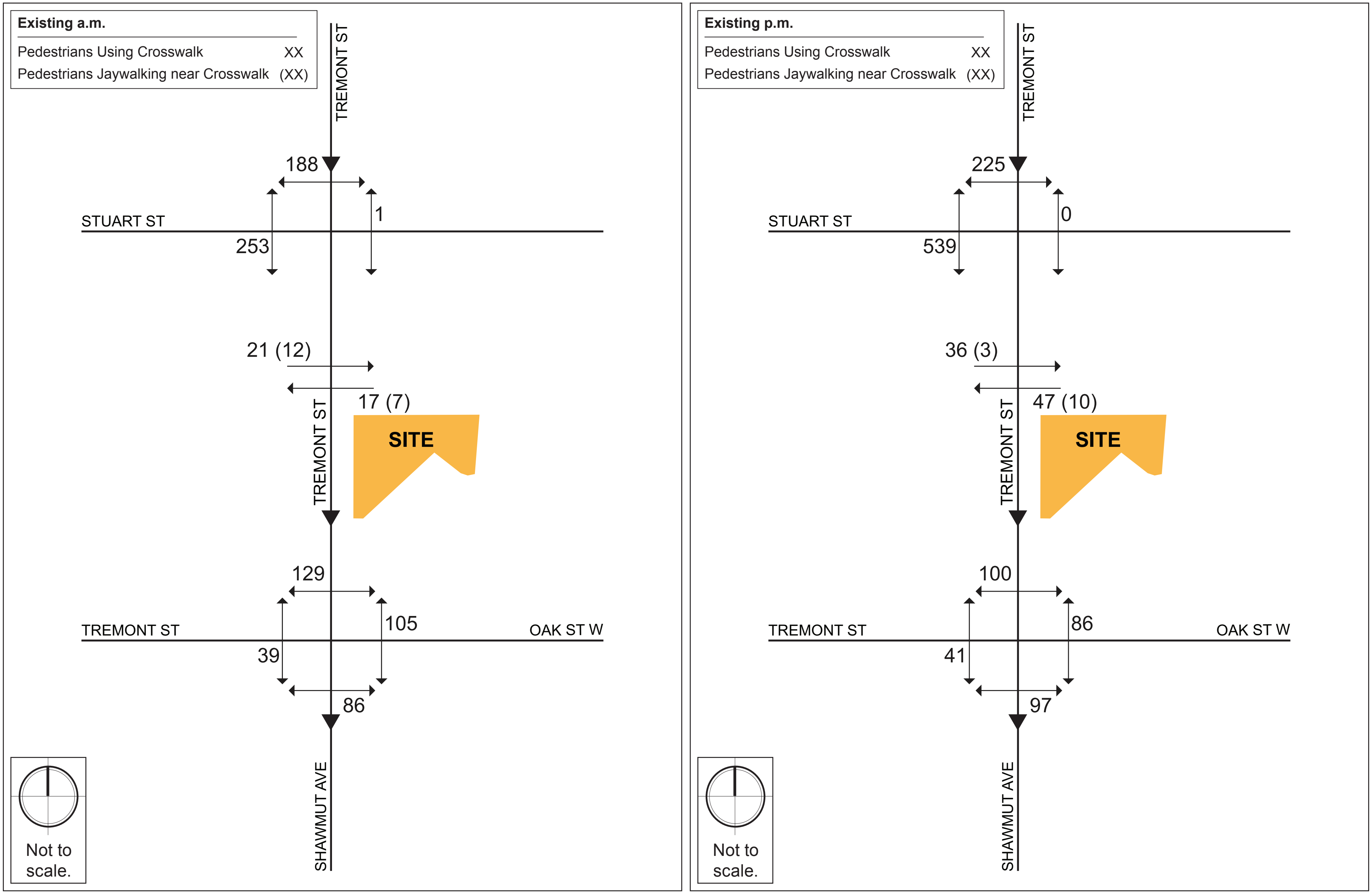
Figure 2-7
Existing (2019) Condition Bicycle Volumes, Weekday a.m. and p.m. Peak Hours



Parcel P-12C   Boston, Massachusetts

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-8
Bicycle Sharing Locations



Parcel P-12C Boston, Massachusetts

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-9
Existing (2019) Condition Pedestrian Volumes, Weekday a.m. and p.m. Peak Hours

2.3.1 *Background Growth Traffic*

The methodology to account for generic future background traffic growth is to evaluate how traffic volumes may be affected by changes in demographics, smaller scale development projects, or projects unforeseen at this time.

Based on a review of recent and historic traffic data collected and to account for any additional unforeseen traffic growth, a traffic growth rate of 0.5% per year, compounded annually through the horizon year seven years in the future, was used.

2.3.2 *Specific Development Traffic Growth*

Traffic volumes associated with known, larger, or adjacent development projects can affect traffic patterns throughout the study area within the future analysis time horizon. Key background development projects were identified in the vicinity of the Project site and are shown in Figure 2-10. Traffic volumes associated with the following projects were directly incorporated into the future conditions traffic volumes:

- **Motor Mart Garage** – The proposed project consists of the redevelopment of the existing eight-story Motor Marta Garage into a 20-story tower with approximately 306 residential units, retention of 46,000 sf of retail and restaurant space, and retention of 672 parking spaces. This project is currently under review by the BPDA.

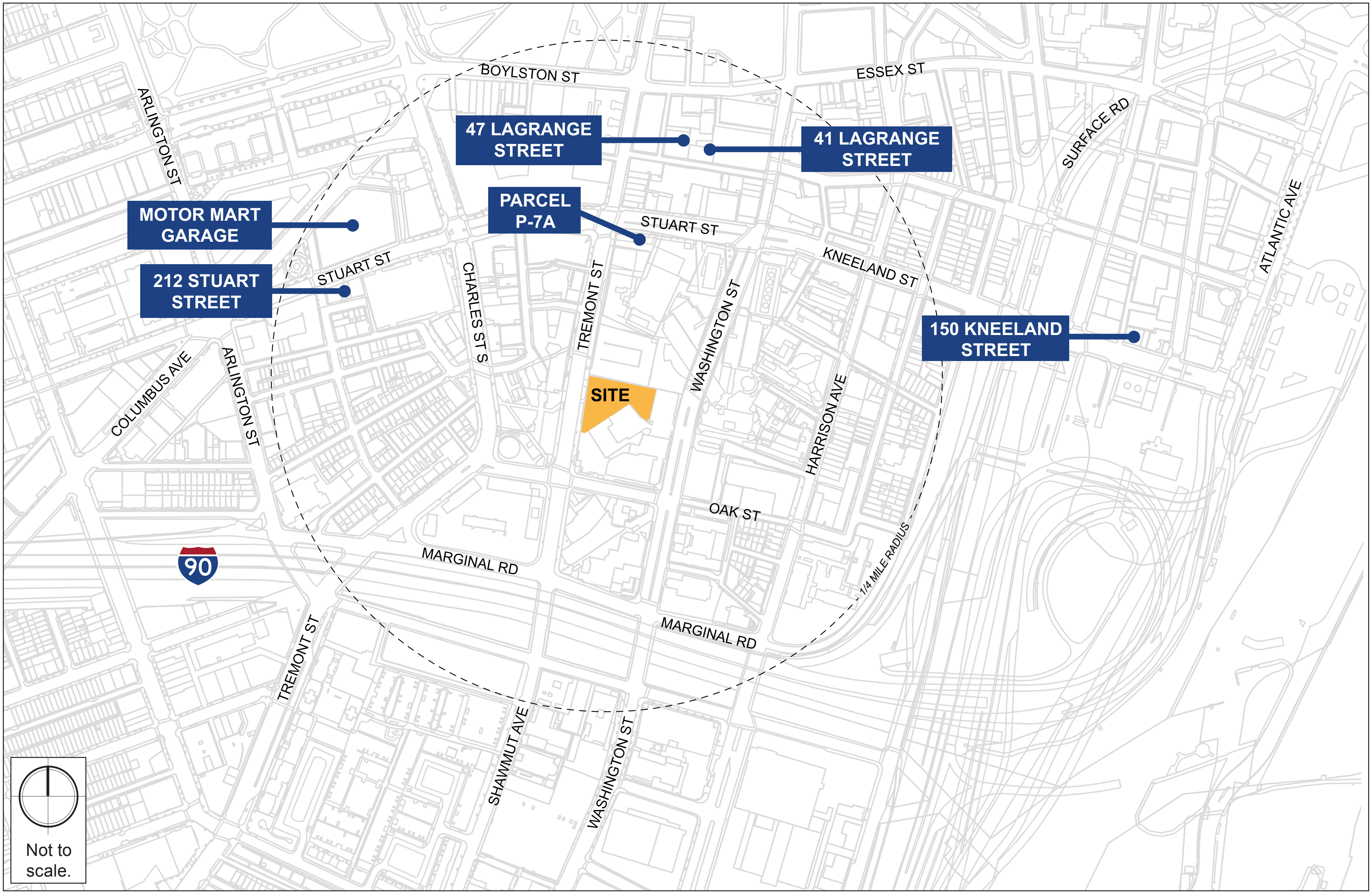
- **212 Stuart Street** – The project consists of an approximately 146,000 sf 19-story building with 126 residential units and 3,000 sf of first floor retail/restaurant space. Parking will be provided at the adjacent garage located at 200 Stuart Street. This project has been approved by the BPDA Board.

- **41 LaGrange Street** – The project consists of a new 19-story residential tower with approximately 126 residential units. No on-site parking will be provided. This project has been approved by the BPDA Board.

- **47 LaGrange Street** – The project consists of an approximately 157,000 sf 21-story building with up to 176 residential units. This project has been approved by the BPDA Board.

- **150 Kneeland Street** – The project consists of a 21-story hotel with approximately 230 rooms and a 3,000-sf lounge. This project has been approved by the BPDA Board.

- **Parcel P-7A/Moxy** – The project consists of the construction of a 125,000 sf 23-story micro hotel with approximately 346 rooms and the installation of a three-story digital/fixed advertising signage. This project is currently under construction.



Parcel P-12C **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-10
Background Projects

2.3.3 Proposed Infrastructure and Transit Improvements

A review of planned improvements to roadway, transit, bicycle, and pedestrian facilities was conducted to determine if there are any nearby improvement projects in the study area. These improvements have been incorporated into the future analysis, as appropriate.

- Tremont Street between Court Street to the north and Boylston Street to the south will be reconstructed to improve sidewalks, wheelchair ramps, and traffic control signals.

- Tremont Street between Boylston Street to the north and Stuart Street to the south will be resurfaced and improvements will be made to pedestrian and bicycle accommodations.

- The City of Boston is studying the potential of narrowing Tremont Street to two lanes (from the current three) and adding bicycle accommodations between Stuart Street to the north and Oak Street to the south. While these roadway improvement plans have not yet been finalized, the narrowing of Tremont Street is reflected in the future condition analysis.

- Based on the MBTA's Focus40 Plan, transit improvements include the following:

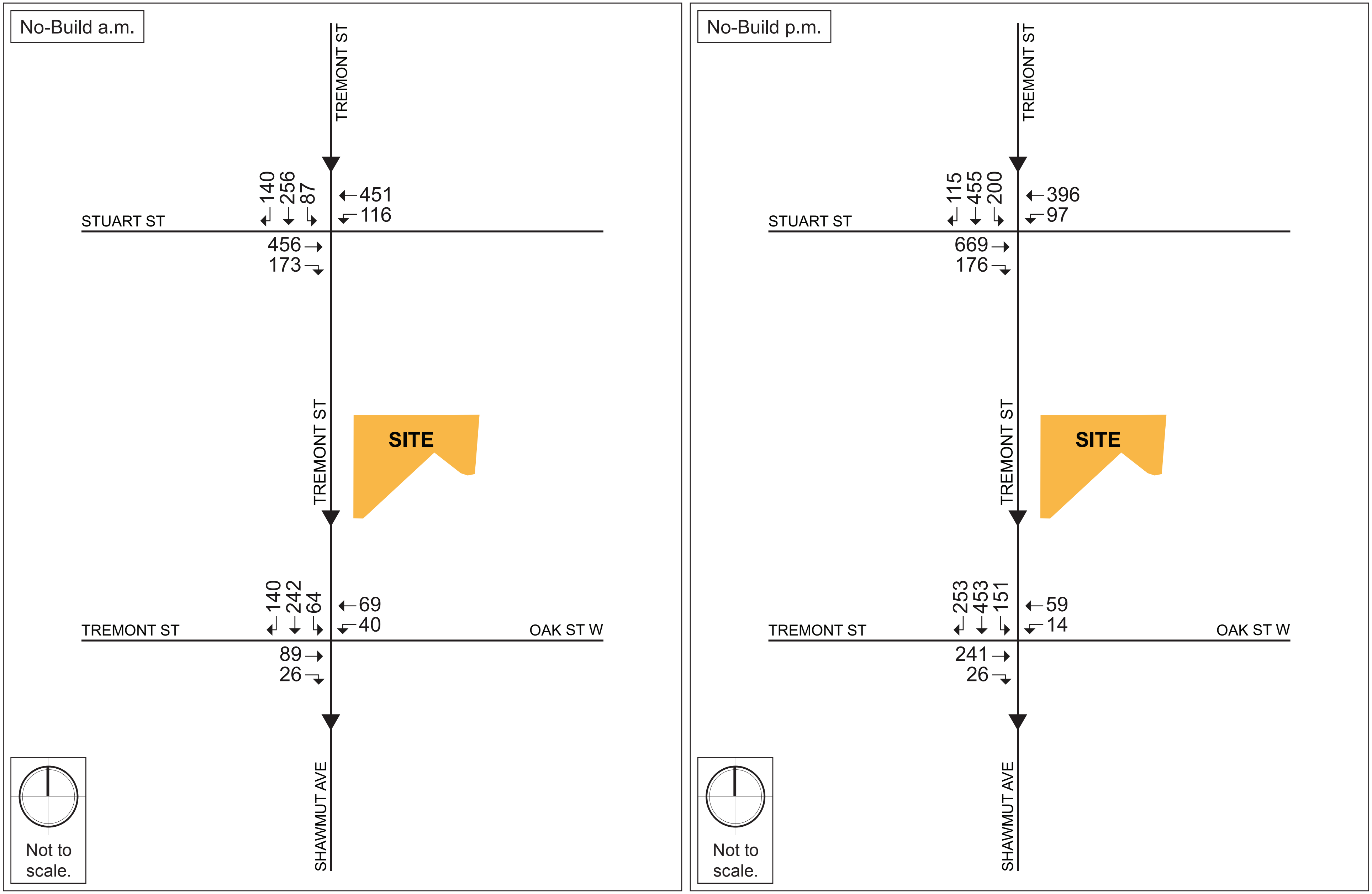
  - Orange Line – MBTA is currently adding a new fleet of Orange Line cars and will continue to add more until 2022. These new fleet cars will provide higher capacity (up to 25%) and shorter headways between trains;

  - Green Line – new fleet of Green Line cars have been added and are in service since December of 2018. MBTA projects an increase in capacity of up to 15% by 2040 with shorter headways.

  - Additional improvements in both rail lines include signal upgrades which will also improve the frequency of trains. These improvements are detailed and analyzed in Section 2.6 Transit Impact Analysis.

2.3.4 No-Build Traffic Volumes

The one-quarter percent per year annual growth rate, compounded annually, was applied to the Existing (2019) Condition traffic volumes, then the traffic volumes associated with the background development projects listed above were added to develop the No-Build (2026) Condition traffic volumes. The No-Build (2026) weekday a.m. peak hour and p.m. peak hour traffic volumes are shown on Figure 2-11.



Parcel P-12C Boston, Massachusetts

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-11
No-Build (2026) Condition Traffic Volumes, Weekday a.m. and p.m. Peak Hours

2.4 Build Condition

The Project will replace the existing lot with up to 171 residential units, an expansion of the Doubletree Hotel with up to 200 rooms, an extension of the adjacent Tremont Street Garage which is owned by TSS, and community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library. Capacity at the adjacent Tremont Street Garage will increase by up to 340 spaces by expanding the existing garage levels horizontally with the possible use of triple stackers on one covered level. These new parking spaces are intended to serve the Medical Center and University and not Project residents or hotel guests.

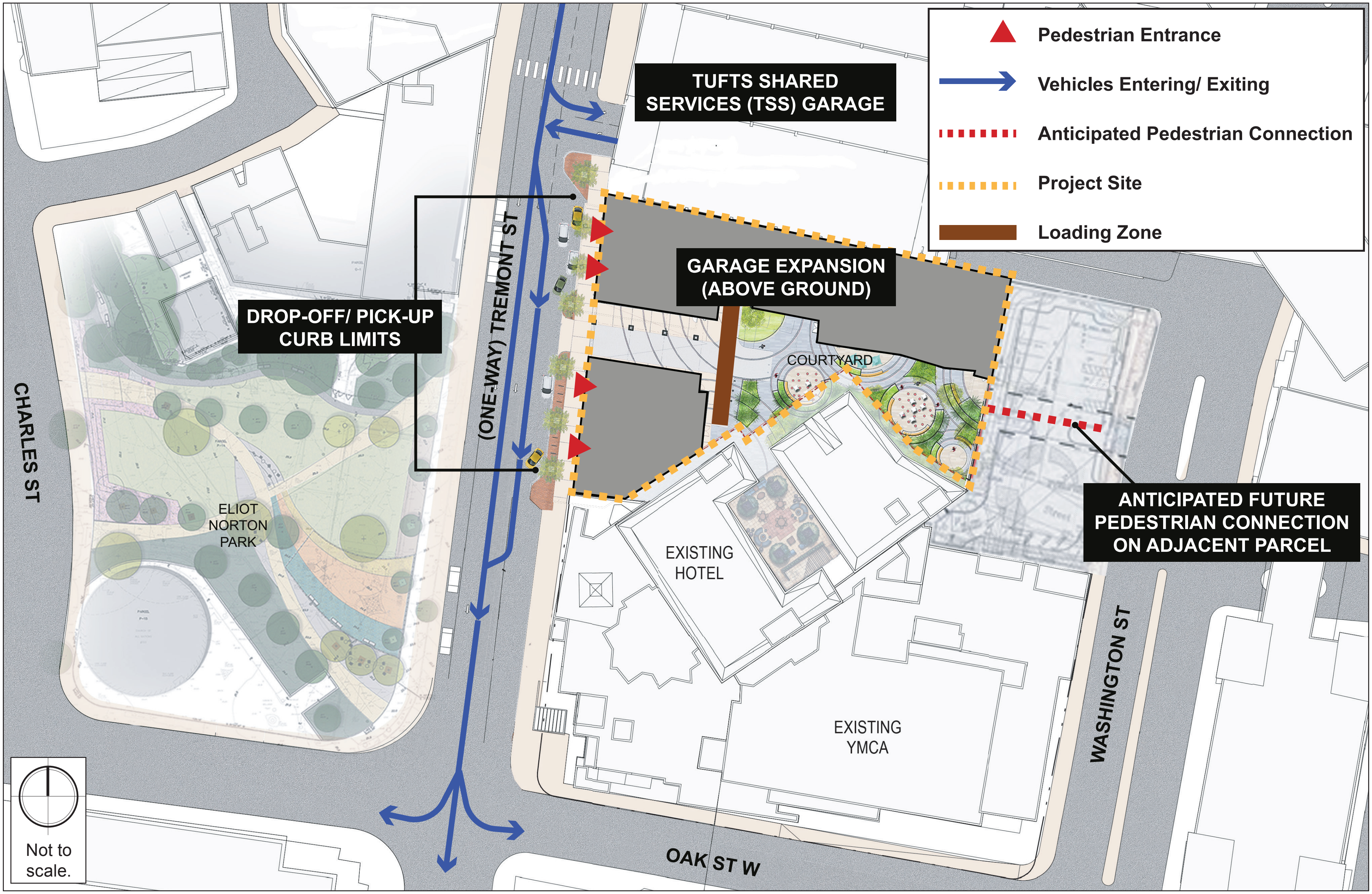
2.4.1 Site Access and Circulation

Vehicle and pedestrian access and circulation at the site are shown on the Site Plan in Figure 2-12. As noted previously, no parking will be provided on-site for residents or hotel guests. Most residents will not own vehicles and, like at other hotels in downtown Boston, guests typically do not use a personal auto during the stay. The planned expanded parking supply at the Tremont Street Garage will be used by Tufts Health Sciences Campus visitors/patients and employees. Vehicles destined to the Tremont Street garage will use the garage driveway and vehicles associated with the residential and hotel uses will use the drop-off/pick-up curb adjacent to the Project site. For analysis purposes, all vehicle trips have been assigned to Tremont Street although some of the limited residential and hotel vehicle trips will park elsewhere and not travel along Tremont Street.

The primary pedestrian entrances to the building lobbies will be located along Tremont Street. The Proponent will improve the pedestrian environment by reconstructing sidewalks and creating a pedestrian walkway through the center of the site, facilitating the anticipated continuation of the walkway to Washington Street. This new pedestrian connection will not only improve walking circulation but will ultimately allow for the creation of new access paths to the MBTA's Tufts Orange Line station and Silver Line bus stops on Washington Street. The Proponent will construct new sidewalks in accordance with Boston Complete Streets guidelines and requirements of the Americans with Disabilities Act and Massachusetts Architectural Access Board (ADA/AAB) to the extent feasible.

2.4.2 Project Parking

The Project will include a garage extension to the existing Tremont Street Garage, which is adjacent to the Project site at 274 Tremont Street and is owned by Tufts Shared Services (TSS). TSS, one of the development partners of this Project, is a joint venture between Tufts University (the University) and Tufts Medical Center (Medical Center). TSS was incorporated as a non-profit in 1968 for the purpose of providing the essential support services necessary for the institutions to carry out their health missions. One such critical support service is the management of parking and transportation programs for the Boston campus. To serve the parking needs of the Medical Center and the University, TSS leases parking at four locations in Chinatown and the South End, owns a parking lot at 5 Traveler Street, and owns the Tremont Street Garage.



Parcel P-12C **Boston, Massachusetts**

Figure 2-12
Site Plan with Vehicle and Pedestrian Circulation

The Project's planned extension of the Tremont Street Garage is intended to serve the Medical Center and University and not Project residents or hotel guests. Note that auto-ownership is expected to be negligible among the Project's residential tenants and many hotels in downtown Boston do not offer on-site parking, reflecting the fact that most tourists and business travelers do not have vehicles while visiting the City. Existing, nearby parking facilities provide over 7,000 public parking spaces, which could serve any residual demand.

The following sections provide an overview of the existing garage and an evaluation of TSS' existing and future parking needs.

2.4.2.1 Overview of the Tremont Street Garage

The Tremont Street Garage is a nine-story garage with 900 spaces, serving patients/visitors, doctors who are direct caregivers, and longstanding nurses of the Medical Center. While the garage is also available for commercial/public use, garage "ambassadors" at the entrances ensure that patients/visitors are given priority over commercial parkers during busy weekday periods.

The garage's primary driveway is on Tremont Street. This driveway provides one access lane and one egress lane for vehicles. Three gated lanes with cashiers/permit readers are located immediately inside the garage. A secondary garage driveway is located on Washington Street. The Washington Street driveway, with only one lane, is designated for entering monthly permit holders during the morning peak hours and is used as a secondary exit lane during the afternoon peak period to ease exiting queues at the Tremont Street driveway. A driveway to a small underground level is located adjacent to the Washington Street driveway. The underground level, however, is only used for storage of maintenance vehicles and equipment and as a secondary loading dock for the health services campus. Parkers can walk inside between the garage and other campus buildings via the third-floor corridor connection or exit the garage and use exterior sidewalks/walkway connections to their destination.

With the Project, the garage capacity will increase to up to 340 spaces by expanding the existing garage levels horizontally with the possible use of triple stackers on one covered level. No new garage driveways are needed at the street level because the expansion will be built against the existing garage allowing direct access between the existing and new sections on each level.

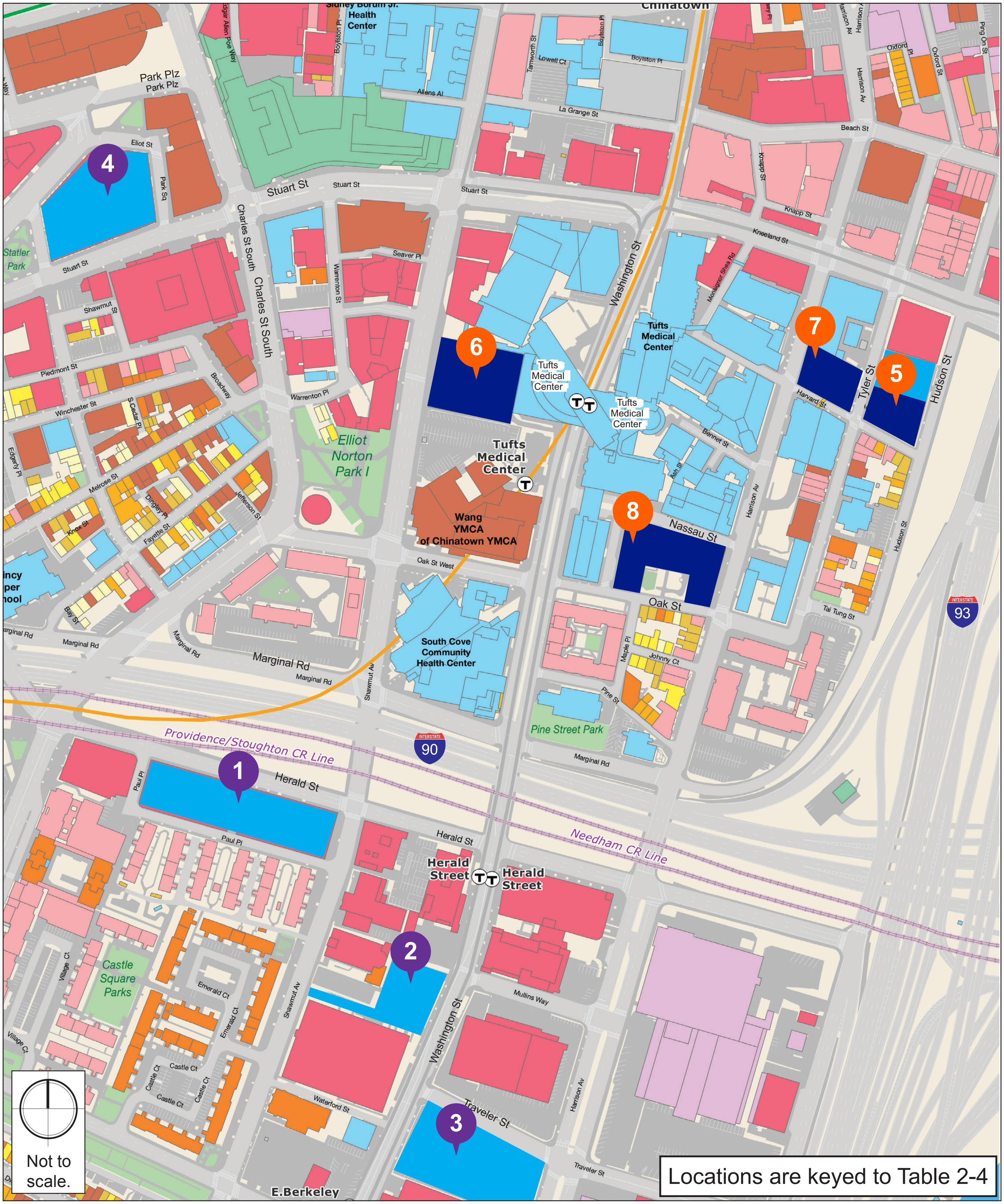
2.4.2.2 Tufts Shared Services Parking Needs Assessment

As an urban campus, TSS faces a dynamic transportation and parking situation. The Medical Center alone has approximately 21,000 Inpatient discharges; 41,500 Emergency Department visits and 350,000 Clinic Visits per year, serving patients and visitors 24 hours a day, seven days a week. The School of Dental Medicine has approximately 160,000 patient visits per year. Although TSS provides a wide variety of programs to reduce single vehicle trips to the campus, the parking demand for healthcare institutions is very different than typical parking demand, understanding that convenient patient and visitor parking is essential and that there are certain staff with atypical work schedules not conducive to utilizing public transportation as their primary mode of transportation.

Figure 2-13 shows the eight existing parking facilities currently used by TSS along with two that lost due to new development. The map id numbers in Figure 2-13 are keyed to Table 2-4, which summarizes the associated facility name, address, ownership/lease status, and capacity by user type. TSS currently has rights of up to approximately 2,127 off-street parking spaces at six different locations; two facilities are owned while the balance are controlled through short-term leases. Of the 2,127 spaces, 690 spaces are available for public use by patients and visitors, and 1,437 are parking for staff and students. As shown in Figure 2-13, the parking for staff and students is further away from the campus so is serviced by a shuttle during peak hours.

Over recent years, the campus' patient volume has continued to grow, while the supply of parking available for patients and visitors has significantly decreased. TSS previously had three facilities that serviced this population which have since been reduced to one main facility (Tremont Street Garage, owned by TSS) and a small, ancillary valet lot. In total, TSS has lost over 370 spaces in close proximity to the campus, suitable for use by patients, that have not been replaced. TSS anticipates that this trend will continue in the near future as the lease with the BPDA for the R-1 lot on Hudson Street expires in 2020 and is unlikely to be renewed for any significant length of time; this will result in the loss of an additional 100 parking spaces. This overall reduction has created a significant strain on total capacity, as the Tremont Street Garage reaches full occupancy and closes to new entrants during peak hours on a daily basis. While valet parking hours have been extended, there has been no increase in the number of available parking spaces for additional valet vehicles to park, hence forcing the valet operation to temporarily close on a regular basis.

In addition to the immediate area surrounding the campus, a great deal of development has occurred in surrounding neighborhoods over the past several years. These developments have also placed constraints on the existing traffic and parking supply servicing the campus. A current issue facing TSS is its lease of up to 450 spaces at the Motor Mart Garage used for doctor and staff parking. The owners of the Motor Mart Garage have announced that they will be reducing available commercial/public parking spaces from 1,037 spaces to 528 spaces. Given the redevelopment plans for that property, it is anticipated that TSS will lose a significant number of those parking privileges when its existing lease expires and the cost of those spaces increases with demand. Additionally, the development of Parcel P-12C itself will result in the loss of the existing surface parking lot with 100 spaces. These spaces are not controlled by TSS (nor part of the TSS' parking inventory) but they do currently support the Medical Center and University as they are often utilized when the Tremont Street Garage is full.



Parcel P-12C **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-13
Tufts Shared Services Parking

Table 2-4 Tufts Shared Services Parking Facilities

Map ID # *(Figure 2-13)*	Facility	Location	Leased/Owned	Spaces Staff/ Student	Spaces Patient/ Visitor	Spaces Total
Current Staff/Student Parking Facilities						
1	Herald St. Garage	120 Herald St.	Short-term lease	370	0	370
2	Verizon Lot	1071 Washington St.	Short-term lease	64	0	64
3	Traveler St. Lot	5 Traveler St.	Owned	243	0	243
4	Motor Mart Garage	20 Park Plaza	Short-term lease	450	0	450
			Subtotal	1,127	0	1,127
Primarily Patient/Visitor Parking Facilities						
5	R-1 (Hudson St.) and Tyler St. lots	51 Hudson St.	Short-term lease	50	50	100
6	Tremont St. Garage	274 Tremont St.	Owned	260	640	900
			Subtotal	310	690	1,000
Total Parking Spaces as of September 2019				**1,437**	**690**	**2,117**
Spaces Loss to Development						
7	Jaharis Lot	136 Harrison St.	Lost parking in 2003	0	250	250
8	Metropolitan Lot	1 Nassau St.	Lost parking in 2004	0	120	120
			Total	**0**	**370**	**370**

Parking is a constant concern for both the University and the Medical Center, one which is addressed by encouraging staff and students to maximize use of alternative forms of transportation to access the campus. TSS has long provided an array of incentives to reduce the number of employees who drive to work. Some of those measures include:

- Membership in A Better City's Transportation Management Association
- A robust MBTA transit pass subsidy program
- Encouraging bicycling and walking incentives and amenities
- Screening vehicles allowed to park in the main garage

While these measures do help to reduce staff and student parking, they do not address the chronic shortage of parking available for patients and visitors. Nor do they satisfy the loss of over 900 parking spaces that have been or are due to be lost from the inventory. The proposed expansion of the Tremont Street Garage, the only TSS facility that is adjacent to the Medical Center, will help to address these needs.

2.4.3 Loading and Service Accommodations

The Project's loading and service zone is shown on the site plan in Figure 2-12. All service vehicles will use Tremont Street to reach the loading zone via the passageway at the base of the Project tower. Although the passageway will serve both pedestrians and service vehicles, the service driveway for vehicles will be separated from pedestrian walkways by bollards. Different paving materials within the passageway will visually signal the change of function and ensure pedestrian safety. The service driveway length has been minimized, while the pedestrian walkway continues into the inner courtyard and may eventually connect through to Washington Street as part of the development of the adjacent parcel.

One loading bay and one trash bay will be provided for the residential building. Residential loading activity includes move-in/move-out, furniture deliveries, contractor/repair calls and shorter-term activity such as package delivery (USPS, UPS, Fed-Ex). All residential loading and delivery activity will be managed by an on-site transportation coordinator. One loading bay and one trash bay will be provided for the hotel building. All hotel loading and delivery activity will be managed by an on-site transportation coordinator. All loading bays will accommodate SU-36 sized trucks.

2.4.4 Trip Generation Methodology

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

To estimate the number of trips expected to be generated by the Project, data published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual*[1] were used. ITE provides data to estimate the total number of unadjusted vehicular trips associated with the Project. In an urban setting well-served by transit, adjustments are necessary to account for other travel modes such as walking, bicycling, and transit.

To estimate the unadjusted number of vehicular trips for the Project, the following ITE land use codes (LUC) were used:

Land Use Code 221 – Multifamily Housing Mid-Rise. Mid-rise multifamily housing includes apartments, townhouses, and condominiums with at least three other dwelling units and that have between three and 10 levels (floors). Calculations of the number of trips use ITE's average rate per dwelling units.

---

[1] Trip Generation Manual, 10th Edition; Institute of Transportation Engineers; Washington, D.C.; 2017.

Land Use Code 310 – Hotel. A hotel is a place of lodging that provides sleeping accommodations and supporting facilities such as restaurants, cocktail loungers, meeting and banquet rooms or convention facilities, limited recreational facilities (pool, fitness room), and/or other retail and service shops. Calculations of the number of trips use ITE's average rate per rooms.

Land Use Code 590 – Library. A library can be either a public or private facility that consists of shelved books, reading rooms, or areas, and sometimes, meeting rooms. Calculations of the number of trips use ITE's average rate per 1,000 square feet. While the Proponent hopes that the Project will include a Chinatown branch of the Boston Public Library, an alternative community use would likely have lower trip generation rates. Therefore, the designation of this space as a library results in a more conservation (higher impact) analysis.

Trip generation associated with the new parking spaces in the expanded section of the Tremont Street Garage was based on knowledge of existing parking characteristics. The existing site contains approximately 100 surface parking spaces. The Project will remove those 100 spaces and add up to 340 parking spaces in the garage, resulting in a net increase of up to 240 spaces. The daily trips associated with the net new spaces was based on a 2.0 turnover per space. New peak hour trips were based on a proportional increase of garage driveway activity, reflecting the maximum increase of parking spaces.

2.4.5 Travel Mode Share

The American Census Survey (ACS) provides travel mode share rates for residents traveling from home to work and back via walking/biking, transit, and vehicles by census tract. The site is located in Census Tract 702. An average of the travel mode shares from the census tracts were adopted for the Project's residential land use. The high share of walking and bicycle as a means of commuting to work reflect the characteristics of this urban neighborhood.

Additionally, BTD provides vehicle, transit, and walking mode share rates for different areas of Boston. The Project is located in the eastern portion of designated Area 3 – Park Plaza. The BTD mode shares were adopted for the hotel and library land uses.

The unadjusted vehicular trips were converted to person-trips by using vehicle occupancy rates published by the Federal Highway Administration (FHWA)[2]. The person-trips were then distributed to different modes according to the mode shares shown in Table 2-5.

---

2 Summary of Travel Trends: 2017 National Household Travel Survey; FHWA; Washington, D.C.; July 2018.

Table 2-5 Travel Mode Shares

Land Use		Walk/Bicycle Share	Transit Share	Vehicle Share	Vehicle Occupancy Rate
Daily					
Residential LUC 221 – 171 Units	In	67%	12%	21%	1.18
	Out	67%	12%	21%	1.18
Hotel LUC 310 – 200 Rooms	In	39%	30%	31%	1.82
	Out	39%	30%	31%	1.82
Library LUC 590 – 14 ksf	In	39%	30%	31%	1.82
	Out	39%	30%	31%	1.82
a.m. Peak Hour					
Residential LUC 221 – 171 Units	In	67%	12%	21%	1.18
	Out	67%	12%	21%	1.18
Hotel LUC 310 – 200 Rooms	In	27%	39%	34%	1.82
	Out	69%	11%	20%	1.82
Library LUC 590 – 14 ksf	In	27%	39%	34%	1.82
	Out	69%	11%	20%	1.82
p.m. Peak Hour					
Residential LUC 221 – 171 Units	In	67%	12%	21%	1.18
	Out	67%	12%	21%	1.18
Hotel LUC 310 – 200 Rooms	In	69%	11%	20%	1.82
	Out	27%	39%	34%	1.82
Library LUC 590 – 14 ksf	In	69%	11%	20%	1.82
	Out	27%	39%	34%	1.82

2.4.6 Project Trip Generation

The travel mode share percentages shown in Table 2-5 were applied to the number of person trips to develop walk/bicycle, transit, and vehicle trip generation estimates for the Project. Vehicle trips include automobiles, taxicabs, and transportation network company (TNC) services, such as Uber and Lyft. The trip generation for the Project by travel mode is shown in Table 2-6. The detailed trip generation information is provided in Attachment C.

Table 2-6 Project Trip Generation

Land Use		Walk/Bicycle Trips	Transit Trips	Vehicle Trips		
				Private	Taxicab/ TNC	Total
Daily						
Residential LUC 221 – 171 Units	In	368	66	92	10	102
	Out	368	66	92	10	102
	Total	**736**	**132**	**184**	**20**	**204**
Hotel LUC 310 – 200 Rooms	In	594	457	251	16	267
	Out	594	457	251	16	267
	Total	**1,188**	**914**	**502**	**32**	**534**
Library LUC 590 – 14 ksf	In	358	275	151	10	161
	Out	358	275	151	10	161
	Total	**716**	**550**	**302**	**20**	**322**
Parking Garage Up to 340 new spaces[1]	In	0	0	548	0	548
	Out	0	0	548	0	548
	Total	**0**	**0**	**1.096**	**0**	**1,096**
a.m. Peak Hour						
Residential LUC 221 – 171 Units	In	13	2	3	1	4
	Out	36	6	9	1	10
	Total	**49**	**8**	**12**	**1**	**14**
Hotel LUC 310 – 200 Rooms	In	27	39	18	1	19
	Out	49	8	8	1	9
	Total	**76**	**47**	**26**	**2**	**28**
Library LUC 590 – 14 ksf	In	5	7	3	0	3
	Out	5	1	1	0	1
	Total	**10**	**8**	**4**	**0**	**4**
Parking Garage Up to 340 new spaces[1]	In	0	0	33	0	33
	Out	0	0	10	0	10
	Total	**0**	**0**	**43**	**0**	**43**
p.m. Peak Hour						
Residential LUC 221 – 171 Units	In	36	6	9	1	10
	Out	23	4	6	1	7
	Total	**59**	**10**	**15**	**2**	**17**
Hotel LUC 310 – 200 Rooms	In	77	12	12	2	14
	Out	29	42	19	2	21
	Total	**106**	**54**	**31**	**4**	**35**
Library LUC 590 – 14 ksf	In	69	11	10	2	12
	Out	29	42	19	2	21
	Total	**98**	**53**	**29**	**4**	**33**
Parking Garage Up to 340 new spaces[1]	In	0	0	12	0	12
	Out	0	0	44	0	44
	Total	**0**	**0**	**56**	**0**	**56**

1 Note that the overall Project includes removal of 100 existing surface parking spaces and the construction of between 270 and 340 new parking spaces, resulting in a net increase of between 170 and 240 spaces. Parking trips shown in Table 2-5 are net new parking trips.

The Project is expected to generate approximately 2,156 daily vehicle trips with 88 vehicle trips (59 entering and 29 exiting) during the weekday a.m. peak hour and 141 vehicle trips (48 entering and 93 exiting) during the weekday p.m. peak hour.

2.4.7 Trip Distribution

The trip distribution identifies the various travel paths for vehicles associated with the Project. Trip distribution patterns for the Project were based on BTD's origin-destination data for Area 1 and trip distribution patterns presented in traffic studies for nearby projects. The trip distribution patterns for the Project are illustrated in Figures 2-14.

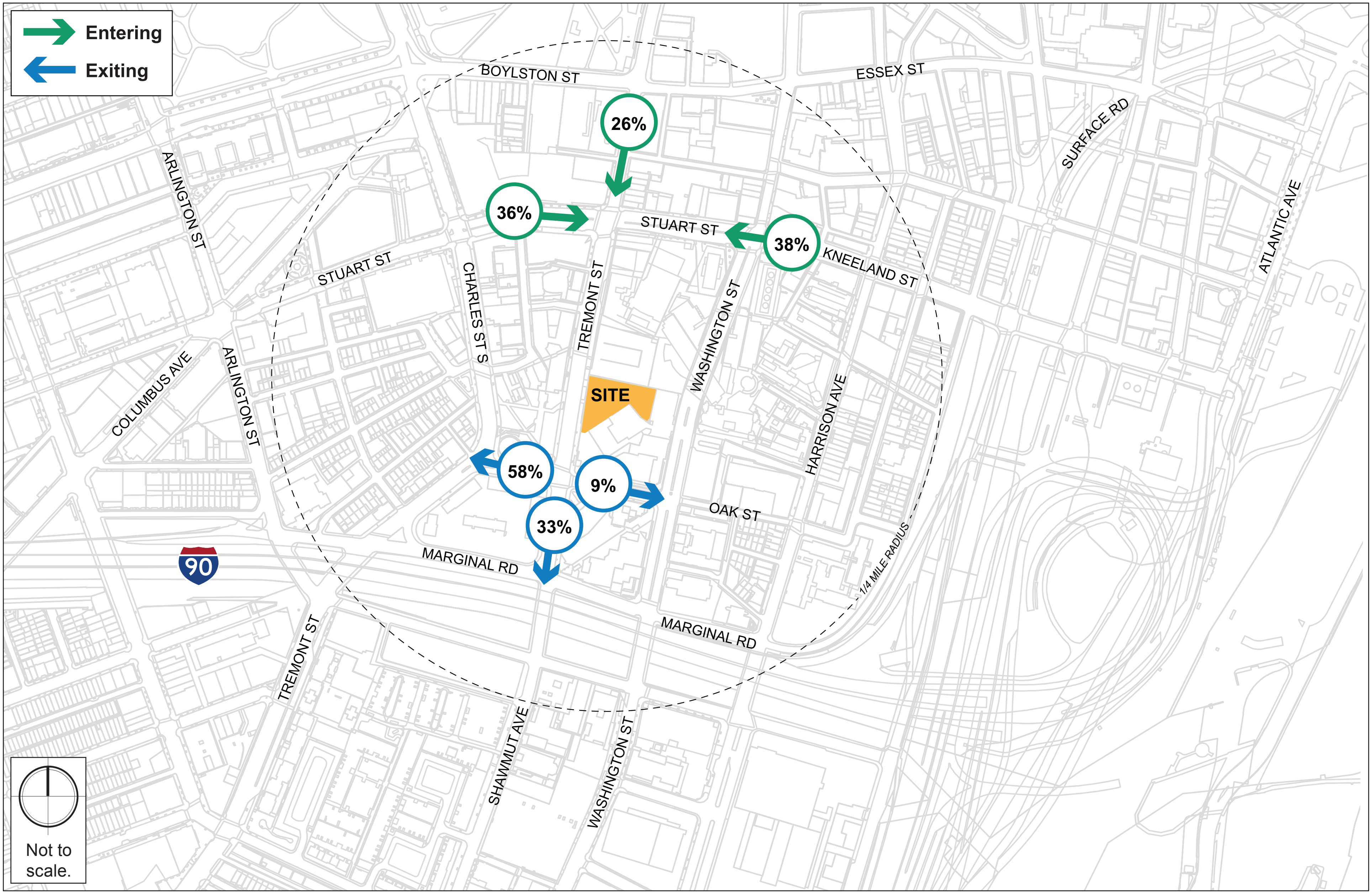
2.4.8 Build Traffic Volumes

The Project-generated vehicle trips were distributed throughout the study area according to the trip distribution patterns. The Project-generated trips at the study area intersections are shown for the weekday a.m. peak hour and the weekday p.m. peak hour in Figure 2-15.

The trip assignments were added to the No-Build (2026) Condition vehicular traffic volumes to produce the Build (2026) Condition vehicular traffic volumes. The Build (2026) Condition a.m. and p.m. peak hour traffic volumes are shown in Figure 2-16.

2.4.9 Bicycle Accommodations

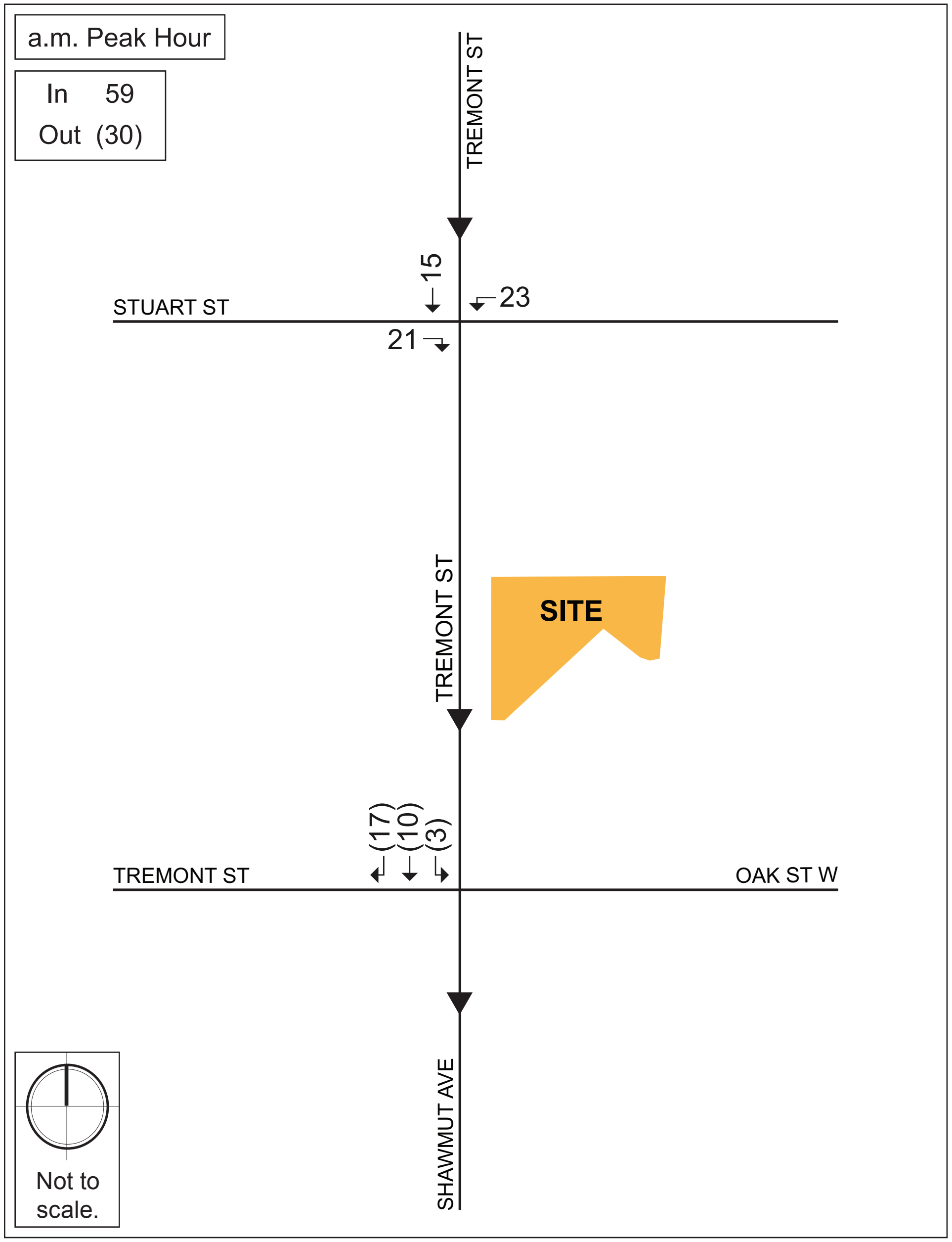
BTD has established guidelines requiring projects subject to Transportation Access Plan Agreement to provide secure bicycle parking for residents, employees, as well as short-term bicycle racks for hotel guests and visitors. The Project will provide one secure/covered bicycle parking space per residential units, for an approximate total of up to 171 secure/covered spaces. Secure bicycle parking for hotel guests and employees will be provided. Employees will have access to showers and locker rooms.

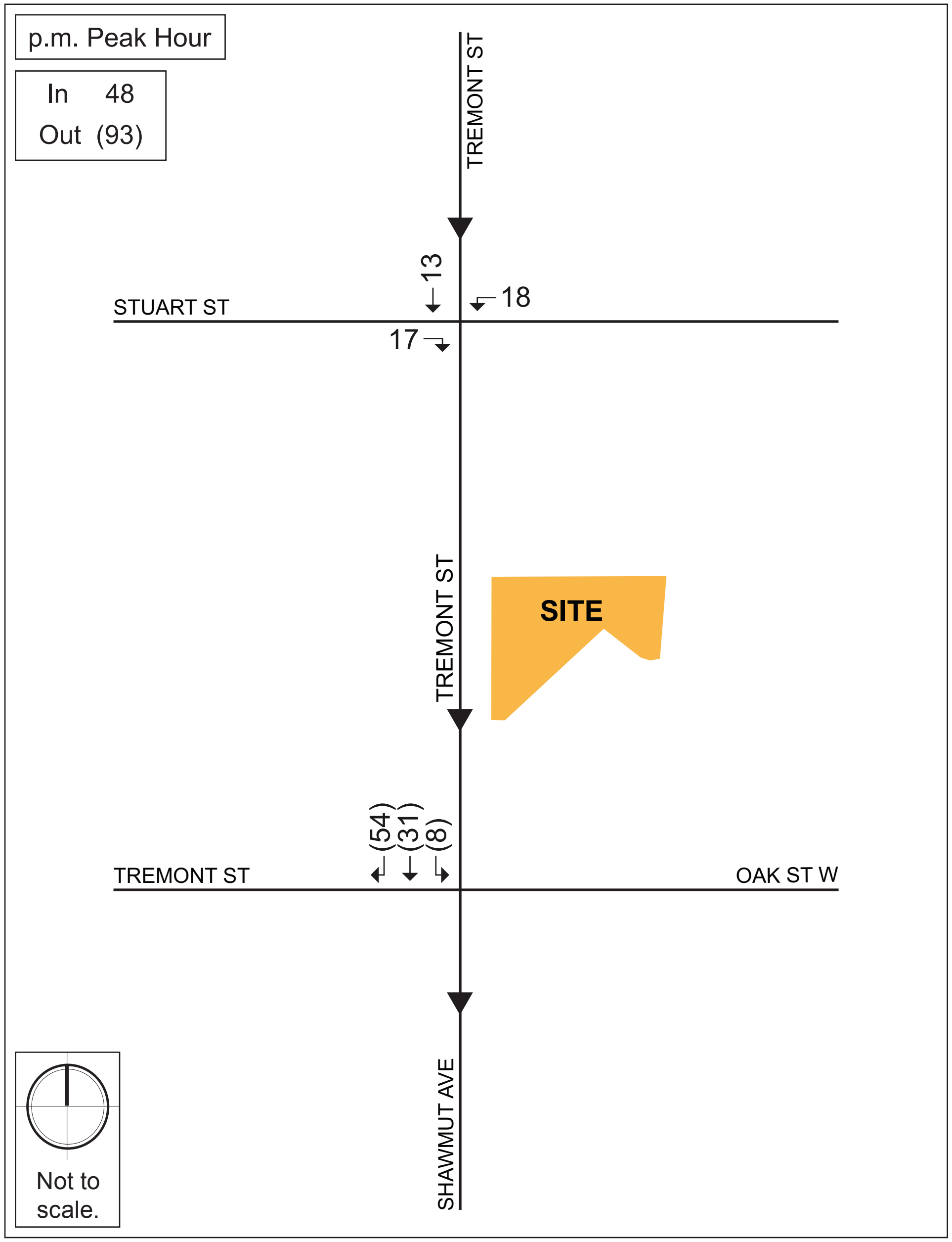


Parcel P-12C **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-14
Trip Distribution

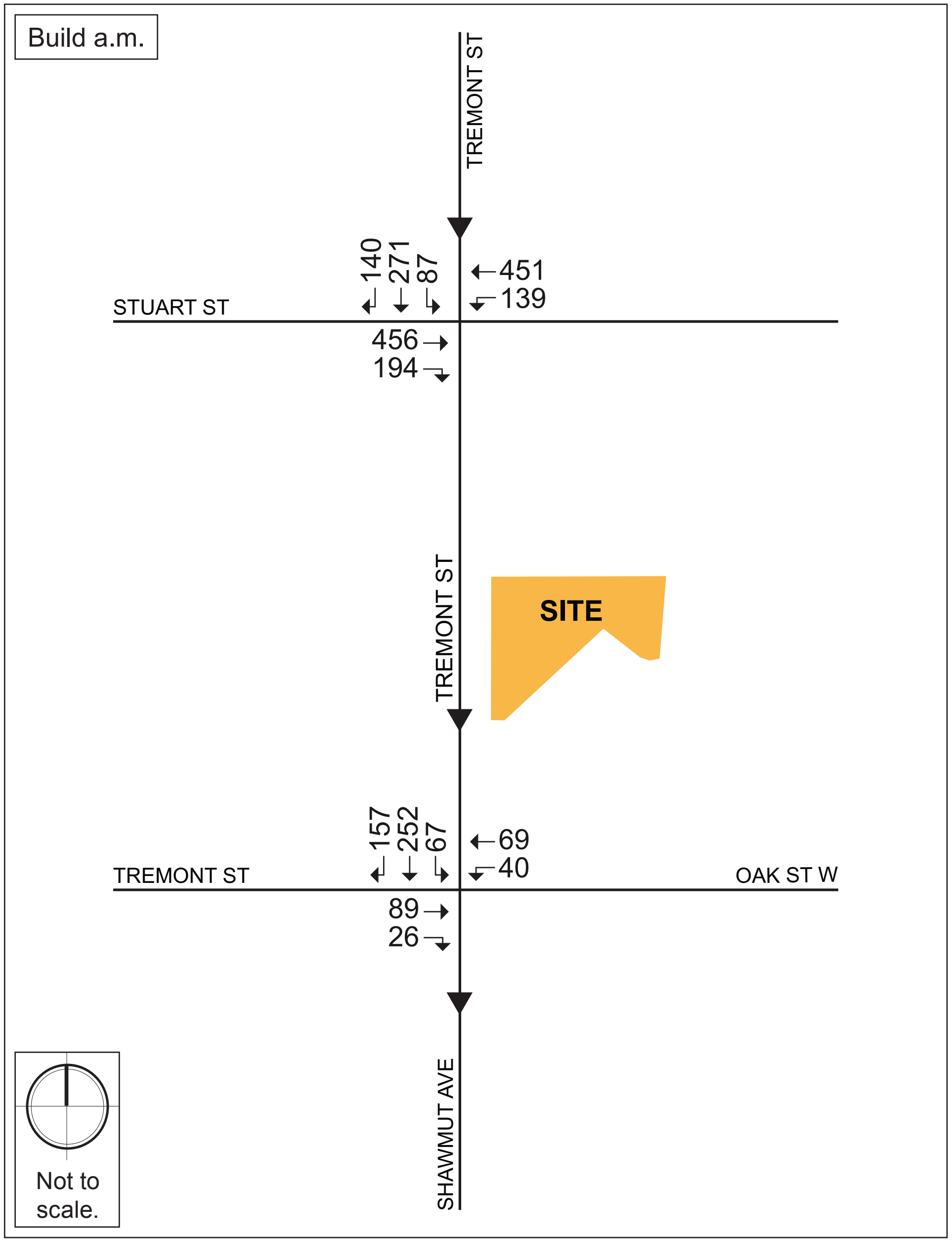


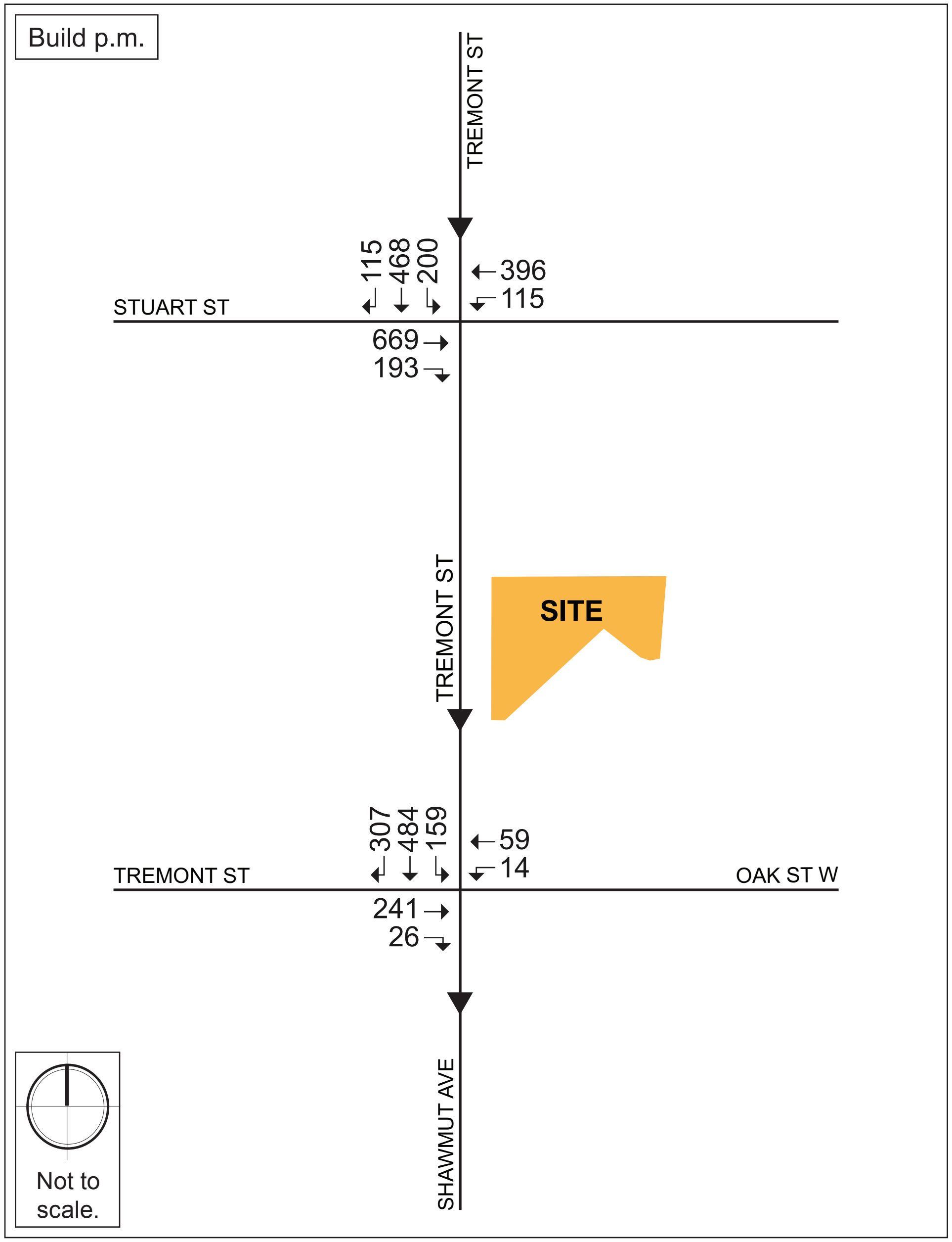


Parcel P-12C Boston, Massachusetts

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-15
Project-Generated Vehicle Trips, Weekday a.m. and p.m. Peak Hours





Parcel P-12C Boston, Massachusetts

HOWARD STEIN HUDSON
Engineers + Planners

Figure 2-16
Build (2026) Condition Traffic Volumes, Weekday a.m. and p.m. Peak Hours

2.5 Transit Impact Analysis

The Project is well served by transit with nearby connections to the MBTA Orange and Green Lines. The transit analysis was performed using existing Spring 2018 rail flow data provided by the MBTA which provides passenger entrances and estimates of exits at each station broken down into 15-minute intervals. The data is broken down in each direction by the maximum hourly rail load leaving the Site and going to the Site for the a.m. and p.m. peak periods between 7:00-9:00 a.m. and 4:00-6:00 p.m.

To account for future growth of ridership along these routes, growth rates published by the Central Transportation Planning Staff (CTPS) in the 2040 Long Range Transportation Plan (LRTP) were used. These rates approximate to one percent growth of rail transit ridership per year and were applied for eight years to establish the No-Build (2026) Condition ridership.

To assess the impact on the public transportation network, the Project-generated trips associated with the residential, hotel, and community/library uses were added to the No-Build Condition ridership to establish the Build (2026) Condition ridership. The trips were added evenly to both Orange and Green Lines.

2.5.1 Existing Condition

To establish the capacity of each of these routes, headways posted by the MBTA were used to determine the number of trains per hour and the MBTA's Service Delivery Policy was referenced to establish the train car capacity. Based on these, the Orange Line runs at six-minute peak hour headways (ten trains per hour) with a train car capacity of 846 passengers, resulting in an 8,460-passenger maximum hourly capacity. The Green Line operates along four different routes, but since the study area is within the service area of all four routes, there are approximately 38 trains during the peak hours with a capacity of 200 passengers, resulting in a 7,600-passenger maximum hourly capacity.

2.5.1.1 Existing MBTA Orange Line Operations

The MBTA Orange Line is a rail transit that serves neighborhoods from Malden (Oak Grove) to the north through Boston (Forest Hills) to the south. The specific station that the MBTA Orange Line serves for the Project is Tufts Medical Center, located eleven stops from the northern terminus of the line. For the purpose of this analysis, the maximum hourly rail load at the Project site from both directions was analyzed.

The *MBTA Service and Delivery Policy* quantifies the service standards and vehicle loading that the MBTA seeks to achieve by time of day, detailed in Table 2-7.

Table 2-7 MBTA Service Delivery Policy, Orange Line Service Standards

Time of Day	Vehicle Load (Per Train Car)	Load per Train (Based on 6 Train Cars)
Early a.m./a.m. Peak	141	846
Midday Base	83	498
p.m. Peak	141	846
Evenings	83	498

The vehicle load standards outlined in the *MBTA Service and Delivery Policy* were used to determine the acceptable train capacity throughout the day by multiplying the load standard per car by the number of train cars by the number of hourly trains (derived from the headway).

The ridership data from the MBTA was summarized hourly and compared to the load standards to determine the existing volume to capacity along the Orange Line, summarized in Table 2-8.

Table 2-8 Existing (2018) Condition Ridership and Capacity Summary, Orange Line

Time	Trains	Vehicle Load Standard	Max Rail Load at Tufts Medical Center			
			NB	v/c	SB	v/c
5:00 – 6:00 a.m.	8	6768	391	0.06	479	0.07
6:00 – 7:00 a.m.	8	6768	2328	0.34	1858	0.27
7:00 – 8:00 a.m.	10	8460	3735	0.44	3274	0.39
8:00 – 9:00 a.m.	10	8460	5401	0.64	3849	0.45
9:00 – 10:00 a.m.	8	3984	2698	0.68	2048	0.51
10:00 – 11:00 a.m.	8	3984	1565	0.39	1299	0.33
11:00 a.m. – 12:00 p.m.	8	3984	1475	0.37	1280	0.32
12:00 – 1:00 p.m.	8	3984	1517	0.38	1447	0.36
1:00 – 2:00 p.m.	8	3984	1647	0.41	1617	0.41
2:00 – 3:00 p.m.	8	3984	2275	0.57	1966	0.49
3:00 – 4:00 p.m.	10	8460	2903	0.34	2675	0.32
4:00 – 5:00 p.m.	10	8460	4074	0.48	3733	0.44
5:00 – 6:00 p.m.	10	8460	4703	0.56	5019	0.59
6:00 – 7:00 p.m.	10	4980	2764	0.56	2961	0.59
7:00 – 8:00 p.m.	8	3984	1602	0.40	1788	0.45
8:00 – 9:00 p.m.	5	2490	1172	0.47	1323	0.53
9:00 – 10:00 p.m.	5	2490	895	0.36	1126	0.45
10:00 – 11:00 p.m.	5	2490	839	0.34	972	0.39
11:00 p.m. – 12:00 a.m.	5	2490	579	0.23	674	0.27
12:00 – 1:00 a.m.	5	2490	199	0.08	210	0.08

As shown in Table 2-8, the Orange Line does not exceed its hourly load standard in either direction. It should be noted that the loading standard does not reflect the physical capacity of the train, but rather standards established by the MBTA.

2.5.1.2 Existing MBTA Green Line Operations

The MBTA Green Line is a rail transit and consists of four different branches, B, C, D, and E, that serves neighborhoods from Cambridge (Lechmere) to the east through Newton (Riverside) to the west. The specific station that the MBTA Green Line serves for the Project is Boylston Station located north of the Project site. For the purpose of this analysis, the maximum hourly rail load at the Project Site from both directions was analyzed.

The *MBTA Service and Delivery Policy* quantifies the service standards and vehicle loading that the MBTA seeks to achieve by time of day, detailed in Table 2-9.

Table 2-9 MBTA Service Delivery Policy, Green Line Service Standards

Time of Day	Vehicle Load (Per Train Car)	Load per Train (Based on two Train Cars)
Early a.m./a.m. Peak	100	200
Midday Base	66	132
p.m. Peak	100	200
Evenings	66	132

The vehicle load standards outlined in the *MBTA Service and Delivery Policy* were used to determine the acceptable train capacity throughout the day by multiplying the load standard per car by the number of train cars by the number of hourly trains (derived from the headway).

The ridership data from the MBTA was summarized hourly and compared to the load standards to determine the existing volume to capacity along the Green Line, summarized in Table 2-10.

Table 2-10 Existing (2018) Condition Ridership and Capacity Summary, Green Line

Time	Trains	Vehicle Load Standard	Max Rail Load at Boylston Station			
			NB	v/c	SB	v/c
5:00 – 6:00 a.m.	32	6400	303	0.05	537	0.08
6:00 – 7:00 a.m.	32	6400	1047	0.16	1893	0.30
7:00 – 8:00 a.m.	40	8000	2826	0.35	3705	0.46
8:00 – 9:00 a.m.	40	8000	3825	0.48	4710	0.59
9:00 – 10:00 a.m.	31	4092	2116	0.52	2819	0.69
10:00 – 11:00 a.m.	31	4092	1404	0.34	1884	0.46
11:00 a.m. – 12:00 p.m.	31	4092	1461	0.36	1692	0.41

Table 2-10 Existing (2018) Condition Ridership and Capacity Summary, Green Line (Continued)

Time	Trains	Vehicle Load Standard	Max Rail Load at Boylston Station			
			NB	v/c	SB	v/c
12:00 – 1:00 p.m.	31	4092	1667	0.41	1866	0.46
1:00 – 2:00 p.m.	31	4092	1828	0.45	1978	0.48
2:00 – 3:00 p.m.	31	4092	2472	0.60	2120	0.52
3:00 – 4:00 p.m.	38	7600	3403	0.45	2625	0.35
4:00 – 5:00 p.m.	38	7600	4533	0.60	3267	0.43
5:00 – 6:00 p.m.	38	7600	5187	0.68	4905	0.65
6:00 – 7:00 p.m.	33	4356	3652	0.84	3644	0.84
7:00 – 8:00 p.m.	33	4356	2385	0.55	2057	0.47
8:00 – 9:00 p.m.	30	3960	1900	0.48	1363	0.34
9:00 – 10:00 p.m.	30	3960	1928	0.49	1118	0.28
10:00 – 11:00 p.m.	30	3960	2018	0.51	970	0.24
11:00 p.m. – 12:00 a.m.	30	3960	1257	0.32	610	0.15
12:00 – 1:00 a.m.	30	3960	346	0.09	227	0.06

NB = Northbound (toward Park Street Station)
SB = Southbound (toward Arlington Station)

As shown in Table 2-10, the Green Line does not exceed its hourly load standard in either direction. It should be noted that the loading standard does not reflect the physical capacity of the train, but rather standards established by the MBTA.

2.5.2 No-Build Condition

The No-Build (2026) Condition reflects a future scenario that incorporates anticipated ridership growth and infrastructure improvements that will affect transit operations in the study area.

The Central Transportation Planning Staff's (CTPS) Long-Range Transportation Plan (LRTP) projects future growth along all public transportation in Massachusetts. Per the LRTP, transit ridership on rapid rail transit lines is expected to grow 28 percent from 2012 to 2040, which is approximately one percent per year.

2.5.2.1 No-Build MBTA Orange Line Operations

Outlined in MBTA's Focus40 plan, a new fleet of Orange Line cars went into service in August 2019 and more will be delivered between now and 2022. These new cars will provide higher capacity for passengers and allow for shorter headways between trains. For the purposes of this analysis, the loading standard capacity of trains is assumed to be the same, but the improvement in headways will increase capacity by approximately 25 percent. This is a very conservatively low estimate for increased capacity as studies suggest the peak hour capacity will increase by 40 to

50 percent. The volume to capacity ratios were assessed under the same loading standard as the Existing condition, however, the graphs (included in Attachment C) highlight the increase in capacity from the new train cars.

The one percent per year growth rate was applied to the 2018 volumes for eight years to grow the Orange Line ridership volumes to the No-Build (2026) Condition. Table 2-11 summarizes the Orange Line No-Build ridership and volume to capacity.

Table 2-11 No-Build (2026) Condition Ridership and Capacity Summary, Orange Line

Time	Trains	Vehicle Load Standard	Max Line Load at Tufts Medical Center Station			
			NB	v/c	SB	v/c
5:00 – 6:00 a.m.	8	6768	423	0.06	519	0.08
6:00 – 7:00 a.m.	8	6768	2521	0.37	2012	0.30
7:00 – 8:00 a.m.	10	8460	4044	0.48	3546	0.42
8:00 – 9:00 a.m.	10	8460	5848	0.69	4167	0.49
9:00 – 10:00 a.m.	8	3984	2922	0.73	2217	0.56
10:00 – 11:00 a.m.	8	3984	1695	0.43	1407	0.35
11:00 a.m. – 12:00 p.m.	8	3984	1597	0.40	1386	0.35
12:00 – 1:00 p.m.	8	3984	1643	0.41	1566	0.39
1:00 – 2:00 p.m.	8	3984	1783	0.45	1751	0.44
2:00 – 3:00 p.m.	8	3984	2464	0.62	2129	0.53
3:00 – 4:00 p.m.	10	8460	3144	0.37	2897	0.34
4:00 – 5:00 p.m.	10	8460	4412	0.52	4042	0.48
5:00 – 6:00 p.m.	10	8460	5093	0.60	5435	0.64
6:00 – 7:00 p.m.	10	4980	2993	0.60	3207	0.64
7:00 – 8:00 p.m.	8	3984	1735	0.44	1936	0.49
8:00 – 9:00 p.m.	5	2490	1269	0.51	1432	0.58
9:00 – 10:00 p.m.	5	2490	969	0.39	1219	0.49
10:00 – 11:00 p.m.	5	2490	908	0.36	1053	0.42
11:00 p.m. – 12:00 a.m.	5	2490	627	0.25	730	0.29
12:00 – 1:00 a.m.	5	2490	215	0.09	227	0.09

NB = Northbound (toward Chinatown Station)
SB = Southbound (toward Back Bay Station)

As shown in Table 2-11, the Orange Line does not exceed its hourly load standard in either direction.

2.5.2.2 No-Build MBTA Green Line Operations

Similar to the Orange Line, a new fleet of Green Line cars have been in service since December 2018. These new cars provide higher capacity for passengers and allow for shorter headways between trains. Based on MBTA's Focus40 plan, the improvement in headways will increase capacity by approximately 15 percent by 2040. For the purpose of this analysis, the capacity and headway will remain the same as the Existing Conditions, however, the graphs (included in Attachment C) highlight the increase in capacity from the new train cars.

The one percent per year growth rate was applied to the 2018 volumes for eight years to grow the Green Line ridership volumes to the No-Build (2026) Condition. Table 2-12 summarizes the Orange Line No-Build ridership and volume to capacity.

Table 2-12 No-Build (2026) Condition Ridership and Capacity Summary, Green Line

Time	Trains	Vehicle Load Standard	Max Rail Load at Boylston Station			
			NB	v/c	SB	v/c
5:00 – 6:00 a.m.	32	6400	328	0.05	581	0.09
6:00 – 7:00 a.m.	32	6400	1133	0.18	2050	0.32
7:00 – 8:00 a.m.	40	8000	3060	0.38	4012	0.50
8:00 – 9:00 a.m.	40	8000	4142	0.52	5100	0.64
9:00 – 10:00 a.m.	31	4092	2291	0.56	3052	0.75
10:00 – 11:00 a.m.	31	4092	1520	0.37	2040	0.50
11:00 a.m. – 12:00 p.m.	31	4092	1582	0.39	1832	0.45
12:00 – 1:00 p.m.	31	4092	1805	0.44	2021	0.49
1:00 – 2:00 p.m.	31	4092	1979	0.48	2142	0.52
2:00 – 3:00 p.m.	31	4092	2677	0.65	2295	0.56
3:00 – 4:00 p.m.	38	7600	3685	0.48	2842	0.37
4:00 – 5:00 p.m.	38	7600	4908	0.65	3538	0.47
5:00 – 6:00 p.m.	38	7600	5617	0.74	5311	0.70
6:00 – 7:00 p.m.	33	4356	3955	0.91	3945	0.91
7:00 – 8:00 p.m.	33	4356	2583	0.59	2228	0.51
8:00 – 9:00 p.m.	30	3960	2057	0.52	1476	0.37
9:00 – 10:00 p.m.	30	3960	2087	0.53	1210	0.31
10:00 – 11:00 p.m.	30	3960	2185	0.55	1051	0.27
11:00 p.m. – 12:00 a.m.	30	3960	1362	0.34	660	0.17
12:00 – 1:00 a.m.	30	3960	374	0.09	246	0.06

NB = Northbound (toward Park Street Station)
SB = Southbound (toward Arlington Station)

As shown in Table 2-12, with the projected increased volumes compared to the existing capacity, the Green Line does not exceed its hourly load standard in either direction.

2.5.3 Build Condition

The Build (2026) Condition reflects a future scenario that incorporates the No-Build Condition with the addition of the project-generated transit trips. For the purpose of this study, the project-generated transit trips were distributed evenly between the Orange Line and Green Line.

2.5.3.1 Build MBTA Orange Line Operations

As previously mentioned, fifty percent of the total project-generated transit trips were distributed to the Orange Line inbound and outbound trains. Table 2-13 summarizes the Orange Line Build ridership and volume to capacity.

Table 2-13 Build (2026) Condition Ridership and Capacity Summary, Orange Line

Time	Trains	Vehicle Load Standard	Max Rail Load at Tufts Medical Center Station			
			NB	v/c	SB	v/c
5:00 – 6:00 a.m.	8	6768	428	0.06	525	0.08
6:00 – 7:00 a.m.	8	6768	2530	0.37	2020	0.30
7:00 – 8:00 a.m.	10	8460	4057	0.48	3561	0.42
8:00 – 9:00 a.m.	10	8460	5872	0.69	4175	0.49
9:00 – 10:00 a.m.	8	3984	2946	0.74	2239	0.56
10:00 – 11:00 a.m.	8	3984	1721	0.43	1428	0.36
11:00 a.m. – 12:00 p.m.	8	3984	1622	0.41	1407	0.35
12:00 – 1:00 p.m.	8	3984	1671	0.42	1593	0.40
1:00 – 2:00 p.m.	8	3984	1810	0.45	1779	0.45
2:00 – 3:00 p.m.	8	3984	2496	0.63	2158	0.54
3:00 – 4:00 p.m.	10	8460	3180	0.38	2933	0.35
4:00 – 5:00 p.m.	10	8460	4445	0.53	4074	0.48
5:00 – 6:00 p.m.	10	8460	5108	0.60	5479	0.65
6:00 – 7:00 p.m.	10	4980	3022	0.61	3232	0.65
7:00 – 8:00 p.m.	8	3984	1754	0.44	1957	0.49
8:00 – 9:00 p.m.	5	2490	1283	0.52	1446	0.58
9:00 – 10:00 p.m.	5	2490	983	0.39	1238	0.50
10:00 – 11:00 p.m.	5	2490	926	0.37	1068	0.43
11:00 p.m. – 12:00 a.m.	5	2490	637	0.26	740	0.30
12:00 – 1:00 a.m.	5	2490	218	0.09	230	0.09

NB = Northbound (toward Chinatown Station)
SB = Southbound (toward Back Bay Station)

As shown in Table 2-13, the Orange Line does not experience any overcapacity conditions as a result of the Project in the Build (2026) Condition. Graphs of the Orange Line ridership and capacity that highlight the ridership and capacity of all three conditions are included in Attachment C.

2.5.3.2 Build MBTA Green Line Operations

Similar to the Orange Line, fifty percent of the total project-generated transit trips were distributed to the Green Line eastbound and westbound trains. Table 2-14 summarizes the Green Line Build ridership and volume to capacity.

Table 2-14 Build (2026) Condition Ridership and Capacity Summary, Green Line

Time	Trains	Vehicle Load Standard	Max Rail Load at Boylston Station			
			NB	v/c	SB	v/c
5:00 – 6:00 a.m.	32	6400	332	0.05	586	0.09
6:00 – 7:00 a.m.	32	6400	1142	0.18	2058	0.32
7:00 – 8:00 a.m.	40	8000	3073	0.38	4026	0.50
8:00 – 9:00 a.m.	40	8000	4166	0.52	5107	0.64
9:00 – 10:00 a.m.	31	4092	2314	0.57	3073	0.75
10:00 – 11:00 a.m.	31	4092	1545	0.38	2061	0.50
11:00 a.m. – 12:00 p.m.	31	4092	1607	0.39	1852	0.45
12:00 – 1:00 p.m.	31	4092	1832	0.45	2048	0.50
1:00 – 2:00 p.m.	31	4092	2006	0.49	2169	0.53
2:00 – 3:00 p.m.	31	4092	2708	0.66	2323	0.57
3:00 – 4:00 p.m.	38	7600	3721	0.49	2877	0.38
4:00 – 5:00 p.m.	38	7600	4940	0.65	3569	0.47
5:00 – 6:00 p.m.	38	7600	5631	0.74	5355	0.70
6:00 – 7:00 p.m.	33	4356	3983	0.91	3969	0.91
7:00 – 8:00 p.m.	33	4356	2602	0.60	2249	0.52
8:00 – 9:00 p.m.	30	3960	2071	0.52	1490	0.38
9:00 – 10:00 p.m.	30	3960	2100	0.53	1229	0.31
10:00 – 11:00 p.m.	30	3960	2202	0.56	1066	0.27
11:00 p.m. – 12:00 a.m.	30	3960	1372	0.35	670	0.17
12:00 – 1:00 a.m.	30	3960	377	0.10	249	0.06

NB = Northbound (toward Park Street Station)
SB = Southbound (toward Arlington Station)

As shown in Table 2-14, the Green Line does not experience any overcapacity conditions as a result of the Project in the Build (2026) Condition. Graphs of the Green Line ridership and capacity that highlight the ridership and capacity of all three conditions are included in Attachment C.

2.6 Traffic Capacity Analysis

While the BTD informed the Project team that traffic operations analysis did not need to be performed, MEPA's requested air quality evaluation requires traffic operation results as input. Therefore, to meet MEPA analysis requirements, traffic capacity analysis was conducted for two key intersections, as summarized in this section.

The criterion for evaluating traffic operations is level of service (LOS), which is determined by assessing average delay experienced by vehicles at intersections and along intersection approaches. Trafficware's Synchro (version 9) software package was used to calculate average delay and associated LOS at the study area intersections. This software is based on the traffic operational analysis methodology of the Transportation Research Board's 2000 Highway Capacity Manual (HCM). Field observations were performed by HSH to collect intersection geometry such as number of turning lanes, lane length, and lane width that were then incorporated into the operations analysis.

LOS designations are based on average delay per vehicle for all vehicles entering an intersection. Table 2-14 displays the intersection LOS criteria. LOS A indicates the most favorable condition, with minimum traffic delay, while LOS F represents the worst condition, with significant traffic delay. LOS D or better is typically considered desirable during the peak hours of traffic in urban and suburban settings. However, LOS E or F is often typical for a stop-controlled minor street that intersects a major roadway and does not necessarily indicate that the operations at the intersection are poor or failing.

Table 2-15 Vehicle Level of Service Criteria

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

Source: 2000 Highway Capacity Manual, Transportation Research Board.

In addition to delay and LOS, the operational capacity and vehicular queues described below are calculated and used to further quantify traffic operations at intersections:

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

- ♦ The 50th percentile queue length, measured in feet, represents the maximum queue length during a cycle of the traffic signal with typical (or median) entering traffic volumes.
- ♦ The 95th percentile queue length, measured in feet, denotes the farthest extent of the vehicle queue (to the last stopped vehicle) upstream from the stop line. This maximum queue occurs five percent, or less, of the time during the peak hour, and typically does not develop during off-peak hours. Since volumes fluctuate throughout the hour, the 95th percentile queue represents what can be considered a "worst case" condition. Queues at an intersection are generally below the 95th percentile length throughout most of the peak hour. It is also unlikely that 95th percentile queues for each approach to an intersection occur simultaneously.

Table 2-16 present the a.m. and p.m. peak hour capacity analysis for the study area intersections under each analysis condition: Existing (2019) Condition, No-Build (2026) Condition, and the Build (2026) Condition. The detailed analysis sheets are provided in Attachment C.

2.6.1 Existing (2019) Condition

As shown under the Existing (2019) Conditions of Table 2-16, both of the study area intersections operate at overall acceptable levels of service (LOS D or better) with the exception of the following movements:

The signalized intersection of **Tremont Street/Oak Street West/Shawmut Avenue** operates at an acceptable level of service during both peak hours. The Tremont Street eastbound shared through/right-turn movement operates at LOS E during the p.m. peak hour. During the a.m. peak hour, the longest queue occurs at the Oak Street West westbound movement and during the p.m. peak hour, the Tremont Street eastbound movement experiences the longest queue.

2.6.2 No-Build (2026) Condition

As shown under the No-Build (2026) Conditions of Table 2-16, the two study area intersections and approaches continue to operate at acceptable levels of service (LOS D or better) during both the peak hours.

2.6.3 Build (2026) Condition

All intersections continue to operate at the same overall level of services as under the No-Build (2026) Condition during the a.m. and p.m. peak hours. The additional vehicle trips generated by the Project will not impact traffic operations in the area.

Table 2-16 Capacity Analysis Summary, Weekday a.m. and p.m. Peak Hours

Intersection/Movement	Existing (2019) Condition					No-Build (2026) Condition					Build (2026) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
a.m. Peak Hour															
Tremont Street/Stuart Street	**C**	**23.8**	-	-	-	**C**	**24.2**	-	-		**C**	**24.5**	-	-	-
Stuart St EB thru | thru	C	28.4	0.38	122	179	C	29.3	0.42	138	200	C	30.0	0.43	139	205
Stuart St EB right	A	5.3	0.28	0	50	A	5.3	0.29	0	50	A	5.4	0.32	0	54
Stuart St WB left	B	13.2	0.32	23	m42	B	14.2	0.36	26	m40	B	15.6	0.43	32	m49
Stuart St WB thru | thru	B	12.3	0.32	46	81	B	13.2	0.34	55	m81	B	13.7	0.35	58	m83
Tremont St SB left	D	52.0	0.47	59	106	D	50.7	0.44	57	103	D	50.1	0.46	62	108
Tremont St SB thru | thru	D	53.4	0.66	94	132	D	53.4	0.66	97	136	D	52.7	0.67	104	141
Tremont St SB right	B	12.4	0.48	0	55	B	12.2	0.48	0	56	B	11.7	0.47	0	55
Tremont Street/Oak Street West/ Shawmut Avenue	**B**	**17.6**	-	-	-	**B**	**19.4**	-	-	-	**B**	**19.4**	-	-	-
Tremont St EB thru/right	C	27.5	0.50	91	100	C	27.4	0.51	94	102	C	27.7	0.51	95	103
Oak St West WB left/thru	C	27.2	0.41	66	122	C	27.9	0.43	69	126	C	27.9	0.43	69	126
Tremont St SB left/thru | thru | thru/right	B	12.3	0.24	53	67	B	15.1	0.35	94	117	B	15.2	0.38	102	126
p.m. Peak Hour															
Tremont Street/Stuart Street	**C**	**30.8**	-	-	-	**C**	**31.6**	-	-	-	**C**	**31.7**	-	-	-
Stuart St EB thru | thru	C	34.1	0.59	206	297	D	35.8	0.65	232	326	D	36.2	0.65	234	326
Stuart St EB right	A	8.8	0.30	15	74	B	10.3	0.32	23	85	B	10.4	0.35	25	92
Stuart St WB left	B	16.8	0.33	25	m42	B	18.9	0.38	25	m45	C	21.8	0.46	30	m55
Stuart St WB thru | thru	B	14.5	0.24	50	80	B	15.9	0.26	54	97	B	16.0	0.26	54	97
Tremont St SB left	D	52.8	0.67	135	197	D	52.5	0.68	138	204	D	51.6	0.67	137	204
Tremont St SB thru | thru	D	48.2	0.71	162	200	D	47.9	0.72	166	207	D	48.2	0.73	172	214
Tremont St SB right	A	6.3	0.30	0	34	A	6.8	0.31	0	38	A	6.7	0.30	0	38
Tremont Street/Oak Street West/ Shawmut Avenue	**C**	**30.1**	-	-	-	**D**	**37.9**	-	-	-	**D**	**37.7**	-	-	-
Tremont St EB thru/right	E	60.6	0.81	236	m252	E	76.5	0.82	245	m253	E	76.5	0.82	245	m253
Oak St West WB left/thru	C	32.1	0.25	43	75	C	32.0	0.26	44	77	C	32.0	0.26	44	77
Tremont St SB left/thru | thru | thru/right	B	17.7	0.41	116	165	C	23.0	0.62	213	300	C	24.2	0.68	245	343

Grey Shading indicates decrease to LOS E or F.

~ 50th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.

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

m Volumes for 95th percentile queue is metered by upstream signal

2.7 Travel Demand Management

The Proponent is committed to implementing Transportation Demand Management (TDM) measures to minimize automobile usage and Project related traffic impacts. In addition to the measures described below, the Proponent will continue to work with the City to create a complete street environment along Tremont Street that supports safe facilities for pedestrians, bicycles, and vehicles.

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

2.7.1 Alternative Mode Benefits and Tactics

The Proponent will work to encourage the use of alternative travel modes, such as public transportation, bicycling, and walking and has committed to the following measures:

- Designating a transportation coordinator to oversee transportation issues, including service and loading and deliveries;
- Working with the hotel operator to raise awareness of public transportation, bicycling, and walking opportunities;
- Providing orientation packets to new tenants containing information on available transportation, including public transportation routes and schedules, nearby vehicle sharing and bicycle sharing locations, and walking opportunities;
- Providing an annual (or more frequent) newsletter or bulletin summarizing transit, ridesharing, bicycling, alternative work schedules, and other travel options; and
- Providing information on travel alternatives for employees and visitors via the Internet and in the building lobby.

2.7.2 Bicycle and Pedestrian Trips

Proposed promotions and incentives to encourage bicycle and pedestrian trips are as follows:

- Providing bicycle and pedestrian access information via the Project website;
- Providing covered, secure bicycle storage for building occupants (approximately 171 secure bicycle spaces for residents) and spaces for hotel employees;
- Providing lockers and showers for hotel employees who walk or bicycle to work; and
- Providing on-site external bicycle racks for visitors.

2.7.3 Public Transportation

The goal of the following promotion and incentive measures is to increase public transit use to and from the site:

- Providing real-time transit information in the lobbies of all Project buildings;
- Providing transit access information on the Project website, including information on bus and subway routes and schedules;
- Encouraging employers to subsidize on-site full-time employees' purchase of monthly transit passes; and
- Promoting to the hotel operator that, as employers, they can save on payroll-related taxes and provide employee benefits when they offer transportation benefits such as subsidized public transportation.

2.8 Transportation Mitigation Measures

While the Project will not cause traffic impacts and is not proposing specific traffic mitigation, the Proponent will continue to work with the City of Boston to create a Project that efficiently serves vehicle trips, improves the pedestrian environment, and encourages transit and bicycle use.

The Proponent will improve the pedestrian environment by reconstructing sidewalks and creating a pedestrian walkway through the center of the Site, facilitating the anticipated continuation of the walkway to Washington Street. This new pedestrian connection will not only improve walking circulation but will create new access paths to the Tufts Orange Line station and Silver Line bus stops on Washington Street. The Proponent will construct new sidewalks adjacent to the Project site in accordance with Boston Complete Streets guidelines and requirements of the Americans with Disabilities Act and Massachusetts Architectural Access Board (ADA/AAB) to the extent feasible.

The City of Boston is studying the potential of narrowing Tremont Street to two lanes (from the current three) and adding bicycle accommodations between Stuart Street to the north and Oak Street to the south. While these roadway improvement plans have not yet been finalized, the Proponent will continue to work with the City to create and/or preserve an adequate curb-to-curb width on Tremont Street, adjacent to the Project site, to support a bicycle lane, should the City implement it in the future.

Other improvements to the pedestrian realm include street lighting where necessary, planting of street trees, and providing bicycle storage racks, where appropriate.

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

2.9 Evaluation of Short-term Construction Impacts

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

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

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

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

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

Chapter 3

Assessment of Development Review Components

3.0 ASSESSMENT OF DEVELOPMENT REVIEW COMPONENTS

In accordance with the BPDA Development Review Guidelines, as well as the Secretary's Certificate on the ENF, this section addresses various environmental considerations. Where the potential for direct or indirect impacts exists, design measures are incorporated to mitigate the impacts, to the extent economically feasible.

3.1 Wind

3.1.1 Introduction

RWDI was retained to conduct a pedestrian wind assessment for Parcel P-12C proposed at 290 Tremont Street. The report presents the Project objectives, background and approach, and a discussion of the results from RWDI's assessment and provides conceptual wind control measures, where appropriate. The key findings are described below.

Effective Gust

- Wind speeds that meet the effective gust criterion are anticipated at all locations in both the No Build and Build scenarios, on an annual basis.

Mean Speed

- Mean speeds in the No Build scenario are mostly comfortable for pedestrian use throughout the year.
- With the addition of the Project, mean speeds at most assessed grade-level areas are expected to continue to be comfortable for the intended usage.
- Of the 115 sensors studied, 110 (almost 95%) show wind conditions suitable for sitting standing, or walking.
- Potentially uncomfortable conditions due to seasonally higher mean speeds are anticipated at one location in the passage through the Project building and three locations along the sidewalks of Tremont Street. Appropriate mitigation measures as described later are expected to help to minimize areas of increased winds.
- Mean speeds at the Level 2 terrace of the Project are anticipated to be comfortable for the intended use throughout the year.

3.1.2 Project Description

The Project (site shown in Figure 3.1-1) is located on Tremont Street and consists of a mixed-use tower and a parking garage with a courtyard between the tower and the parking garage. The proposed tower is 350' tall, consisting of 30 stories and a penthouse level.

Parcel P-12C Boston, Massachusetts

Figure 3.1-1
Aerial View of the Site (Courtesy of Google Earth)

3.1.3 Objectives

The objective of the study was to assess the effect of the Project on local wind conditions in pedestrian areas on and around the study site as per the requirements of the Boston Planning and Development Agency. The quantitative assessment was based on wind speed measurements on a scale model of the Project and its surroundings in one of RWDI's boundary-layer wind tunnels. These measurements were combined with the local wind records and compared to the wind criteria recommended by the BPDA for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas, including building entrances, the courtyard and public sidewalks.

3.1.4 Background and Approach

3.1.4.1 Wind Tunnel Study Model

To assess the wind environment around the proposed Project, a 1:300 scale model of the Project site and surroundings was constructed for the wind tunnel tests of the following configurations:

- A – No Build: Existing site with surroundings including BPDA approved Projects (Figure 3.1-2), and,

- B – Build: Proposed Project with surroundings including BPDA approved projects not yet built (Figure 3.1-3).

The wind tunnel model included all relevant surrounding buildings and topography within an approximately 1,200 foot radius of the study site. The wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were also simulated in RWDI's wind tunnel. The wind tunnel model was instrumented with 115 specially designed wind speed sensors to measure mean and gust speeds at a full-scale height of approximately five feet above the concerned levels in pedestrian/patron areas throughout the study site. Wind speeds were measured for 36 directions in 10-degree increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model. The placement of wind measurement locations was based on RWDI's experience and understanding of the pedestrian usage for this site and reviewed by the Project design team and the BPDA.

3.1.4.2 Meteorological Data

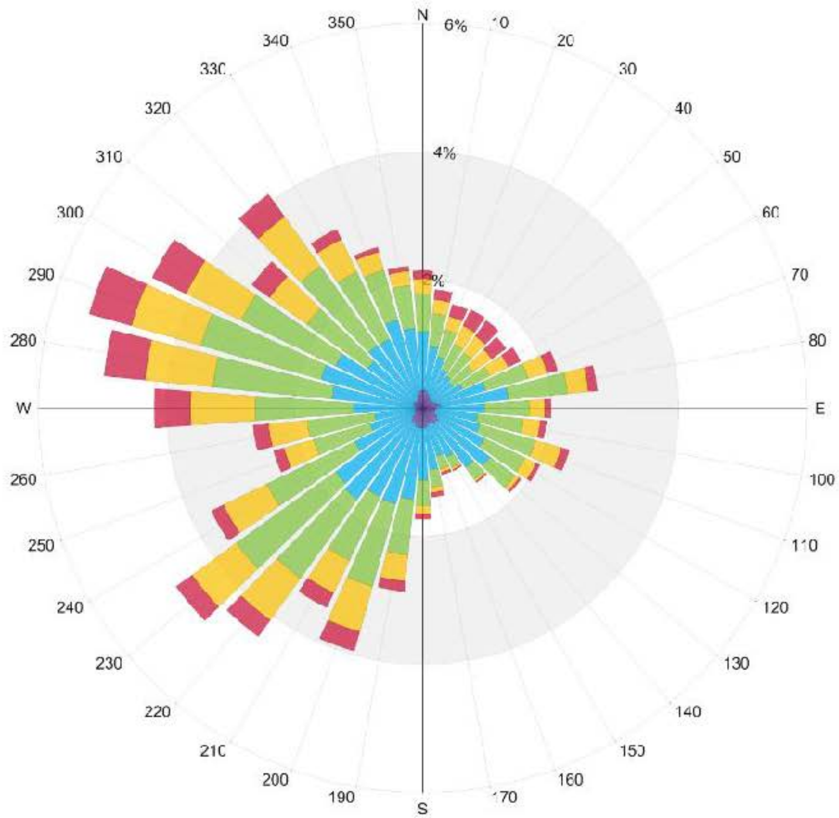
The results were then combined with long term meteorological data, recorded during the years 1995 through 2018 at Boston's Logan International Airport to predict full scale wind conditions. The analysis was performed separately for the entire year and for each of the four seasons. Figures 3.1-4 and 3.1-5 present "wind roses", summarizing the annual and seasonal wind climates in the Boston area respectively, based on the data from Logan Airport.

Parcel P-12C Boston, Massachusetts

Figure 3.1-2
Wind Tunnel Study Model – No Build Configuration

Parcel P-12C Boston, Massachusetts

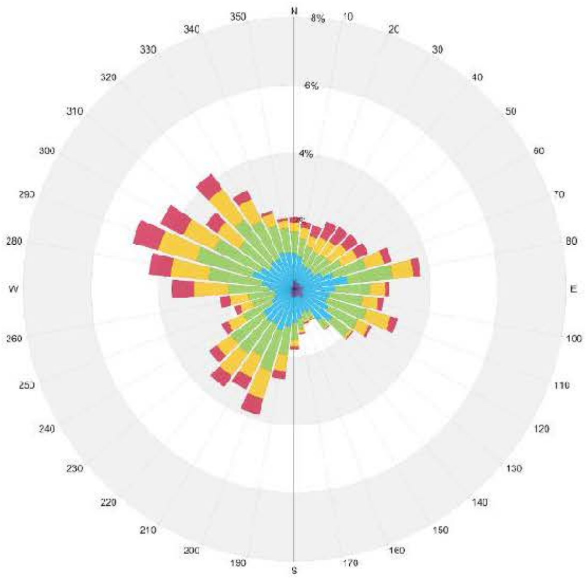
Figure 3.1-3
Wind Tunnel Study Model – Build Configuration



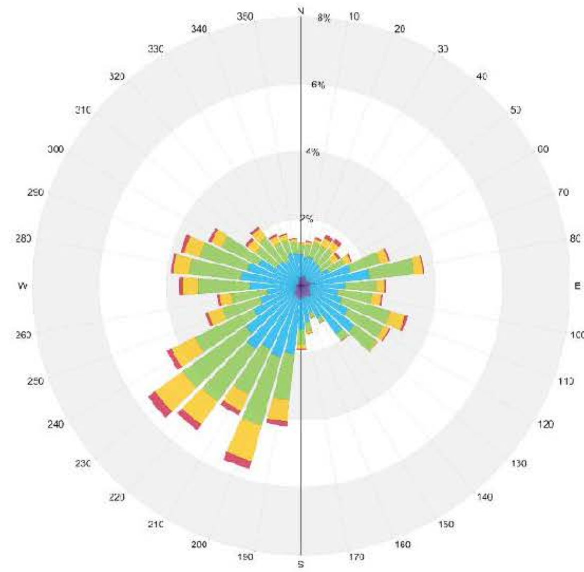
Wind Speed (mph)	Probability (%) Annual
Calm	3.0
1-5	7.9
6-10	32.5
11-15	32.4
16-20	16.3
>20	7.9

Figure 3.1-4

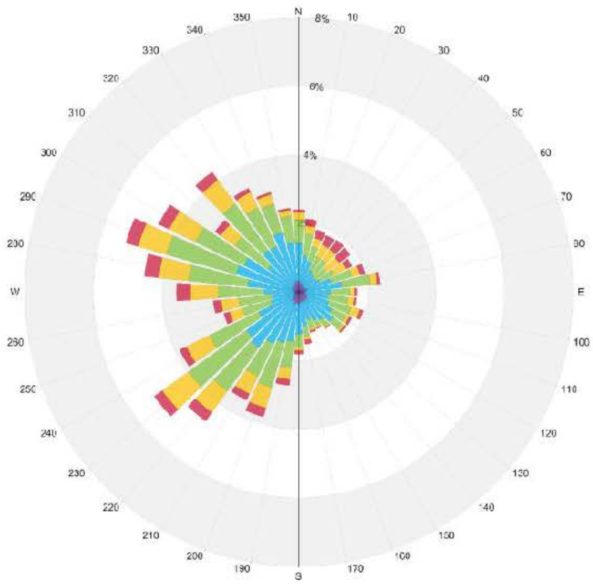
Annual Directional Distribution of Winds Approaching Boston Logan International Airport from 1995 through 2018



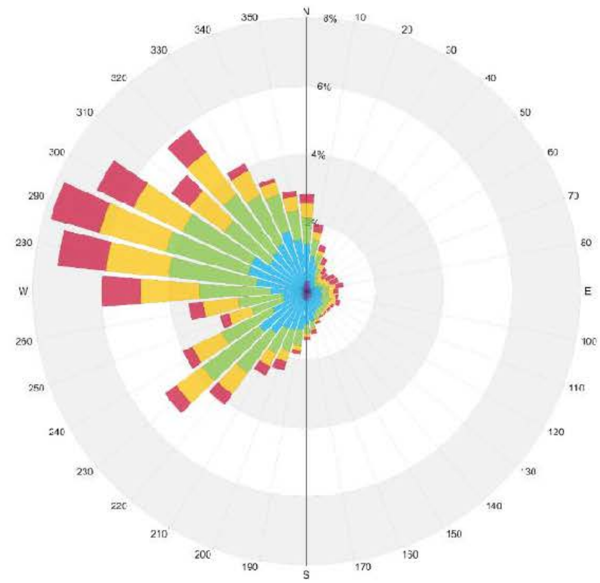
Spring (March – May)



Summer (June – August)



Fall (September – November)



Winter (December – February)

Wind Speed (mph)	Probability (%)			
	Spring	Summer	Fall	Winter
Calm	2.8	3.0	3.4	2.6
1-5	6.8	9.4	8.7	6.5
6-10	28.9	38.8	34.6	27.9
11-15	32.3	34.4	32.0	30.9
16-20	19.2	11.8	14.5	19.7
>20	10.1	2.6	6.8	12.4

Figure 3.1-5

Seasonal Directional Distribution of Winds Approaching Boston Logan International Airport from 1995 through 2018

On an annual basis, the most common wind directions are those between south-southwest and north-northwest (Figure 3.1-4). Winds from the east-northeast to the east-southeast are also relatively common. In the case of strong winds (red bands), west-northwest, northwest, west and northeast are the dominant wind directions. A similar directionality can be seen in the seasonal wind roses in Figure 3.1-5.

3.1.4.3 BPDA Wind Criteria

The Boston Planning and Development Agency has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BPDA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root mean square wind speed) of 31 mph should not be exceeded more than one percent of the time.

The second set of criteria used by the BPDA to determine the acceptability of specific locations is based on the work of Melbourne. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the 1-hour mean wind speed exceeded 1% of the time.

Table 3.1-1 Effective Gust Velocity Criteria*

Wind Acceptability	Effective Gust Speed (mpg)
Acceptable	≤31
Unacceptable	>31

**Applicable to hourly mean wind speed exceeded 1% of the time.*

Table 3.1-2 BPDA Mean Wind Criteria*

Comfort Category	Mean Wind Speed (mph)
Dangerous	>27
Uncomfortable for Walking	>19 and ≤27
Comfortable for Walking	>15 and ≤19
Comfortable for Standing	12 and ≤15
Comfortable for Sitting	≤12

**Applicable to the hourly mean speed exceeded 1% of the time.*

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

The wind climate found in a typical downtown location in Boston is generally comfortable for the pedestrian use of sidewalks and thoroughfares and meets the BPDA effective gust velocity criterion of 31 mph. However, without any mitigation measures, this wind climate is likely to be frequently uncomfortable for more passive activities such as sitting.

The study involved state of the art measurement and analysis techniques to predict wind conditions. Nevertheless, some uncertainty remains in predicting wind comfort, and this must be kept in mind. For example, the sensation of comfort among individuals can be quite variable. Variations in age, individual health, clothing, and other human factors can change a particular response of an individual. The comfort limits used in this report represent an average for the total population. Also, unforeseen changes in the Project area, such as the construction or removal of buildings, can affect the conditions experienced at the site. Finally, the prediction of wind speeds is necessarily a statistical procedure. The wind speeds reported are for the frequency of occurrence stated (1% of the time). Higher wind speeds will occur but on a less frequent basis.

3.1.5 Results and Discussion

The predicted wind conditions in terms of mean and effective gust speeds pertaining to the tested configurations are graphically depicted on site plans in Figures 3.1-6 through 3.1-9. These conditions and the associated wind speeds are presented in Tables 1 and 2, located in Attachment D. The following summary of pedestrian wind comfort is based on the annual winds for each configuration tested. Typically, the summer and fall winds tend to be more comfortable than the annual winds while the winter and spring winds are less comfortable than the annual winds. Note that landscaping was not included in the model of the proposed Project and its surroundings in both tested configurations.

The following is a detailed discussion of the suitability of the predicted wind comfort conditions for the anticipated pedestrian use of each area of interest. Wind conditions comfortable for walking are appropriate for sidewalks and walkways as pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds conducive to standing are preferred at main entrances where pedestrians are apt to linger. Wind speeds comfortable for sitting are ideal during the summer for areas intended for passive activities, such as plaza spaces or outdoor dining areas.

3.1.5.1 No Build Configuration

In general, the mean wind speeds at the existing site and the blocks surrounding it are rated comfortable for walking, standing or sitting with the exception of one location north of the site near the high-rise W Boston building at 100 Stuart Street, where conditions are rated uncomfortable for walking (Location 35 in Figure 3.1-6).

The effective gust criterion is met annually at all locations assessed on and around the existing site in the No Build configuration (Figure 3.1-7).

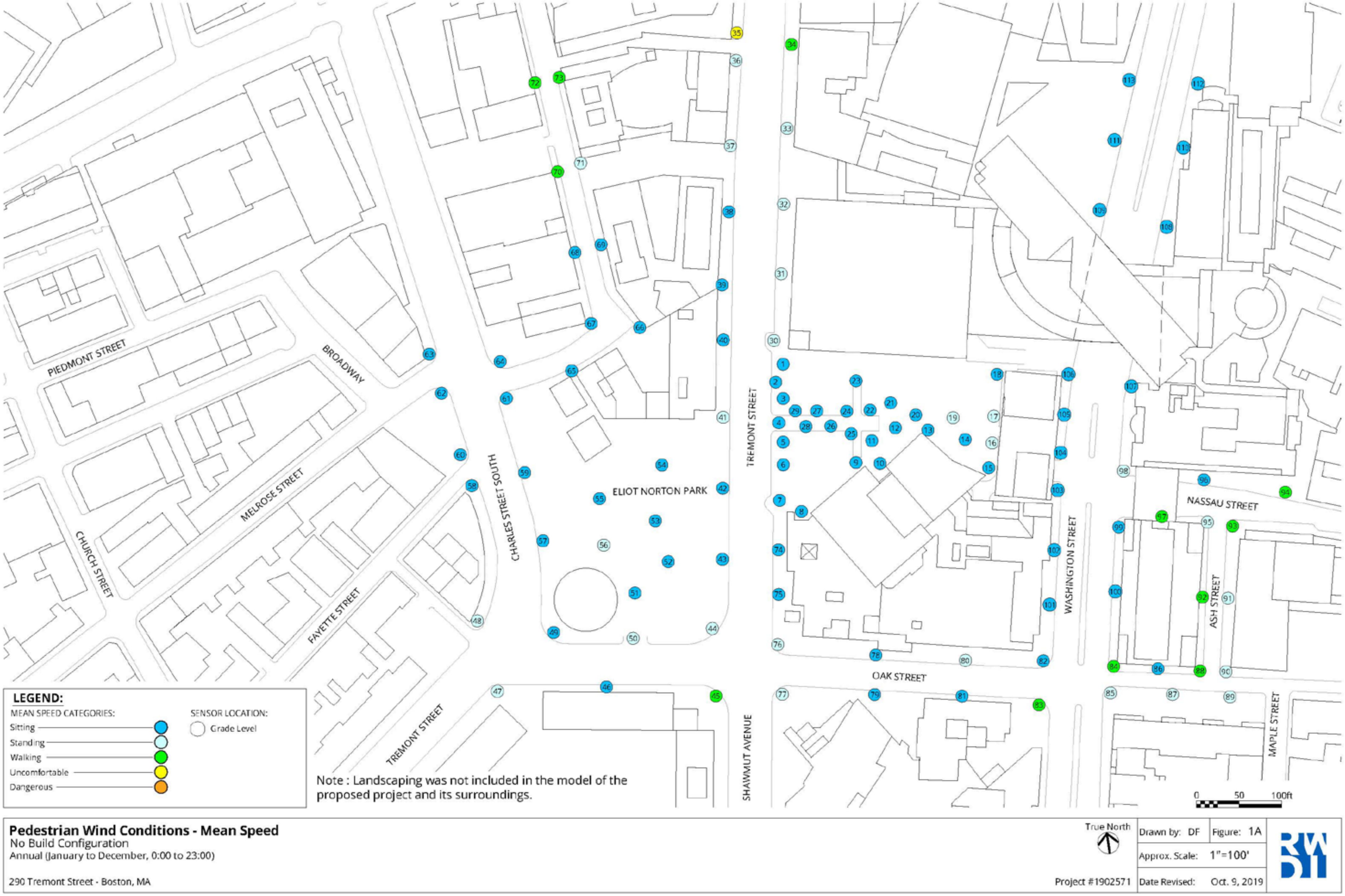
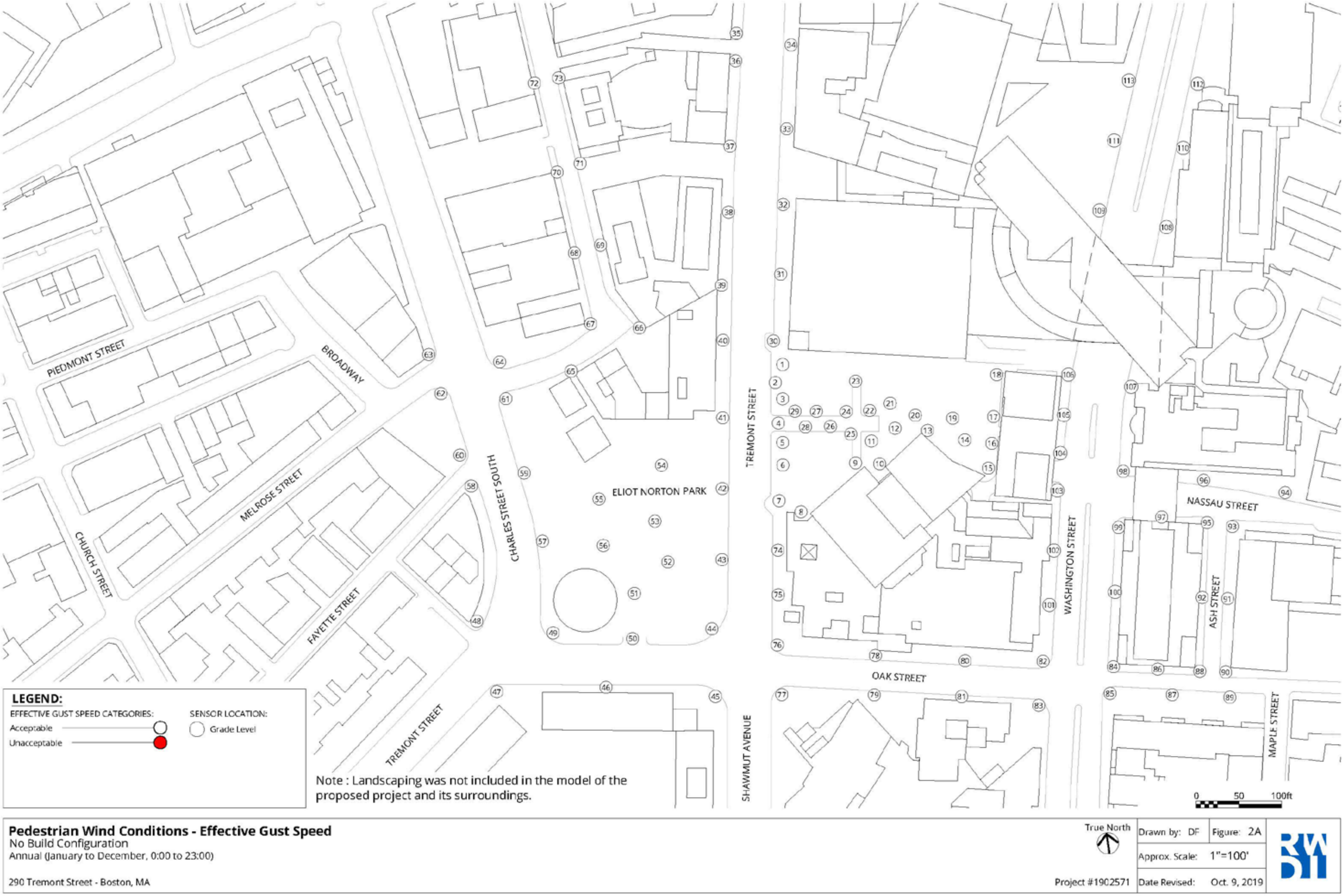


Figure 3.1-6

Pedestrian Wind Conditions – Mean Speed – No Build Configuration



Parcel P-12C Boston, Massachusetts

Figure 3.1-7

Pedestrian Wind Conditions – Effective Gust Speed – No Build Configuration

Although the effect of landscaping has not been quantitatively evaluated in this study, it is expected that the existing trees in the Eliot Norton Park to the southwest of the Project site and on the sidewalks along Tremont Street will reduce wind speeds around the Project site, especially during summer and fall.

3.1.5.2 Build Configuration

With the addition of the Project, an increase in wind speeds is expected locally around the Project. Similar mean speed conditions as the No Build configuration are anticipated at a majority of the locations around the Project site (Figure 3.1-8). Of the 115 sensors studied, 110 (almost 95%) have wind conditions suitable for sitting standing, or walking. Locations where an increase in wind speeds are anticipated with the addition of the Project are mostly restricted to the sidewalks along Tremont Street, with conditions at most areas rated comfortable for sitting, standing or walking, including most locations along the Project perimeter. Wind comfort conditions at the Level 2 terrace are anticipated to be suitable for the intended use throughout the year (Figure 3.1-8).

Higher wind speeds, rated uncomfortable for walking, are predicted in the entrance passage of the Project from Tremont Street (Location 27), two locations north of the Project on Tremont Street (Locations 31 and 32), and one location southeast of the intersection of Oak Street and Shawmut Avenue (Location 45). The annual mean wind speeds at all locations rated uncomfortable for walking only marginally exceed the mean speed threshold rated comfortable for walking (Table 1 in Attachment D). The elevated wind speeds on the sidewalks along Tremont Street are due to seasonally stronger westerly winds downwashing off the façade of the Project and flowing along Tremont Street. Wind speeds rated dangerous are not predicted at any location on an annual basis.

Similar to the No Build Configuration, the existing landscaping around the Project site will help to reduce the observed wind speeds around the Project site in the Build Configuration, especially during summer and fall. The trees proposed along the Project perimeter on Tremont Street will also aid in reducing wind activity caused by the Project. Marcescent and coniferous trees with dense crowns that retain foliage throughout the year are most effective for wind control, particularly in spring and winter.

The effective gust criterion is predicted to be met at all locations assessed (Figure 3.1-9).

3.1.6 Conclusion

As stated above, mean speeds in the No Build and Build scenario are mostly comfortable for pedestrian use throughout the year. Of the 115 sensors studied, 110 (almost 95%) show wind conditions suitable for sitting standing, or walking. Potentially uncomfortable conditions due to seasonally higher mean speeds are anticipated at one location in the passage through the Project building and three locations along the sidewalks of Tremont Street. Appropriate

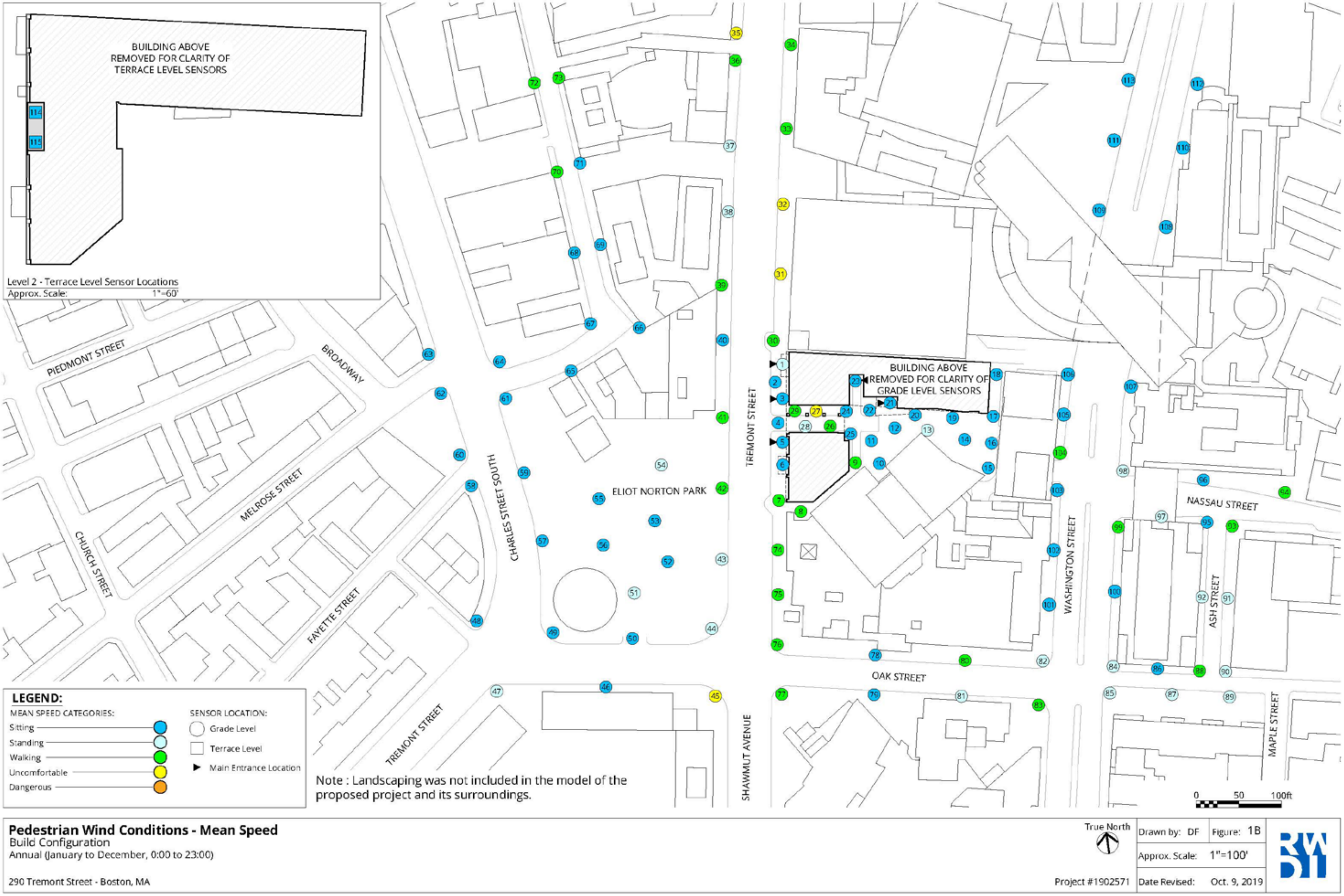


Figure 3.1-8

Pedestrian Wind Conditions – Mean Speed – Build Configuration

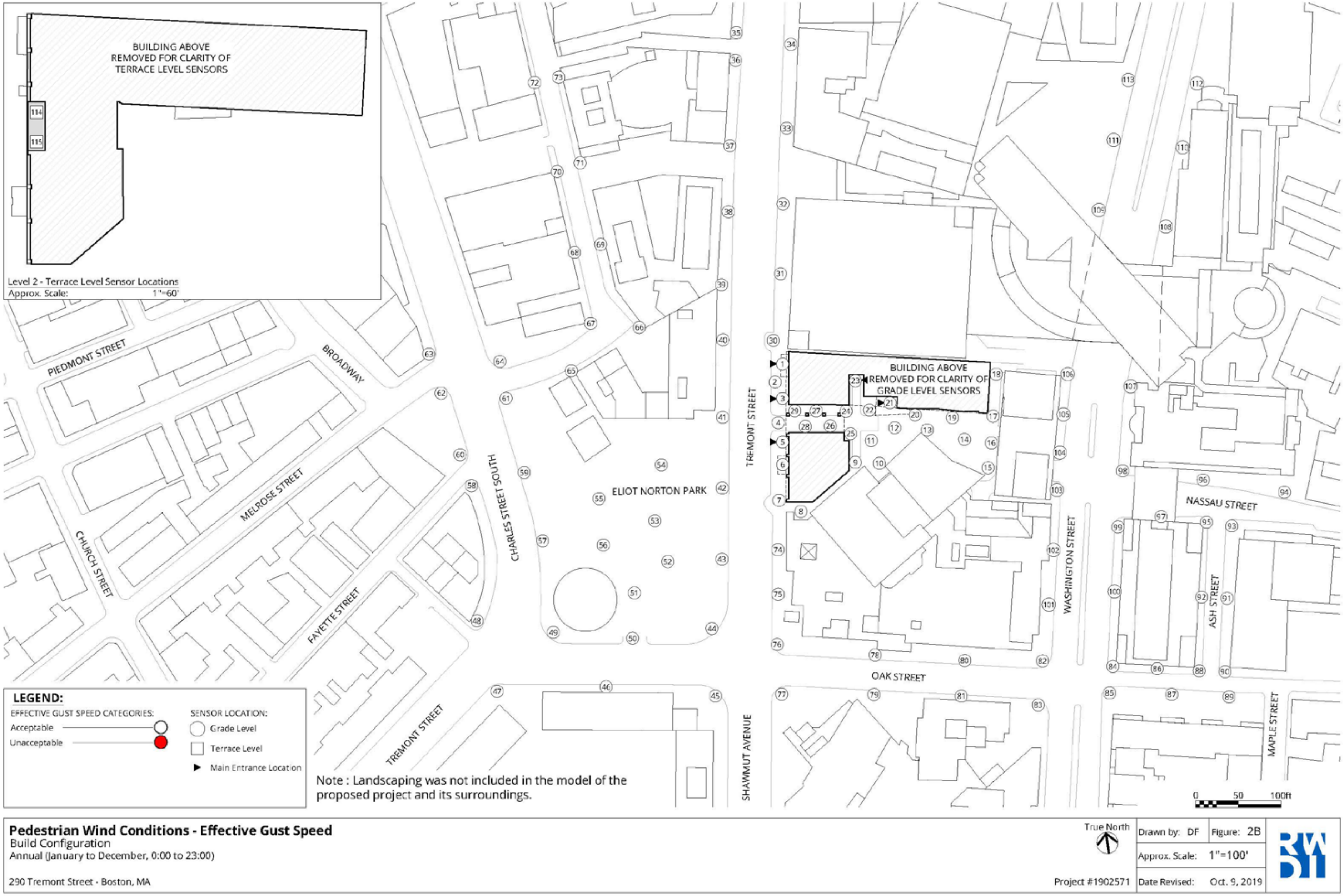


Figure 3.1-9

Pedestrian Wind Conditions – Effective Gust Speed – Build Configuration mitigation measures as described are expected to help to minimize areas of increased winds. Wind speeds that meet the effective gust criterion are anticipated at all locations in both the No Build and Build scenarios, on an annual basis.

3.2 Shadow

3.2.1 Introduction and Methodology

As typically required by the BPDA, a shadow impact analysis was conducted to investigate shadow impacts from the Project during three time periods (9:00 a.m., 12:00 noon, and 3:00 p.m.) during the vernal equinox (March 21), summer solstice (June 21), autumnal equinox (September 21), and winter solstice (December 21). In addition, shadow studies were conducted for the 6:00 p.m. time period during the summer solstice and autumnal equinox. Shadows have been determined using the applicable Altitude and Azimuth data for Boston. Figures showing the net new shadow from the Project are provided in Figures 3.2-1 to 3.2-14 at the end of this section.

The shadow analysis presents the existing shadow and new shadow that would be created by the proposed Project, illustrating the incremental impact of the Project. The analysis focuses on nearby open spaces, sidewalks and bus stops adjacent to and in the vicinity of the Project site. In addition, shadow studies including analysis of historic resources in the Project area are included in Chapter 6.0.

Fourteen time periods were studied to determine the extent of new shadow cast by the Project. The shadow study shows that net new shadow will mainly be cast across nearby streets and sidewalks. Eleven of the 14 time periods studied had no net new shadow cast onto public open spaces. Net new shadow will be cast onto only one MBTA bus stop at 285 Tremont Street during only six of the fourteen time periods studied. The Project complies with the Boston Common and Boston Public Garden shadow laws (Chapter 362 of the Acts of 1990 and Chapter 384 of the Acts of 1992, each as amended by Chapter 57 of the Acts of 2017, “An Act Protecting Sunlight and Promoting Economic Development in the City of Boston”).

3.2.2 Vernal Equinox (March 21)

At 9:00 a.m. during the vernal equinox, net new shadow from the Project will be cast to the west across Tremont Street and its sidewalks, Charles Street and its sidewalks, a portion of Eliot Norton Park, and the MBTA bus stop at 285 Tremont Street.

At 12:00 p.m., shadow from the Project will be cast to north and is very limited. No net new shadow will be cast onto public open space. Net new shadow will be cast onto Tremont Street and its sidewalks, and onto the MBTA bus stop at 285 Tremont Street.

At 3:00 p.m., shadow from the Project will be cast to the northeast and is very limited. No net new shadow will be cast onto nearby public open space or bus stops in the vicinity of the Project site.

3.2.3 Summer Solstice (June 21)

At 9:00 a.m. during the summer solstice, shadow from the Project will be cast to the west across Tremont Street and Charles Street and their sidewalks, a small portion of Bay Village Neighborhood Park, Eliot Norton Park and the MBTA bus stop at 285 Tremont Street.

At 12:00 p.m., shadow from the Project will be cast to the northwest and is very limited. No net new shadow will be cast onto nearby public open space. Net new shadow will be cast onto Tremont Street and its sidewalks and onto the MBTA bus stop at 285 Tremont Street.

At 3:00 p.m., shadow from the Project will be cast to the northeast and is very limited. No net new shadow will be cast onto nearby public open space or bus stops in the vicinity of the Project site.

At 6:00 p.m., shadow from the Project will be cast to the east. No net new shadow will be cast onto nearby public open space, or bus stops in the vicinity of the Project site. No net new shadow will be cast onto Washington Street and its sidewalks as well as onto Harrison Avenue.

3.2.4 Autumnal Equinox (September 21)

At 9:00 a.m. during the summer solstice, net new shadow from the Project will be cast to the northwest across Tremont Street and its sidewalks, Charles Street and its sidewalks, the MBTA bus stop at 285 Tremont Street and Eliot Norton Park.

At 12:00 p.m., shadow from the Project will be cast to the north and is very limited. No net new shadow will be cast onto nearby public open space or bus stops in the vicinity of the Project site. Net new shadow will be cast onto Tremont Street and its sidewalks.

At 3:00 p.m., shadow from the Project will be cast to northeast. No net new shadow will be cast onto nearby public open space or bus stops in the vicinity of the Project site.

At 6:00 p.m., much of the area is under existing shadow. No net new shadow will be cast onto nearby public open space or bus stops in the vicinity of the Project site.

3.2.5 Winter Solstice (December 21)

The winter solstice creates the least favorable conditions for sunlight in New England. The sun angle during the winter is lower than in any other season, causing the shadows in urban areas to elongate and be cast onto large portions of the surrounding area.

At 9:00 a.m., shadow from the Project will be cast to the northwest. No net new shadow will be cast onto nearby public open space in the vicinity of the Project site. Net new shadow will be cast onto a sliver of Charles Street, Stuart Street and its northern sidewalk and a sliver of the MBTA bus stop at 285 Tremont Street.

At 12:00 p.m., shadow from the Project will be cast to the north. No net new shadow will be cast onto nearby public open space or bus stops in the vicinity of the Project site. Net new shadow will be cast onto Tremont Street and its eastern sidewalk.

At 3:00 p.m., much of the area is under existing shadow. Shadow from the Project will be cast to the northeast and is very limited. No net new shadow will be cast onto nearby public open space or bus stops in the vicinity of the Project site.

3.2.6 Conclusions

Fourteen time periods were studied to determine the extent of net new shadow cast by the Project. The shadow study shows that net new shadow will mainly be cast across nearby streets and sidewalks. Eleven of the 14 time periods studied had no net new shadow cast onto public open spaces. Net new shadow will be cast onto only one MBTA bus stop at 285 Tremont Street during only six of the fourteen time periods studied.

3.3 Daylight

The daylight analysis was performed using the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program[1]. This program measures the percentage of sky-dome that is obstructed by a project and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

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

The analysis compares three conditions for the Project site: Existing Condition; Proposed Condition, and the context of the area.

Two viewpoints were chosen to evaluate daylight obstruction for the Existing, Proposed and As-of-right conditions: one from Tremont Street (Viewpoint 1) and one from Washington Street (Viewpoint 2). Three area context points were considered to provide a basis of comparison to existing conditions in the surrounding area. The viewpoints were taken from the following locations and are shown on Figure 3.3-1:

---

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

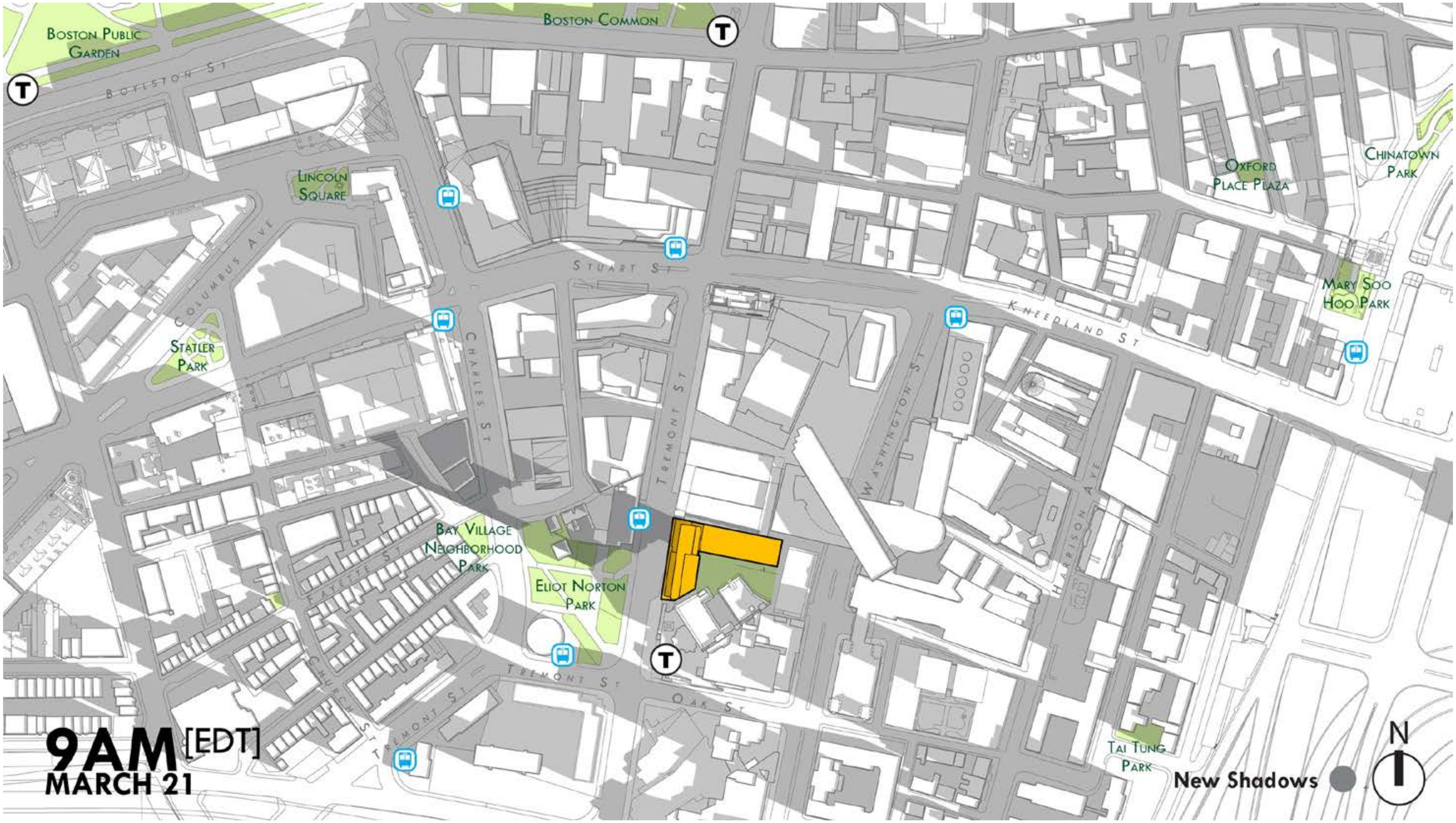
- **Viewpoint 1:** View from Tremont Street facing east toward the Project site.
- **Viewpoint 2:** View from Washington Street facing west toward the Project site.
- **Area Context Viewpoint (AC1):** View from Tremont Street facing west toward 285 Tremont Street.
- **Area Context Viewpoint (AC2):** View from Washington Street facing west toward 711 Washington Street.
- **Area Context Viewpoint (AC3):** View from Washington Street facing west toward 821 Washington Street.

3.3.1 Results

Results for each viewpoint are described in Table 3.3-1. Figures 3.3-2 through 3.3-5 illustrate the BRADA results for each analysis and are located at the end of this section.

Table 3.3-1 Daylight Obstruction Values

Viewpoint Locations		Existing Conditions	Proposed Conditions
Viewpoint 1	View from Tremont Street facing east toward the Project site	8.8%	88.2%
Viewpoint 2	View from Washington Street facing west toward the Project site	13.7%	36.7%
Area Context Points			
AC1	View from Tremont Street facing west toward 285 Tremont Street	71.2%	N/A
AC2	View from Washington Street facing west toward 711 Washington Street	91.2%	N/A
AC3	View from Washington Street facing west toward 821 Washington Street	68.0%	N/A



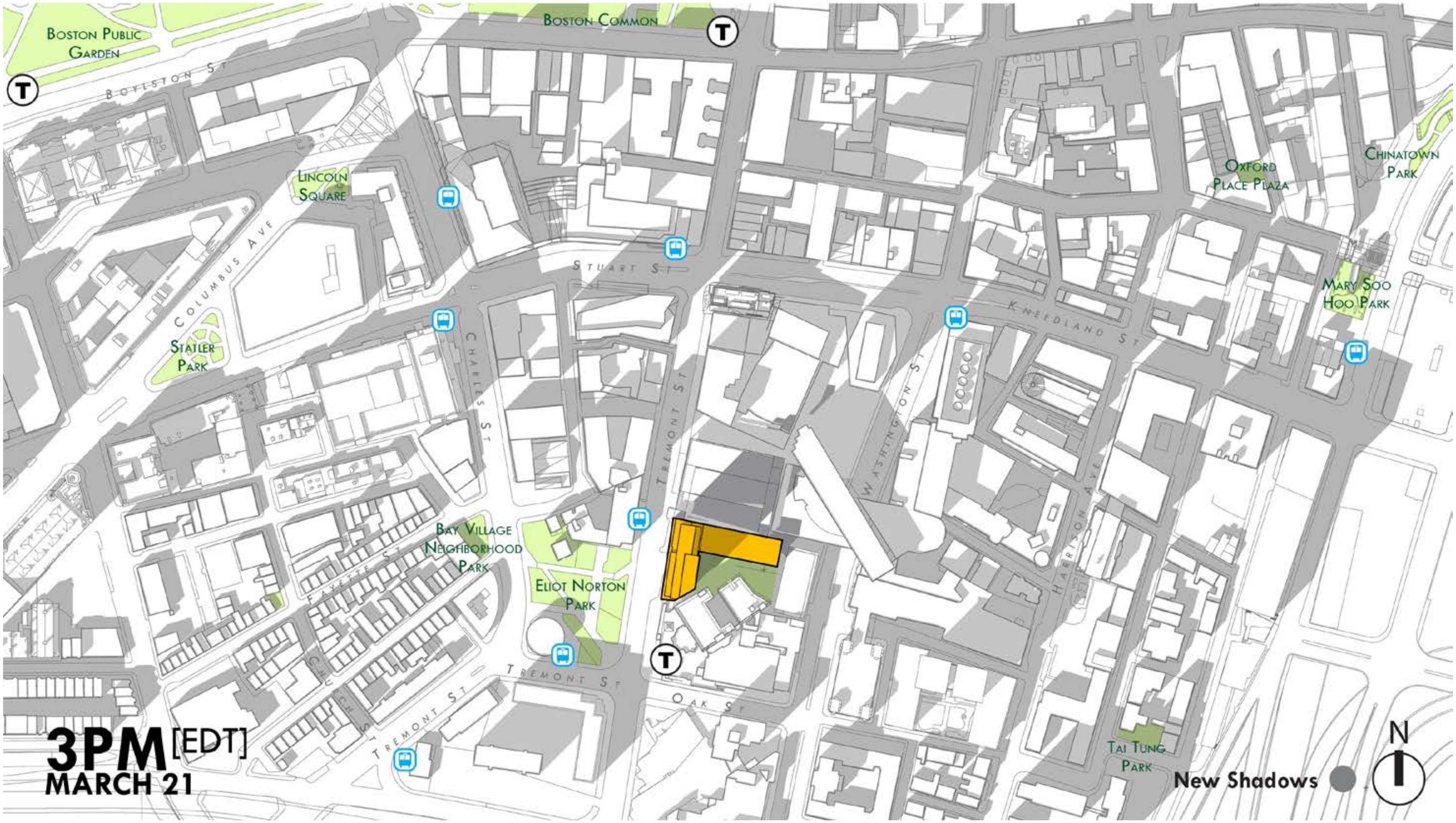
Parcel P-12C **Boston, Massachusetts**

Figure 3.2-1
Shadow Study, March 21, 9:00 a.m.

Parcel P-12C Boston, Massachusetts

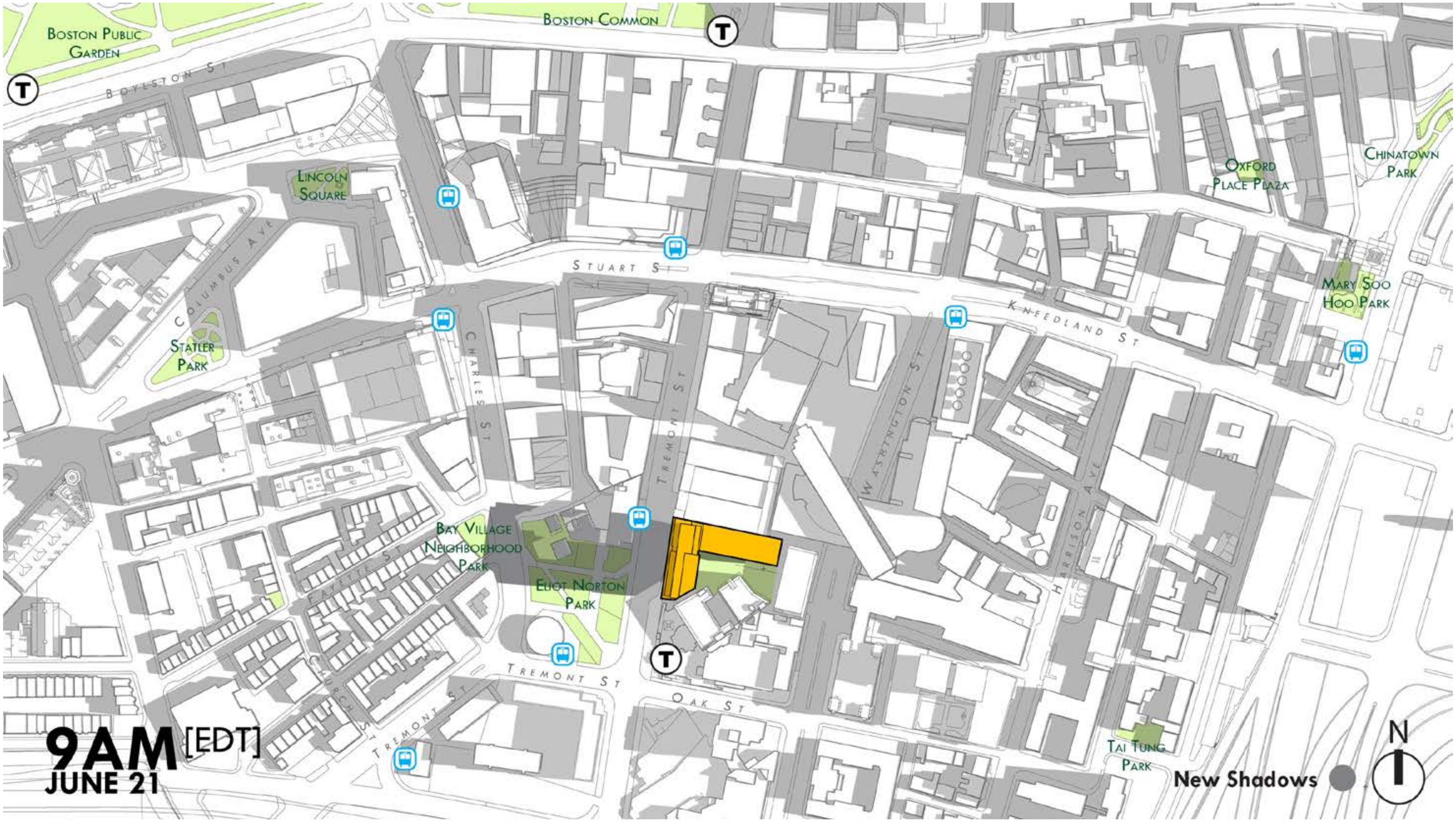
Figure 3.2-2

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



Parcel P-12C Boston, Massachusetts

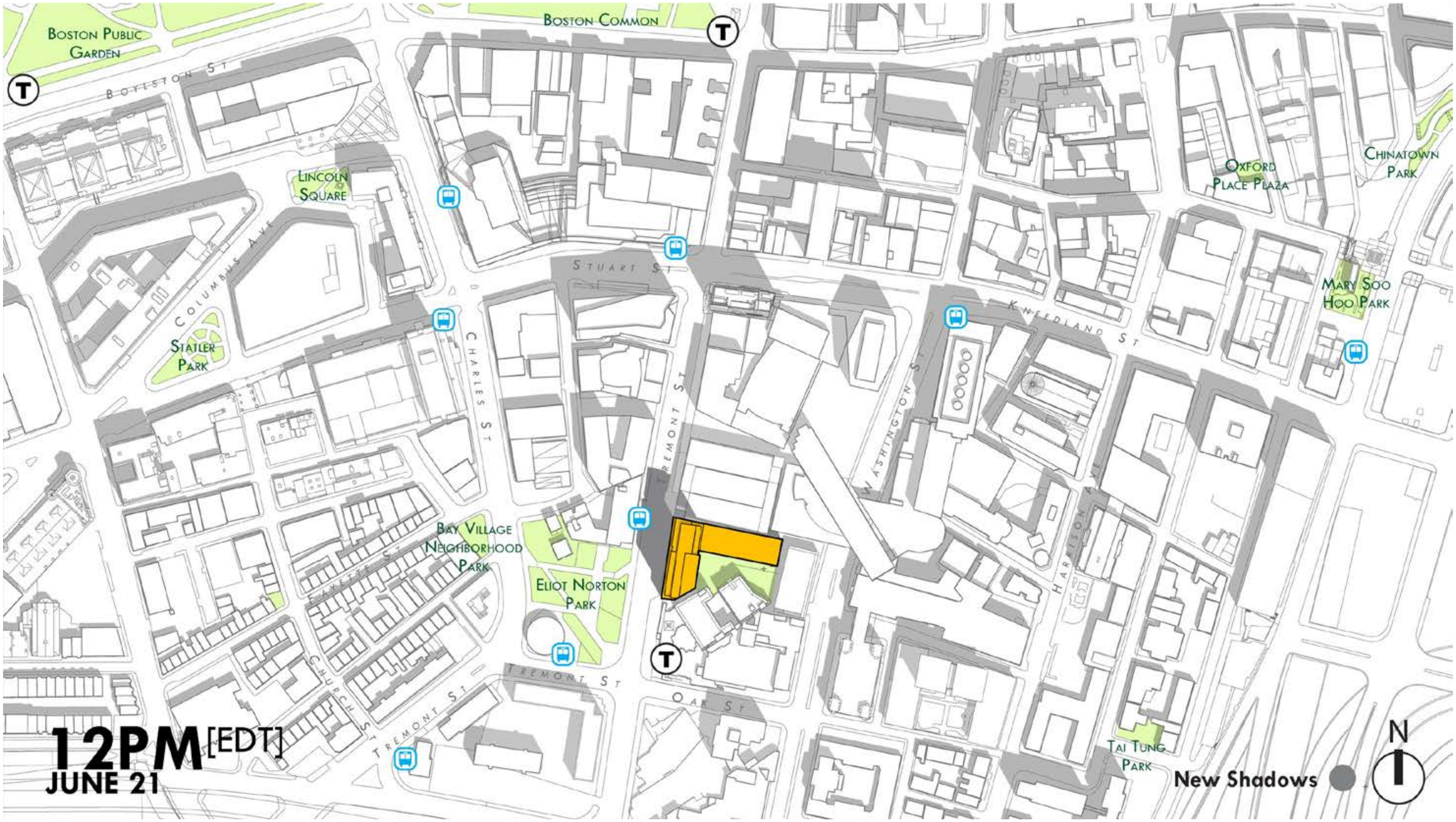
Figure 3.2-3
Shadow Study, March 21, 3:00 p.m.



Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

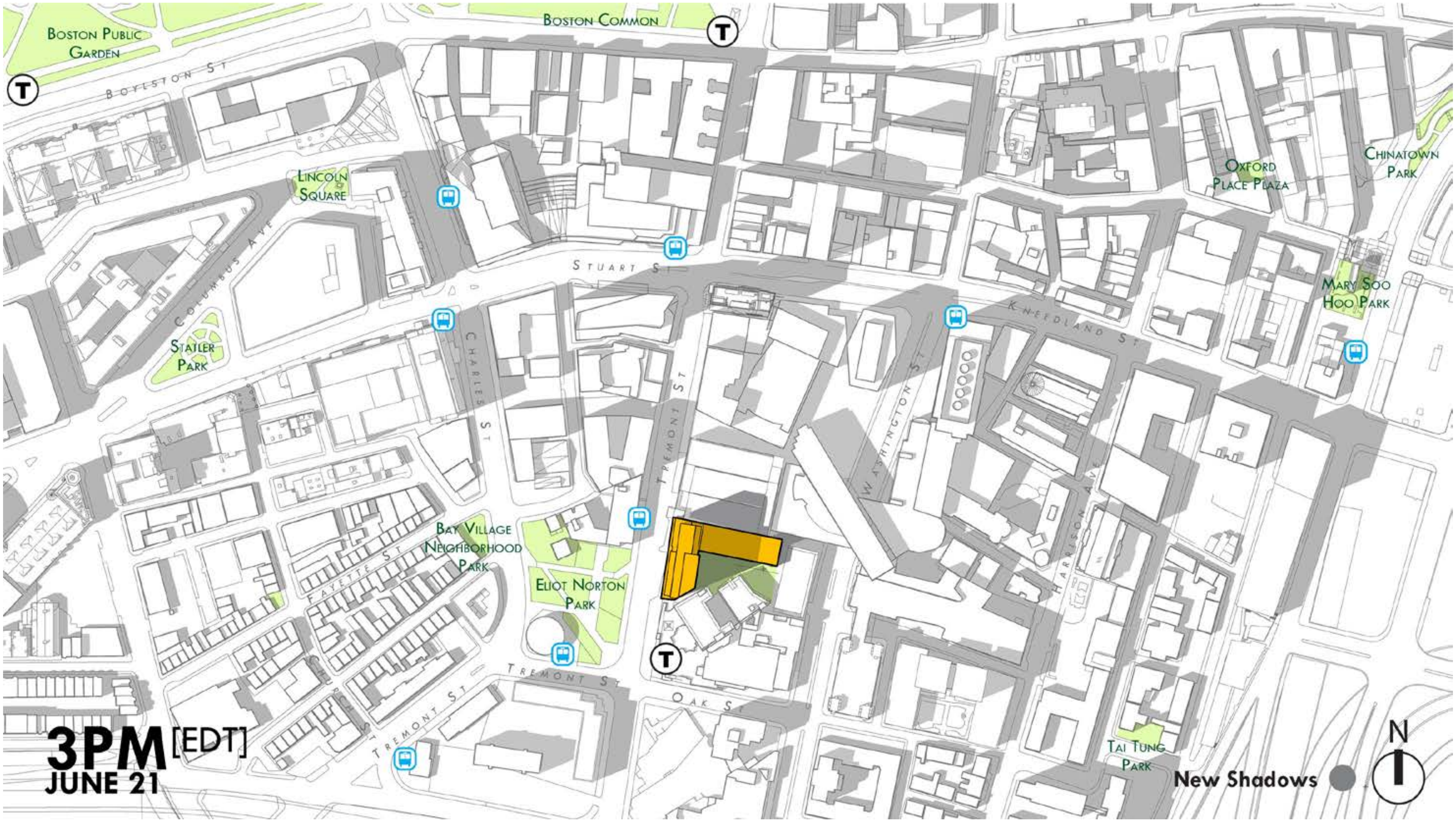
Figure 3.2-4
Shadow Study, June 21, 9:00 a.m.



Parcel P-12C Boston, Massachusetts

Stantec D/R/E/A/M COLLABORATIVE ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 3.2-5
Shadow Study, June 21, 12:00 p.m.



Parcel P-12C Boston, Massachusetts

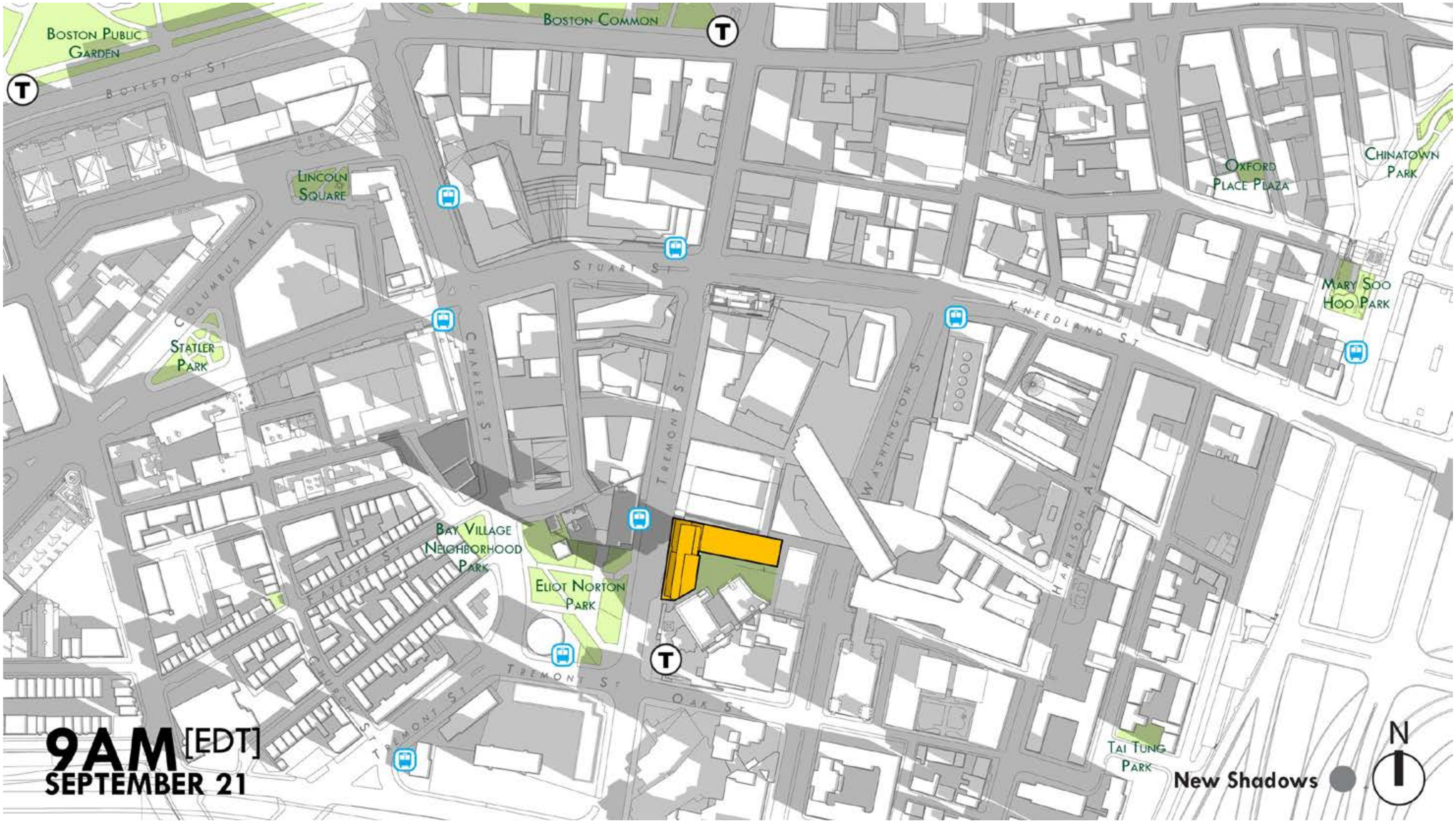
Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 3.2-6
Shadow Study, June 21, 3:00 p.m.

Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

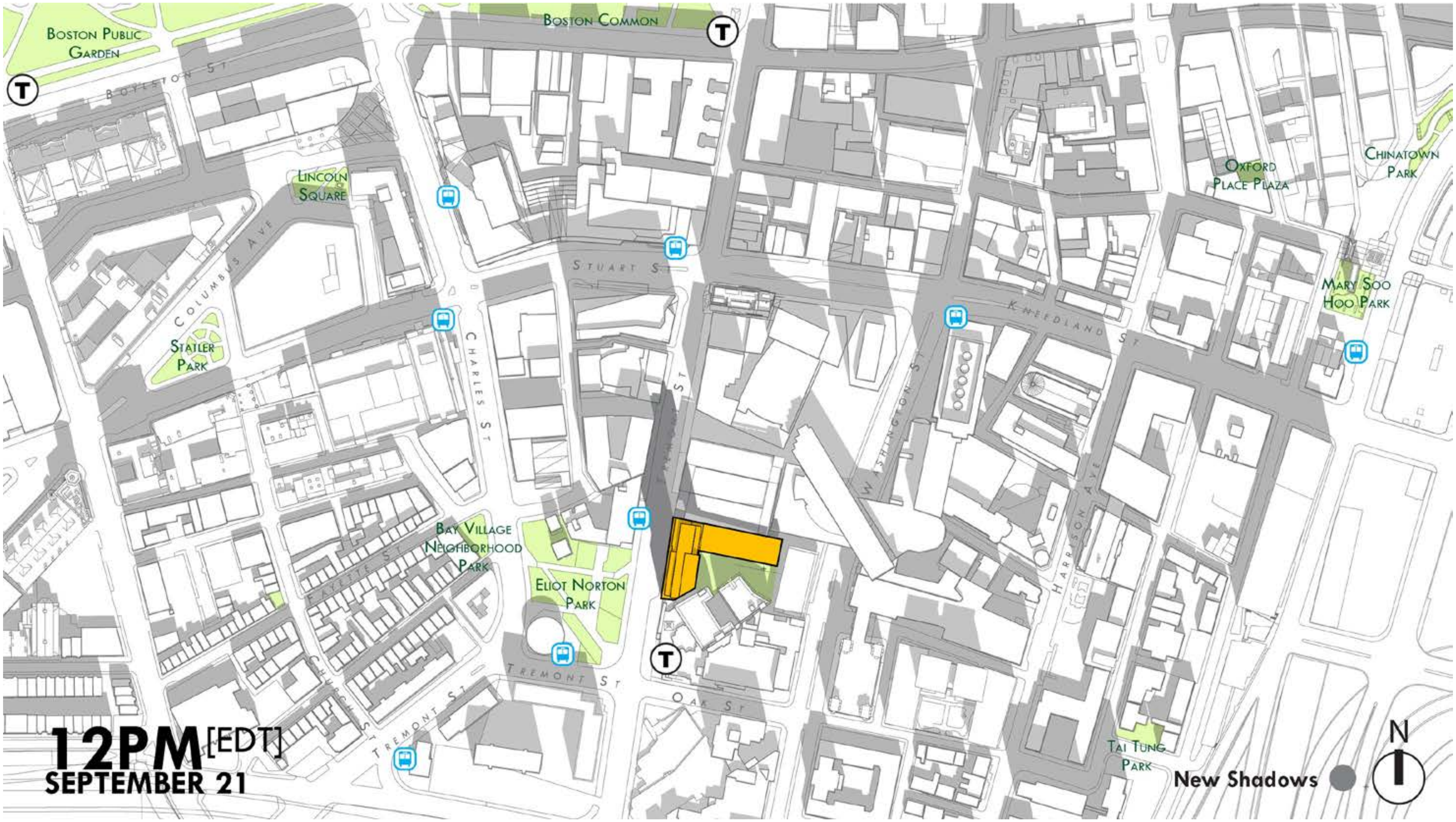
Figure 3.2-7
Shadow Study, June 21, 6:00 p.m.



Parcel P-12C Boston, Massachusetts

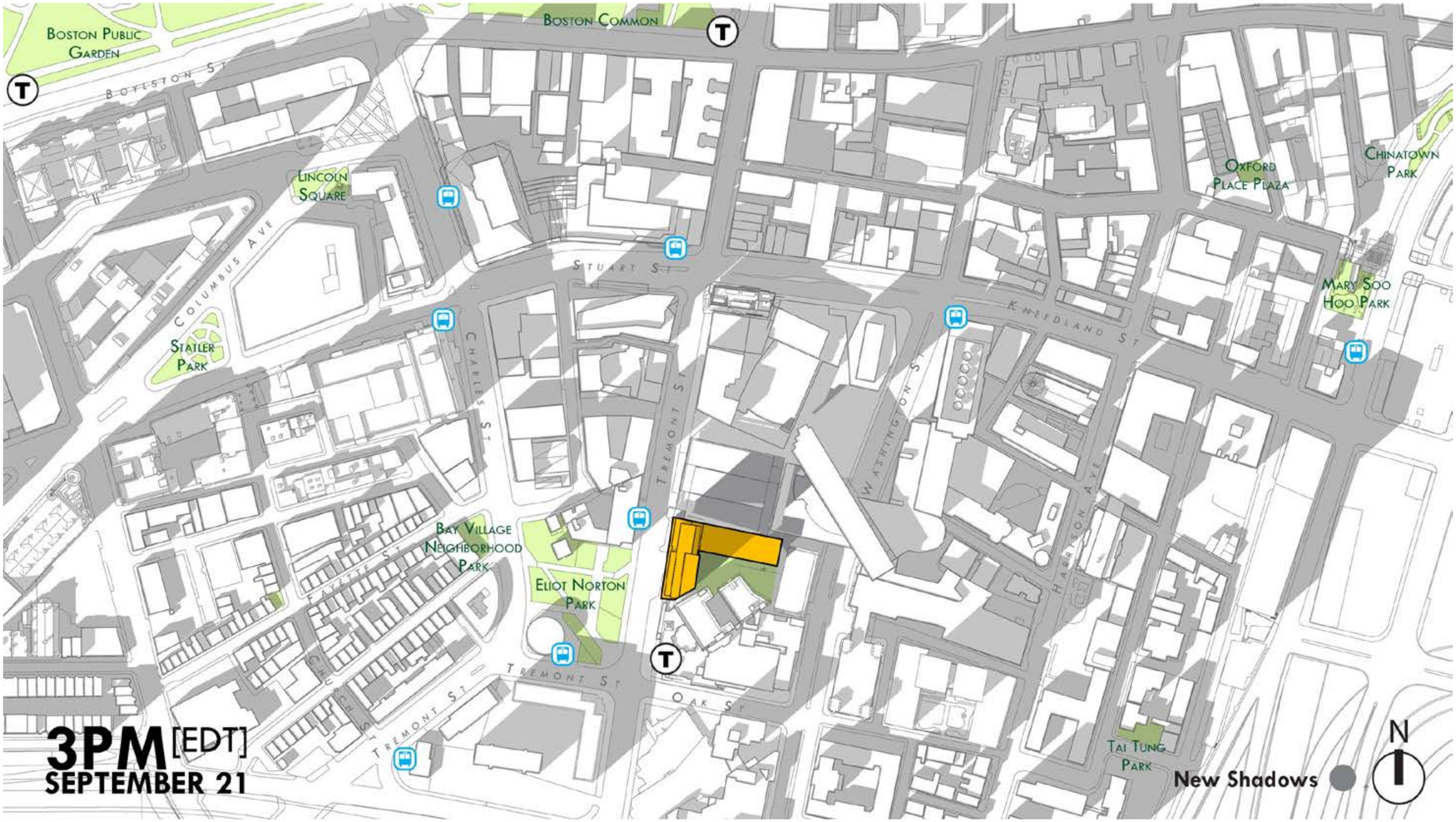
Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 3.2-8
Shadow Study, September 21, 9:00 a.m.



Parcel P-12C **Boston, Massachusetts**

Figure 3.2-9
Shadow Study, September 21, 12:00 p.m.



Parcel P-12C Boston, Massachusetts

Figure 3.2-10
Shadow Study, September 21, 3:00 p.m.

Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 3.2-11
Shadow Study, September 21, 6:00 p.m.

Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 3.2-12
Shadow Study, December 21, 9:00 a.m.

Parcel P-12C **Boston, Massachusetts**

Figure 3.2-13
Shadow Study, December 21, 12:00 p.m.

Figure 3.2-14
Shadow Study, December 21, 3:00 p.m.

Tremont Street – Viewpoint 1

Tremont Street runs along the western edge of the Project site. Viewpoint 1 was taken from the center of Tremont Street looking east at the Project site. Since the Project site currently includes a surface parking lot, the development of the Project will result in an increase in the daylight obstruction value at this viewpoint of 88.2%. While this is an increase over Existing Conditions, this daylight obstruction value is similar to the Area Context values and to a typical urban area.

Washington Street – Viewpoint 2

Washington Street runs along the eastern edge of the Project site. Viewpoint 2 was taken from the center of Washington Street looking west toward the Project site. The development of the Project will result in an increase in the daylight obstruction value at this viewpoint of 36.7%. While this is an increase over Existing Conditions, due to setback from the street of the building, this daylight obstruction value is substantially lower than the Area Context values.

Area Context Views

The area around the Project site is densely populated with mid- and high-rise buildings. To provide a larger context for comparison of daylight conditions, obstruction values were calculated for three Area Context Viewpoints described above and shown in Figures 3.3-3 to 3.3-4. The daylight obstruction values ranged from 68.0% for AC3 to 91.2% for AC2. Daylight obstruction values for the Project are similar to and in some cases lower than buildings in the Project vicinity, including the Area Context values.

3.3.2 Conclusion

The daylight analysis conducted for the Project describes existing and proposed daylight obstruction conditions at the Project site and the surrounding area. Results of the BRADA analysis indicate that while development of the Project will result in increased daylight obstruction over existing conditions, the resulting conditions will be similar to the daylight obstruction values within the surrounding area and typical of densely built urban areas.

3.4 Solar Glare

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

3.5 Air Quality Analysis

An air quality analysis has been conducted to determine the impact of pollutant emissions from stationary and mobile sources generated by the Project. Any new stationary sources will be reviewed by the Massachusetts Department of Environmental Protection (MassDEP) during permitting under the Environmental Results Program (ERP).

3.5.1 National Ambient Air Quality Standards and Background Concentrations

Background air quality concentrations and federal air quality standards were utilized to conduct the microscale analysis mentioned above. Federal National Ambient Air Quality Standards (NAAQS) were developed by the U.S. Environmental Protection Agency (EPA) to protect the human health against adverse health effects with a margin of safety. The modeling methodologies were developed in accordance with the latest Massachusetts Department of Environmental Protection (MassDEP) modeling policies and Federal modeling guidelines.[2] The following sections outline the NAAQS standards and detail the sources of background air quality data.

3.5.1.1 National Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, EPA promulgated NAAQS for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) (PM10 and PM2.5), carbon monoxide (CO), ozone (O_3), and lead (Pb).[3] The NAAQS are listed in Table 3.5-1.

The Commonwealth recently promulgated amendments to the Massachusetts Ambient Air Quality Standards (MAAQS) to be identical to NAAQS.[4].

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

---

[2] 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

[3] 40 CFR 50, National Primary And Secondary Ambient Air Quality Standards, Nov. 25, 1971.

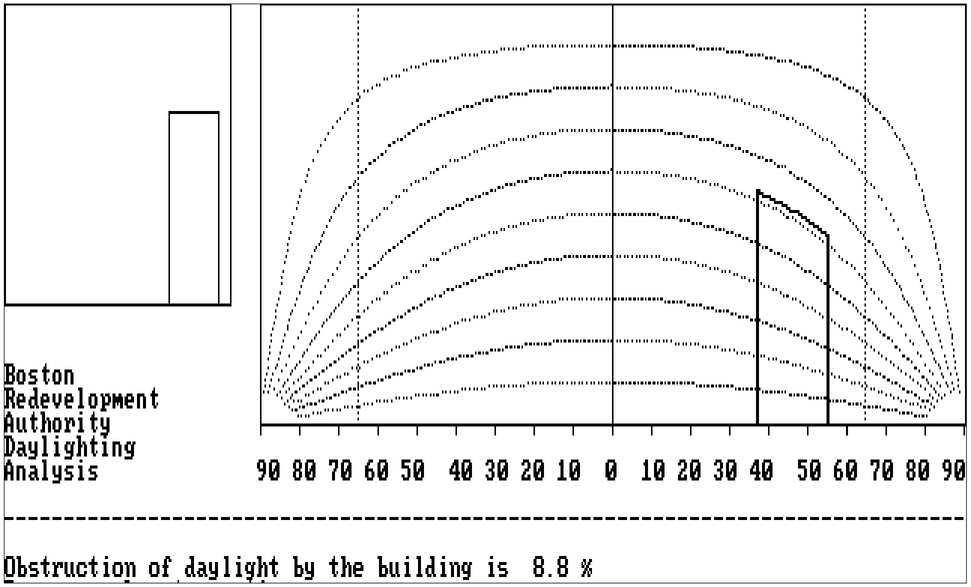
[4] 310 CMR 6.04, June 14, 2019

Parcel P-12C Boston Massachusetts

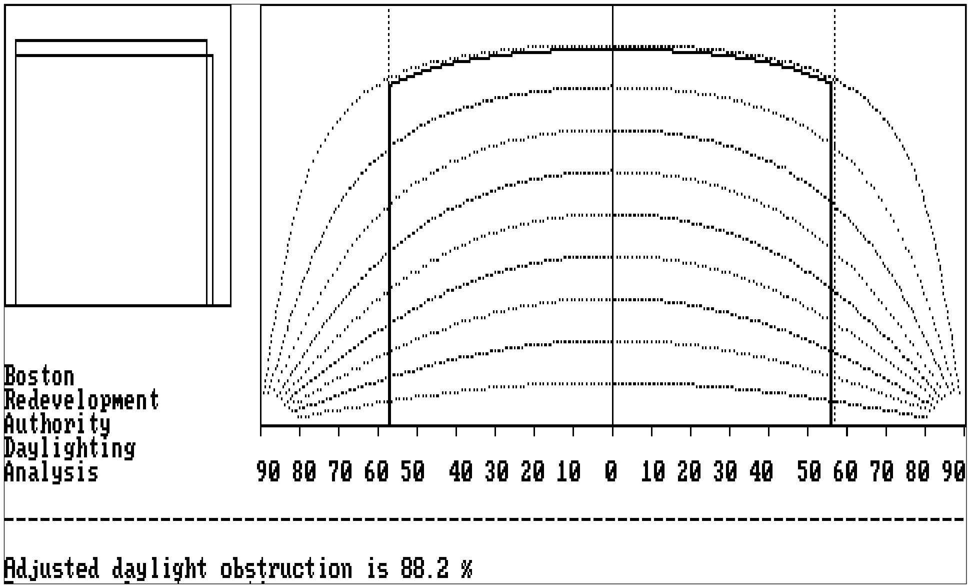
Epsilon ASSOCIATES INC.

Figure 3.3-1

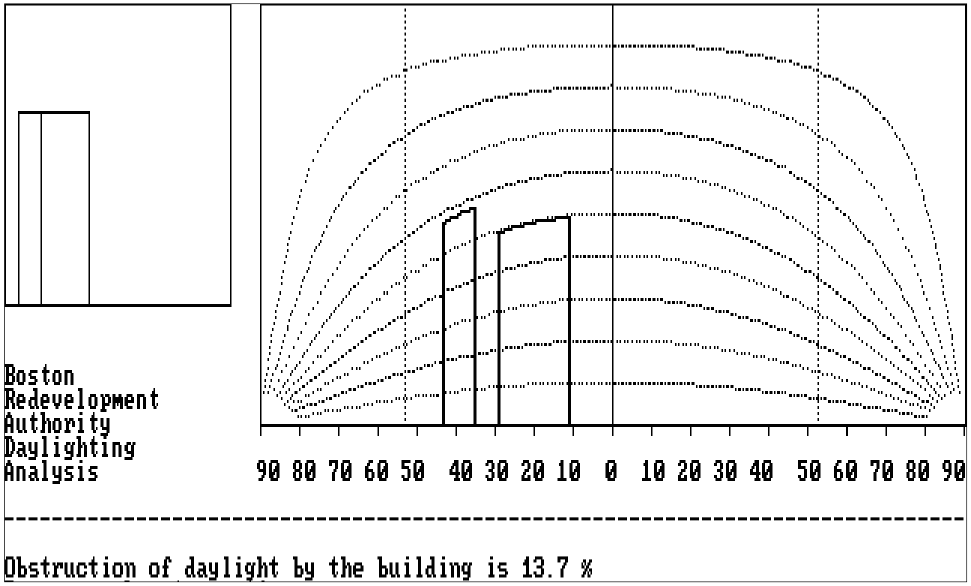
Viewpoint and Area Context Locations



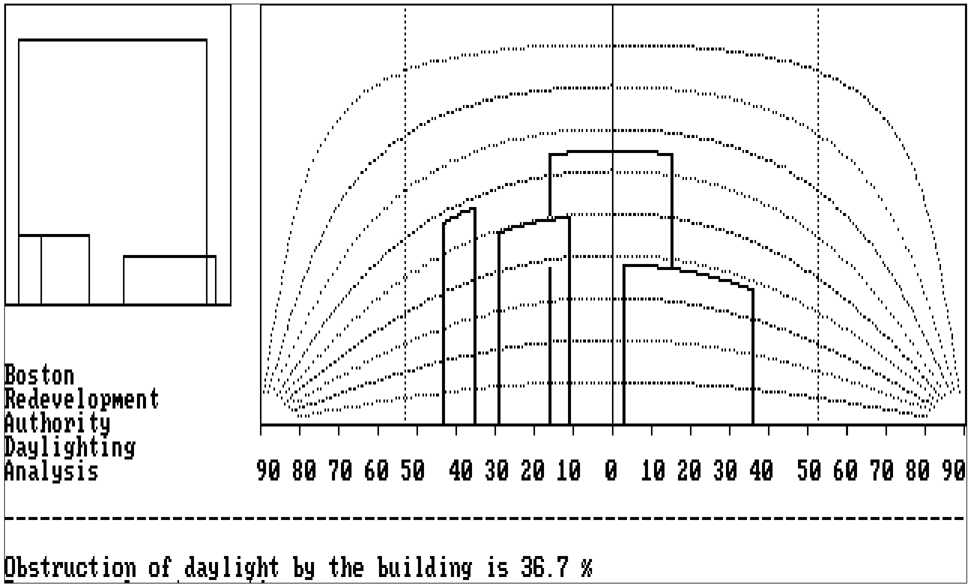
Viewpoint 1 (Existing): View from Tremont Street facing east toward the Project site



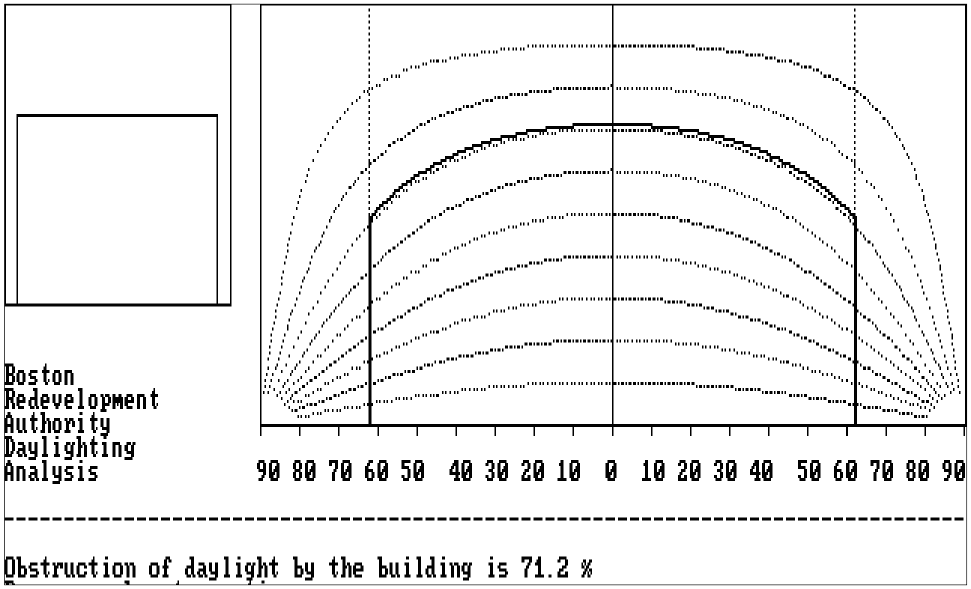
Viewpoint 1 (Proposed): View from Tremont Street facing east toward the Project site



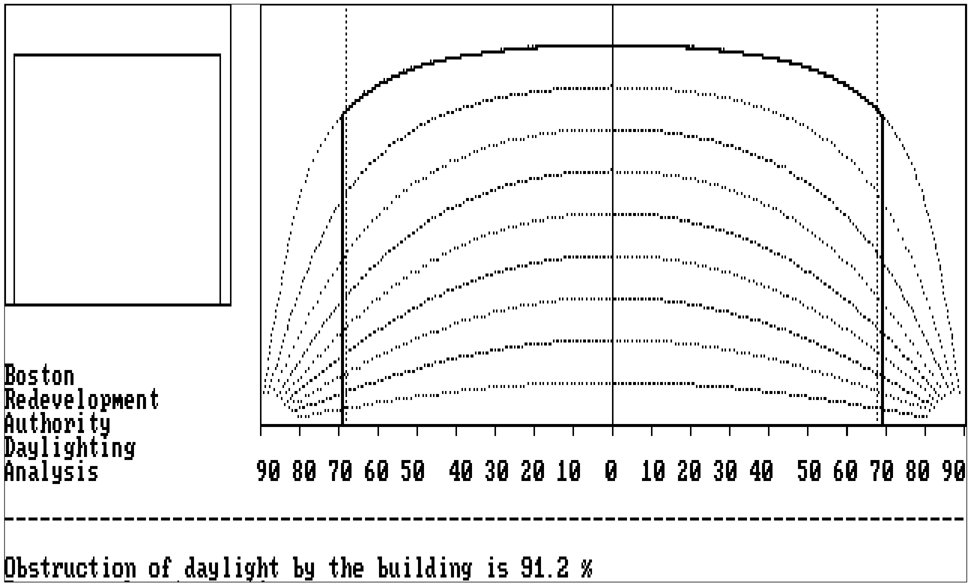
Viewpoint 2 (Existing): View from Washington Street facing west toward the Project site



Viewpoint 2 (Proposed): View from Washington Street facing west toward the Project site

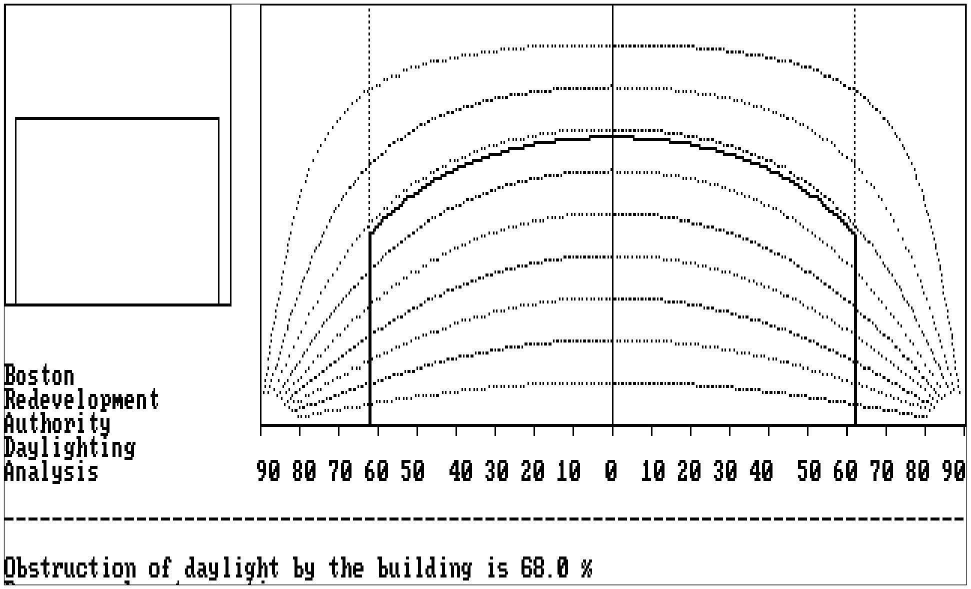


AC1: View from Tremont Street facing west toward 285 Tremont Street



AC2: View from

AC2: View from Washington Street facing west toward 711 Washington Street



AC3: View from Washington Street facing west toward 821 Washington Street

The NAAQS also reflect various durations of exposure. The non-probabilistic short-term periods (24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term periods refer to limits that cannot be exceeded for exposure averaged over three months or longer.

Table 3.5-1 National (NAAQS) and Massachusetts (MAAQS) Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS/MAAQS ($\mu g/m^3$) Primary	Secondary
NO_2	Annual (1)	100	Same
	1-hour (2)	188	None
SO_2	3-hour (3)	None	1300
	1-hour (4)	196	None
PM2.5	Annual (1)	12	15
	24-hour (5)	35	Same
PM10	24-hour (3)	150	Same
CO	8-hour (3)	10,000	Same
	1-hour (3)	40,000	Same
Ozone	8-hour (6)	147	Same
Pb	3-month (1)	1.5	Same

Source: http://www.epa.gov/ttn/naaqs/criteria.html and 310 CMR 6.04
(1) Not to be exceeded.
(2) 98th percentile of one-hour daily maximum concentrations, averaged over three years.
(3) Not to be exceeded more than once per year.
(4) 99th percentile of one-hour daily maximum concentrations, averaged over three years.
(5) 98th percentile, averaged over three years.
(6) Annual fourth-highest daily maximum eight-hour concentration, averaged over three years.

3.5.1.2 Background Concentrations

To estimate background pollutant levels representative of the area, the most recent air quality monitor data reported by the MassDEP in their Annual Air Quality Reports was obtained for 2015 to 2017. The three-hour SO_2 values are no longer reported in the annual reports. Data for this pollutant and averaging time combination was obtained from the EPA's AirData website.

The Clean Air Act allows for one exceedance per year of the CO and SO_2 short-term NAAQS per year. The highest second-high accounts for the one exceedance. Annual NAAQS are never to be exceeded. The 24-hour PM10 standard is not to be exceeded more than once per year on average over three years. To attain the 24-hour PM2.5 standard, the three-year average of the 98th percentile of 24-hour concentrations must not exceed 35 $\mu g/m^3$. For annual PM2.5 averages, the average of the highest yearly observations was used as the background concentration. To attain the one-hour NO_2 standard, the three-year average of the 98th percentile of the maximum daily one-hour concentrations must not exceed 188 $\mu g/m^3$.

Background concentrations were determined from the closest available monitoring stations to the proposed development. All pollutants are not monitored at every station, so data from multiple locations are necessary. The closest monitor is at 174 North Street (1.1 miles north) in Boston's North End. However this station only monitors PM10. Kenmore Square (1.6 miles west) monitors all except CO. The monitored CO values at Harrison Avenue are presented.

A summary of the background air quality concentrations are presented in Table 3.5-2. MassDEP provided the values to be used.

Table 3.5-2 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	*Averaging Period*	*Form of Standard*	*Background Concentration (µg/m³)*	*NAAQS*	*Percent of NAAQS*
SO_2 (1)(6)	1-Hour (5)	99th %	8.9	196.0	5%
	3-Hour	H2H	10.0	1300.0	1%
PM-10	24-Hour	H2H	30.0	150.0	20%
PM-2.5	24-Hour (5)	98th %	15.1	35.0	43%
	Annual (5)	H	6.9	12.0	58%
NO_2 (3)	1-Hour (5)	98th %	86.5	188.0	46%
	Annual	H	47.5	100.0	47%
CO (2)	1-Hour	H2H	2750.4	40000.0	7%
	8-Hour	H2H	1439.4	10000.0	14%
Ozone (4)	8-Hour	H4H	135.4	147.0	92%
Lead (7)	Rolling 3-Month	H	0.017	0.15	12%

Notes:
From MassDEP Air Quality Monitor reports or EPA's AirData Website
(1) SO_2 reported ppb. Converted to µg/m³ using factor of 1 ppm = 2.62 µg/m³.
(2) CO reported in ppm. Converted to µg/m³ using factor of 1 ppm = 1146 µg/m³.
(3) NO_2 reported in ppb. Converted to µg/m³ using factor of 1 ppm = 1.88 µg/m³.
(4) O_3 reported in ppm. Converted to µg/m³ using factor of 1 ppm = 1963 µg/m³.
(5) Background level is the average concentration of the three years.
(6) The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.
(7) Lead is not reported at any site in Massachusetts in 2017 or 2018.

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

3.5.2 Microscale Analysis

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

Mobile sources of air pollution include emissions from vehicle traffic associated with the Project.

BPDA guidelines state:

A microscale analysis predicting localized carbon monoxide concentrations should be performed, including identification of any locations projected to exceed the National or Massachusetts Ambient Air Quality Standards, for projects in which: 1) project traffic would impact intersections or roadway links currently operating at Level of Service ("LOS") D, E, or F or would cause LOS to decline to D, E, or F; 2) project traffic would increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or, 3) the project will generate 3,000 or more new average daily trips on roadways providing access to a single location.

For this Project, of the intersections studied, one intersection either currently operating at LOS D or worse, or is projected to operate at LOS D or worse for future cases. Therefore, a microscale analysis is required.

3.5.2.1 Methodology

The BPDA typically requests an analysis of the effect on air quality of the increase in traffic generated by projects subject to Large Project Review. The microscale analysis involves modeling of carbon monoxide (CO) emissions from vehicles idling at and traveling through signaled intersections. Predicted ambient concentrations of CO for the Build and No Build cases are compared with federal (and state) ambient air quality standards for CO.

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

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

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

Baseline (2019) and future year (2026) emission factor data calculated from the MOVES model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersection.

Existing background values of CO at the nearest monitor location at Harrison Avenue were obtained from MassDEP. CAL3QHC results were then added to background CO values of 2.4 ppm (one-hour) and 1.3 ppm (eight-hour), as provided by MassDEP, to determine total air quality impacts due to the Project. These values were compared to the NAAQS for CO of 35 ppm (one-hour) and 9 ppm (eight-hour).

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

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

3.5.2.2 Intersection Selection

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

One signalized intersections included in the traffic study met the above conditions (see Chapter 2). The traffic volumes and LOS calculations provided in Chapter 2 form the basis of evaluating the traffic data versus the microscale thresholds. Of these, one intersection was chosen based on their LOS, volumes, and overall Project impact.

The intersection found to meet the criteria is the intersection of Shawmut Avenue, Tremont Street, and Oak Street West.

Microscale modeling was performed for the intersections based on the aforementioned methodology. The 2019 Existing conditions and the 2026 No Build, and Build conditions were each evaluated for both morning (a.m.) and afternoon (p.m.) peak.

The CAL3QHC model's queueing algorithm is not designed for unsignalized intersections. Therefore an analysis of intersections where no signal exists was not performed.

---

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

3.5.2.3 Emissions Calculations (MOVES)

The EPA MOVES computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOVES model are based on motor vehicle operations typical of daily periods. The Commonwealth's statewide annual Inspection and Maintenance (I&M) program was included, as well as the county specific vehicle age registration distribution, fleet mix, meteorology, and other inputs. The inputs for MOVES for the existing (2019) and build year (2026) are provided by MassDEP.

All link types for the modeled intersections were input into MOVES. Idle emission factors are obtained from factors for a link average speed of 0 miles per hour (mph). Moving emissions are calculated based on speeds at which free-flowing vehicles travel through the intersection as stated in traffic modeling (SYNCHRO) reports. A speed of 25 mph is used for all free-flow traffic. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary) and left turns, respectively. Roadway emissions factors were obtained from MOVES using EPA guidance.[7]

Winter CO emission factors are typically higher than summer. Therefore, January weekday emission factors were conservatively used in the microscale analysis. The emission factors are presented in Table 3.5-3.

Table 3.5-3 MOVES Carbon Monoxide Emission Factors

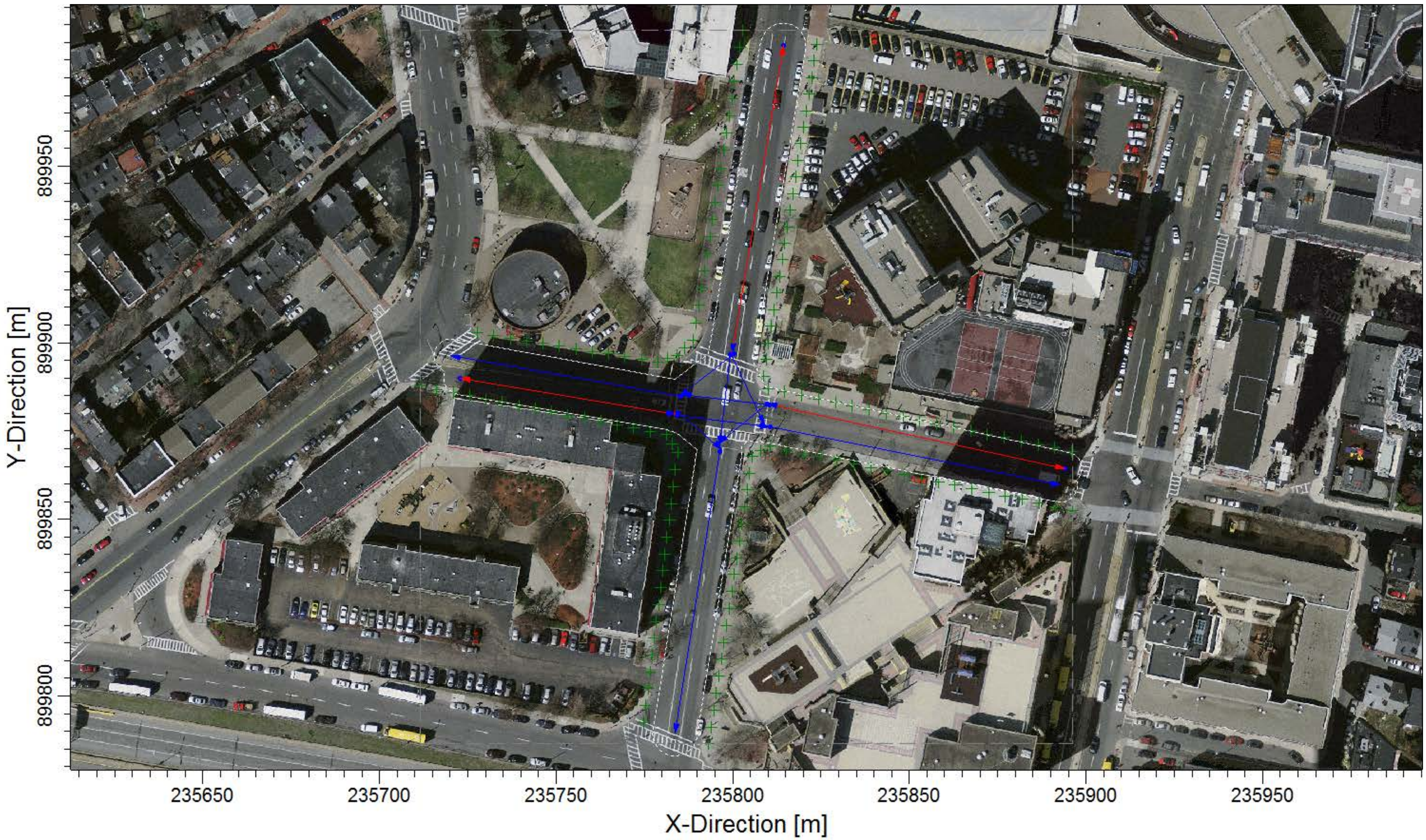
Carbon Monoxide Only			
		2019	***2026***
Free Flow	25 mph	2.992	1.614
Right Turns	10 mph	4.667	2.474
Left Turns	15 mph	4.021	2.182
Queues	Idle	10.463	2.866

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

3.5.2.4 Receptors & Meteorology Inputs

A set of receptors was placed in the vicinity of the modeled intersection. Receptors extended approximately 300 feet on the sidewalks along the roadways approaching the intersections. The roadway links and receptor locations of the modeled intersection are presented in Figure 3.5-1.

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



Parcel P-12C **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 3.5-1

Intersection of Shawmut Avenue, Tremont Street, and Oak Street West

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

3.5.2.5 Impact Calculations (CAL3QHC)

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

For use in the microscale analysis, background concentrations of CO in ppm were required. The corresponding maximum background concentrations in ppm were 2750.4 $\mu g/m^3$ (2.4 ppm) for one-hour and 1439.4 $\mu g/m^3$ (1.3 ppm) for eight-hour CO.

3.5.2.6 Microscale Results

Results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 3.5-4 through 3.5-6 for the 2019 and 2026 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.9.[11]

Results of the one-hour and eight-hour maximum modeled CO ground-level concentrations from CAL3QHC were added to EPA supplied background levels for comparison to the NAAQS. These values represent the highest potential concentrations at the intersection as they are predicted during the simultaneous occurrence of "defined" worst case meteorology. The highest one-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.2 ppm) plus background (2.4 ppm) is 2.6 ppm.

The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.2 ppm) plus background (1.3 ppm) is 1.5 ppm. Both maximum concentrations occur under Existing Conditions.

---

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

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

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

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

Under future No-Build and Build cases, the highest one-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.1 ppm) plus background (2.4 ppm) is 2.5 ppm. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.1 ppm) plus background (1.3 ppm) is 1.4 ppm.

All concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm. Mitigation is provided only at the intersection of Everett Street and Western Avenue and offers little to no benefit with respect to air quality impacts.

3.5.2.7 Microscale Conclusions

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

Existing impacts are often higher than future impacts for a number of reasons:

- the evolution of alternatively-fueled low-emission vehicles into the general roadway fleet (hybrids, electrics, CNG vehicles);
- the emission rates of traditional fossil-fueled vehicles continue to improve; and
- the increase in traffic volume with (or even without) the proposed Project is not large enough to overcome the benefits of a lower emitting vehicle fleet.

Table 3.5-4 Summary of Microscale Modeling Analysis (Existing 2019)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Shawmut Avenue, Tremont Street, & Oak Street West	AM	0.1	2.4	2.5	35
	PM	0.2	2.4	2.6	35
8-Hour					
Shawmut Avenue, Tremont Street, & Oak Street West	AM	0.1	1.3	1.4	9
	PM	0.2	1.3	1.5	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

Table 3.5-5 Summary of Microscale Modeling Analysis (No-Build 2026)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Shawmut Avenue, Tremont Street, & Oak Street West	AM	<0.1	2.4	2.5	35
	PM	0.1	2.4	2.5	35
8-Hour					
Shawmut Avenue, Tremont Street, & Oak Street West	AM	<0.1	1.3	1.4	9
	PM	0.1	1.3	1.4	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

Table 3.5-6 Summary of Microscale Modeling Analysis (Build 2026)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Shawmut Avenue, Tremont Street, & Oak Street West	AM	<0.1	2.4	2.5	35
	PM	0.1	2.4	2.5	35
8-Hour					
Shawmut Avenue, Tremont Street, & Oak Street West	AM	<0.1	1.3	1.4	9
	PM	0.1	1.3	1.4	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

3.5.3 Mesoscale Analysis

In accordance with MassDEP guidance[12], a mesoscale analysis is required for the following projects for which an ENF is filed under MEPA after May 1, 1991:

- any office project generating 3,000 or more ADT; and
- any other non-residential project generating 6,000 or more ADT.

A mesoscale analysis will be required for the following projects for which a decision on the adequacy of an EIR is issued under MEPA after May 1, 1991:

- any non-residential project generating 10,000 or more ADT.

A mesoscale analysis is required to ensure that a proposed project will not negatively impact the existing SIP. The SIP is created to track how the state intends to maintain compliance with NAAQS or to plan for future emissions reductions to attain compliance. At their discretion, MEPA may still require a mesoscale analysis for projects that do not meet the above criteria.

3.5.3.1 Methodology

A mesoscale analysis predicts the change in regional ozone precursor emissions [oxides of nitrogen (NOx) and volatile organic compounds (VOCs)] due to the Project.

The analysis includes a comparison of the future Build conditions to the No-Build condition. If emissions are greater for the Build conditions, reasonable and feasible mitigation measures will be evaluated. The methodology and parameters for the mesoscale analysis follow methodology approved by MassDEP.

The mesoscale analysis performed for this Project predicts the change in regional ozone precursor emissions due to the proposed redevelopment of the Project site. The total vehicle pollutant burden was estimated for the 2019 Existing conditions and the No-Build and Build conditions for year 2026. Traffic conditions are described in more detail in Section 2.

The EPA has developed an emissions factor model (called MOVES) and MassDEP provides state-specific inputs required for this model. Therefore, the MOVES computer program was used to estimate motor vehicle emissions of VOC and NOx (and greenhouse gases) on the roadway network in the Project area. Average hourly emission estimates were calculated using the vehicle count data provided in the transportation study, mileage between intersections, and county-specific model inputs provided by MassDEP.

---

12 MassDEP, Guidelines For Performing Mesoscale Analysis Of Indirect Sources, May 1991

Traffic volumes provided in Chapter 2 form the basis of the mesoscale study. Approximately seven roadway links were included in the mesoscale analysis. Peak hour traffic volumes were provided by the transportation consultant. Estimates of average daily traffic (ADT) were made from the peak hour volumes assuming a 10% K-Factor. This ADT was then converted into average hourly volumes by simply dividing by 24. Average speed was assumed based on roadway type (typically 10-40 mph for arterial roads) for all links. Distances for the links were estimated with mapping software.

MOVES output emissions are in tons per hour. Since average hourly traffic data were input, emissions in tons per year were calculated assuming a seven day week for 52 weeks per year.

For intersection emissions, idle vehicle emission rates were obtained in MOVES by using a fictitious roadway link with 100 vehicles and a zero miles per hour vehicle speed. The total emissions on this link can be divided by the number of vehicles to get a mass per hour emission rate for idling vehicles. This method is recommended by EPA to get emission factors for air quality concentration analyses of idling vehicles at intersections (microscale analyses).[13] These emission factors were then used with vehicle counts and delay information from the traffic analyses to estimate vehicle emissions at intersections.

Attachment E presents the intersection emissions calculations, and the Project-specific link data input into the MOVES program.

3.5.3.2 Results

Results of the mesoscale analysis are presented in Tables 3.5-7 through 3.5-8.

As shown in Table 3.5-7, the analysis indicates the change in total emissions from the 2019 Existing conditions to the 2026 No-Build conditions. Typically, a decrease in total emissions, even with the modest increases in traffic vehicle miles traveled (VMT), is attributable to anticipated improvements in vehicle engine and emissions technologies, which are expected to reduce the per-vehicle emission rates. Even with a roughly 10% increase in VMT, large reductions are realized due to improved fleet vehicle emissions.

Table 3.5-7 Regional Mesoscale (Indirect) Emissions Analysis Summary (No Build)

Pollutant	*VOC (lbs/day)*	*VOC (tons/yr)*	*NOx (lbs/day)*	*NOx (tons/yr)*
2019 Existing	6.7	1.2	4.6	0.8
2026 No-Build	3.8	0.7	1.7	0.3
Difference	-2.9	-0.5	-2.9	-0.5
Difference (%)	-43%	-43%	-64%	-64%

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

As shown in Table 3.5-6, the 2026 Build condition exhibits an increase of NOx and VOC emissions compared to 2026 No-Build conditions due to a direct increase in vehicular traffic and increased delay times at area intersections attributable to the Project. This results in increases of approximately 4 percent of VOC and 5 percent of NOx emissions.

Table 3.5-8 Regional Mesoscale (Indirect) Emissions Analysis Summary (Build)

Pollutant	*VOC (lbs/day)*	*VOC (tons/yr)*	*NOx (lbs/day)*	*NOx (tons/yr)*
2025 No-Build	3.8	0.7	1.7	0.3
2025 Build	4.0	0.7	1.7	0.3
Difference Difference (%)	0.2 4%	0.0 4%	0.1 5%	0.0 5%

For this Project, no roadway mitigation is proposed.

3.5.3.3 Conclusions

Mesoscale analysis results show increases of 4 percent in VOC and 5 percent in NOx emissions for the 2026 Build conditions relative to the 2026 No-Build condition due to traffic increases from No-Build to Build conditions. However, the actual increase in emissions is well less than 1 ton per year of each pollutant.

Any implementation of any future improvements not yet determined or discussed in Section 2 may further reduce emissions.

3.5.4 Stationary Sources of Air Pollution

3.5.4.1 Permitting

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

It is expected that the majority of stationary sources (boilers, engines, etc.) may be subject to MassDEP's Environmental Results Program (ERP). The Proponent will complete the required applications and submittals for the equipment, as necessary. No sources are expected to meet or exceed the thresholds for a Non-Major Comprehensive Plan Approval.

3.6 Stormwater

Stormwater Management is included in Section 7.3.

3.7 Flood Hazard Zones/Wetlands

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Project site located in the City of Boston - Community Panel Number 25025C0077J indicates the FEMA Flood Zone Designations for the Project site. The map shows that the Project is located in a Zone X Area determined to be outside the 0.2% annual chance floodplain.

The Project site does not contain wetlands.

3.8 Geotechnical/Groundwater

3.8.1 Existing Site Conditions

The site is currently an at-grade surface parking lot with existing grades ranging from approximately El. 27 to El. 30 Boston City Base (BCB) datum, generally sloping downward from north to south. Historically, two streets, Common Street and Wyman Place, crossed through the site which was previously occupied by several commercial and residential buildings. According to Sanborn Maps, the buildings were demolished in the 1940s and 1950s, and the streets were removed in the 1970s, at which point the site was occupied by the current at-grade parking lot. Municipal utilities are present beneath the surrounding streets and sidewalks.

3.8.2 Subsurface Soil and Bedrock Conditions

A recent subsurface exploration program, consisting of thirteen test borings and six test pits undertaken by the Proponent in July and August 2019, generally indicates the following sequence of subsurface units in order of increasing depth below ground surface in Table 3.8-1

Table 3.8-1 Subsurface Soil and Bedrock Conditions

Stratum/ Subsurface Unit	Top of Stratum Elevation (BCB)	Est. Stratum Thickness (ft)
Urban Fill	El. 30 to El. 27	6 to 12
Marine Clay Deposits	El. 23.5 to El. 16	75.5 to 89.5
Glacial Deposits	El. -60 to El. -68.5	2 to 4
Bedrock	El. -54.5 to El. -70.5	--

3.8.3 Groundwater

Groundwater levels measured in observations wells installed at the site during the recent subsurface exploration program indicate groundwater ranges from approximately 11 to 22 feet below existing site grades, which corresponds to approximately El. 16 to El. 8 BCB. Groundwater levels may be influenced by leakage into and out of sewers, storm drains, and other below-grade structures, as well as perched water conditions on top of the Marine Clay and environmental factors such as precipitation, season, and temperature.

The site is located within the Groundwater Conservation Overlay District (GCOD) and therefore will provide a recharge system designed to collect stormwater runoff and recharge to the groundwater table to the extent feasible in accordance with the City regulations. The Project is required to infiltrate the first inch of stormwater runoff over site impervious areas. Additionally, because the Project will be over 100,000 square feet, the project will be required to retain the first 1.25 inches of stormwater over site impervious areas. The Project will comply with both of these requirements as described in Section 7.3.2.

3.8.4 Foundation Construction

The foundation support requirements for the new building are under design. However, based on available information and the current loading information for the proposed structures, it is anticipated that the high-rise portion of the building will be supported on deep foundation elements deriving their capacity in the bedrock underlying the site and the low-rise portion will either be supported on deep foundations or on a concrete mat bearing in the Marine Clay. Excavations to construct the partial below-grade level are anticipated to extend to depths of up to 15 feet below existing site grades. A temporary lateral earth support system is necessary to complete construction of the below-grade space.

Temporary dewatering will likely be required during construction to control groundwater and stormwater to perform construction in-the-dry. A temporary construction dewatering permit will be obtained prior to discharge of dewatering effluent from the site. Testing of the effluent will be conducted prior to and during discharge in accordance with the permit requirements.

3.8.4.1 Potential Impacts During Below Grade Construction

In general, potential impacts during excavation and foundation construction include possible ground vibrations, noise, and ground movements outside of the excavation. The foundation design and construction will be conducted to control and limit potential adverse impacts, especially to adjacent structures and to groundwater levels.

3.8.5 Mitigation Measures

Mitigation measures will be incorporated into the design and construction of the Project to limit potential adverse impacts to immediately adjacent areas as described below.

The Project team will conduct studies, prepare designs and specifications, and monitor the contractor's performance for conformance to the Project’s contract documents with specific attention to protecting nearby structures and facilities, and preventing lowering of groundwater levels. Selection and design of the foundations and excavation support system will be made with careful attention to mitigating adverse temporary and long-term effects outside the site.

Performance criteria will be established in the Project specifications for the foundations and lateral excavation support system with respect to ground vibrations, movements, water-tightness and the construction sequence of the below-grade portion of the work.

The contractor will be required to plan, employ, and modify as necessary, construction methods and take all necessary steps during the work to protect nearby structures and utilities.

Geotechnical instrumentation will be installed and monitored prior to and during the below-grade portion of the work to evaluate the performance of the excavation, adjacent structures and utilities, and area groundwater levels.

3.9 Solid and Hazardous Waste

The Proponent conducted a Phase I Environmental Site Assessment and Limited Site Investigation for the Project Site in July/August 2019. Chemical testing of soil and groundwater was conducted as part of this assessment. No previous data on soil and groundwater quality was available prior to the assessment. Based on review of Sanborn maps, the historic use of the property included urban commercial and residential buildings with two streets, Common Street and Wyman Place. The site structures were demolished and replaced with a surface parking lot in the 1940s to 1960s, and the original streets were removed by the 1970s.

No reported releases of oil or hazardous materials have occurred within the limits of the Project site. The Project site is underlain by urban fill, which is ubiquitous throughout Boston. As is typical of urban fill material, the results of the initial soil testing conducted to date indicate the urban fill contains heavy metals, Polycyclic aromatic hydrocarbons (PAHs), and petroleum hydrocarbons at concentrations that will require management under the Massachusetts Contingency Plan (MCP). Groundwater testing conducted at the Project site indicated groundwater is not impacted.

The Proponent will be conducting additional testing to further characterize and classify the soil to be generated from excavation and foundation spoils for off-site removal to appropriate facilities. Materials excavated during construction of the Project will be managed in accordance with applicable regulatory requirements including, a Release Abatement Measure (RAM) Plan under the MCP.

3.9.1 Operational Solid Waste

The Project will generate solid waste typical of residential and hotel uses. Solid waste is expected to include wastepaper, cardboard, glass and plastic bottles and food. Recyclable materials will be recycled through a program implemented by building management. Per the requirements for LEED Certifiability the Project will meet the LEED Prerequisite for Storage & Collection of Recyclables. Those requirements state that the Project will put a recycling program in place for mixed paper, corrugated cardboard, glass, plastics, and metals as well as a sufficient space to collect those recyclables. In addition, a new LEED v4 requirement states that the Project will collect and properly dispose of two of the following waste streams – batteries, mercury-containing lamps and electronic waste.

With the exception of household hazardous wastes typical of hotel and residential developments (e.g. cleaning fluids and paint), the Project will not involve the generation, use, transportation, storage, release, or disposal of potentially hazardous materials.

3.10 Noise Impacts

3.10.1 Introduction

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

This analysis, which is consistent with BPDA requirements for noise studies, indicates that with appropriate noise controls, predicted sound levels from the Project will comply with local noise regulations.

3.10.2 Noise Terminology

There are several ways in which sound (noise) levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. The following information defines the sound level measurement terminology used in this analysis.

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

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

A sound level meter (SLM) that is used to measure noise is a standardized instrument.[14] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. The most commonly used weighting network is the A-weighting (there are also C-, and Z-weighting networks) because it most closely approximates how the human ear responds to sound at various frequencies,

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

described in Hertz (Hz). The A-weighting network is the accepted scale used for community sound level measurements, and sounds are frequently reported as detected with a sound level meter with this weighting. A-weighted sound levels emphasize middle frequency sounds (i.e., middle pitched – around 1,000 Hz), and de-emphasize low and high frequency sounds. A-weighted sound levels are reported in decibels designated as "dBA".

Because the sounds in the environment vary with time, many different sound metrics may be used to quantify them. There are two typical methods used for describing variable sounds. These are exceedance levels and equivalent levels, both of which are derived from a large number of moment-to-moment A-weighted sound pressure level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where "n" can have a value between 0 and 100 in terms of percentage. Equivalent levels are designated L_{eq} and quantify a hypothetical steady sound that would have the same energy as the actual fluctuating sound observed. The several sound level metrics that are commonly reported in community noise monitoring and are presented in this report are described below.

- L_{90} is the sound level in dBA exceeded 90 percent of the time during a measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources.
- L_{50} is the median sound level, the sound level in dBA exceeded 50 percent of the time during the measurement period.
- L_{10} is the sound level in dBA exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder noises like those from passing motor vehicles.
- L_{max} is the maximum instantaneous sound level observed over a given period.
- L_{eq} is a sound pressure level commonly A-weighted and presented in dBA. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with time-averaged mean square sound pressure values, the L_{eq} is primarily controlled by loud noises if there are fluctuating sound levels.

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

3.10.3 Noise Regulations and Criteria

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

Table 3.10-1 below presents the "Zoning District Noise Standards" contained in Regulation 2.5 of the BAPCC "Regulations for the Control of Noise in the City of Boston," adopted December 17, 1976. These maximum allowable sound pressure levels apply at the property line of the receiving property. The "Residential Zoning District" limits apply to any lot located within a residential zoning district or to any residential use located in another zone except an Industrial Zoning District, according to Regulation 2.2. Similarly, per Regulation 2.3, business limits apply to any lot located within a business zoning district not in residential or institutional use.

Table 3.10-1 City Noise Standards, Maximum Allowable Sound Pressure Levels

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

Notes:

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

3.10.4 Existing Conditions

A background noise level survey was conducted to characterize the existing "baseline" acoustical environment in the vicinity of the Project. Existing noise sources around the Project include: vehicular and truck traffic along local streets, pedestrian traffic, mechanical and ventilation noise from surrounding structures, construction noise from distant projects, overhead planes and helicopters, nearby and passing sirens, wind, vegetation rustle, birds, and the general city soundscape.

3.10.5 Noise Monitoring Methodology

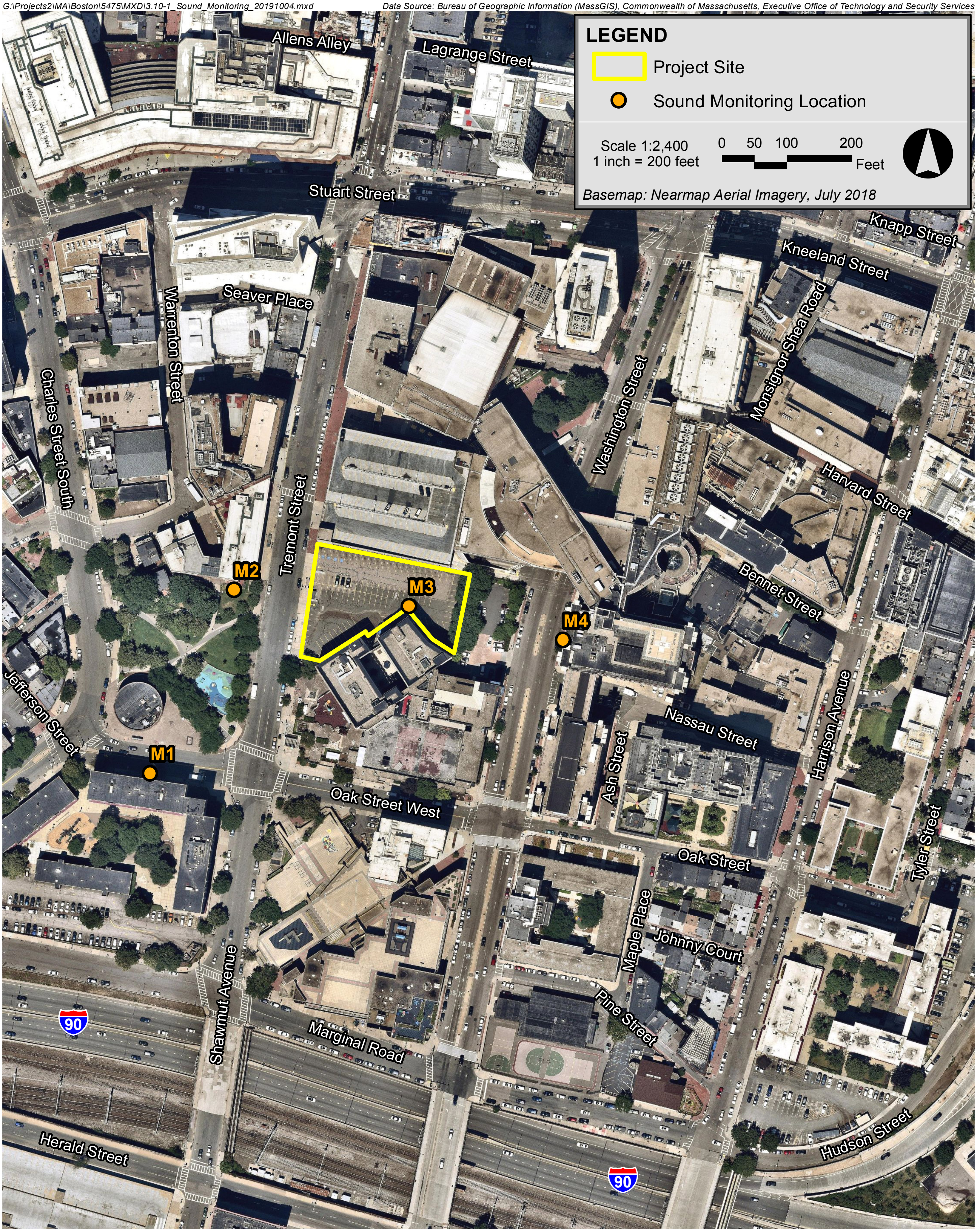
Since noise impacts from the Project on the community will be highest when background noise levels are the lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Therefore, daytime measurements were scheduled to avoid peak traffic conditions. Sound level measurements were made on Tuesday, August 27, 2019 during the daytime (12:00 p.m. to 1:45 p.m.) and on Wednesday, August 28, 2019 during the nighttime hours (1:00 a.m. to 2:45 a.m.). All measurements were 20 minutes in duration.

Sound levels were measured at publicly accessible locations at a height of five feet (1.5 meters) above ground level, under low wind conditions, and with dry roadway surfaces. Wind speed, temperature, and humidity measurements were made with a Kestrel 3000 Pocket Wind Meter, which is equipped with an electronic wind speed indicator, temperature thermistor, and humidity sensor. Unofficial observations about meteorology or land use in the community were made solely to characterize the existing sound levels in the area and to estimate the noise sensitivity at properties near the Project.

3.10.6 Noise Monitoring Locations

The selection of the noise monitoring locations was based upon a review of zoning and land use in the Project Area. Four noise monitoring locations were selected as representative sites to obtain a sampling of the ambient baseline noise environment. These measurement locations are depicted on Figure 3.10-1 and described below.

- **Location 1** is located on the sidewalk in front of 320 Tremont Street, southwest of the Project. This location is representative of the closest residential receptors southwest of the Project.



Parcel P-12C Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 3.10-1
Sound Monitoring Locations

- **Location 2** is located on the sidewalk to the south of 285 Tremont Street at Eliot Norton Park, west of the Project. This location is representative of the closest residential receptors west of the Project.

- **Location 3** is located within the parking lot at 290 Tremont Street at the corner of 821 Washington Street, south of the Project. This location represents the DoubleTree Hotel adjacent to the southern property line, along with the closest residential receptors immediately south of the Project.

- **Location 4** is located on the eastern sidewalk of Washington Street, in front of Tufts Health Sciences Campus east of the Project. This location is representative of the closest institutional receptors east of the Project.

3.10.7 Noise Monitoring Equipment

A Larson Davis Model 831 sound level meter equipped with a PCB PRM831 preamplifier, a PCB 377B20 half-inch microphone, and manufacturer-provided windscreen was used to collect background sound pressure level data. This instrumentation meets the "Type 1 - Precision" requirements set forth in ANSI S1.4 for acoustical measuring devices. The measurement equipment was calibrated in the field before and after the surveys with a Larson Davis CAL200 acoustical calibrator which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984. Statistical descriptors (e.g., L_{eq}, L_{90}, etc.) were measured for each 20-minute sampling period, with octave-band sound levels corresponding to the same data set processed for the broadband levels.

3.10.8 Measured Background Sound Levels

Baseline noise monitoring results are presented in Table 3.10-2 and summarized below:

- The daytime residual background (L_{90}) measurements ranged from 62 to 63 dBA;
- The nighttime residual background (L_{90}) measurements ranged from 54 to 60 dBA;
- The daytime equivalent level (L_{eq}) measurements ranged from 67 to 73 dBA;
- The nighttime equivalent level (L_{eq}) measurements ranged from 58 to 64 dBA.

Table 3.10-2 Summary of Measured Background Noise Levels – August 27, 2019 (Daytime) & August 28, 2019 (Nighttime)

Location	Period	Start Time	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{90} Sound Pressure Level by Octave-Band Center Frequency (Hz)									
								31.5	63	125	250	500	1000	2000	4000	8000	16000
			dBA	dBA	dBA	dBA	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
1	Day	12:02 PM	69	83	73	68	63	67	64	62	62	61	57	53	43	32	24
2	Day	12:27 PM	73	98	67	64	62	69	65	61	59	59	57	54	48	36	25
3	Day	12:53 PM	67	76	71	65	63	66	65	59	60	60	59	54	46	33	24
4	Day	1:17 PM	72	98	69	65	63	66	65	64	60	61	58	54	46	34	26
1	Night	1:09 AM	58	76	59	55	54	59	60	59	56	52	48	42	33	21	23
2	Night	1:32 AM	58	69	60	56	55	59	61	58	55	53	50	45	36	24	23
3	Night	1:54 AM	60	65	61	59	59	59	61	60	60	56	54	50	41	27	23
4	Night	2:23 AM	64	87	64	61	60	60	62	63	59	58	55	52	44	32	23

Note: Sound pressure levels are rounded to the nearest whole decibel.

<u>Weather Conditions:</u>

	Date	Temp	RH	Sky	Wind
Daytime	Tuesday, August 27, 2019	74°F	45%	Partly Cloudy	Calm
Nighttime	Wednesday, August 28, 2019	70°F	57%	Overcast	E 0-3 mph

<u>Monitoring Equipment Used:</u>

	Manufacturer	Model	S/N
Sound Level Meter	Larson Davis	LD831	4374
Microphone	Larson Davis	377C20	165110
Preamp	Larson Davis	PRM831	46515
Calibrator	Larson Davis	CAL200	13675

3.10.9 *Future Conditions – Overview of Potential Project Noise Sources*

The primary sources of continuous sound exterior to the Project are expected to consist of ventilation, cooling, and emergency power noise sources. Multiple noise sources are anticipated to be located on the rooftop, an ERU ventilation aperture on the eastern façade of the eleventh floor, and an exhaust fan is anticipated to be located on the eastern façade of the first floor.

Table 3.10-3 provides an anticipated list of the major sources of sound. Sound power levels used in the acoustical modeling of each piece of equipment are presented in Table 3.10-4. Sound power level data were provided by the respective manufacturer of each piece of equipment. The sound power level for the enclosed combined mechanical and exhaust components of the emergency generator was calculated using the broadband sound pressure level provided at a reference distance.

The Project includes select noise-control measures in order to achieve compliance with the applicable noise regulations. As the design progresses, specifications for mechanical equipment may change; however, appropriate measures will be taken to ensure compliance with the City Noise Standards. Acoustical louvers were applied to the ventilation fans for the eleventh-floor ERU unit and the first-floor loading dock exhaust fan. It is expected that the emergency generator sound levels will be controlled using a Level 2 sound attenuated enclosure. To further limit impacts from the standby generator, required periodic, routine testing will be conducted during daytime hours, when background sound levels are highest. A summary of potential noise mitigation considered for the Project is presented in Table 3.10-5.

Table 3.10-3 Modeled Noise Sources

Noise Source	Quantity	Approximate Location & Elevation	Size/Capacity
Cooling Tower (Air cooled)	2	North end of Rooftop Level (329’ AGL)	96,830 CFM
Emergency Generator	1	North end of Rooftop Level (329’ AGL)	1000 kW
Energy Recovery Unit	2	1 unit towards the Center of Rooftop Level (329’ AGL) & 1 unit on the 11th Floor Eastern façade (110’ AGL)	11,580 CFM
Loading Dock Exhaust Fan	1	Eastern façade of Level 1 at the Loading Dock (10’ AGL)	400 CFM

Table 3.10-4 Modeled Sound Power Levels per Noise Source

Noise Source	Broad-band (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Cooling Tower (Air cooled)[2]	86	93[1]	93	93	90	83	77	73	69	63
Emergency Generator[3]	101	102[1]	102	110	106	98	90	87	81	79
Energy Recovery Unit[4]	104	98[1]	98	98	104	99	99	98	91	87
Loading Dock Exhaust Fan[5]	76	78[1]	78	84	75	76	67	62	60	57

Notes: Sound power levels do not include mitigation identified in Table 3.10-5.

1. No data provided by manufacturer. Octave-band sound level assumed to be equal to the 63 Hz band level.
2. Baltimore Air Coil Series 3000 XES3E-1020-07L.
3. Caterpillar Sound Attenuated Level 2 Enclosure for a C32 ESE, 1000 kW; Sound power levels calculated from sound pressure level data measured at a distance of 49.2 feet.
4. Valent VPRE-352-40C-100I-C-5DE.
5. Greenheck BSQ-80-5.

Table 3.10-5 Attenuation Values Applied to Mitigate Each Noise Source

Noise Source	Form of Mitigation	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Loading Dock Exhaust Fan	Louver[1]	0[2]	6	11	19	24	28	23	17	17
Energy Recovery Unit- 11th Floor	Louver[3]	0[2]	11	14	20	28	33	36	36	37

Notes:

1. Noisshield Model LF2-24 Acoustical Louver.
2. No data provided by manufacturer. Octave-band sound level conservatively assumed to be zero.
3. Kinetics Noise Control KCAL-2 Acoustical Louver.

3.10.10 Noise Modeling Methodology

The noise impacts associated with the Project were predicted at the nearest and most representative receptors using the CadnaA noise calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The benefits of this software are a refined set of computations due to the inclusion of topography, ground attenuation, multiple building reflections, drop-off with distance, and atmospheric absorption. The CadnaA software allows for octave-band calculation of noise from multiple noise sources, as well as computation of diffraction around building edges.

3.10.11 Future Sound Levels – Nighttime

The analysis of sound levels at night included all the mechanical equipment operating at maximum loads, except the emergency generator, to simulate worst-case nighttime operation conditions at nearby receptors. Seven modeling locations (A-G) were included in the analysis. All seven of the modeling receptors represented nearby residential or institutionally zoned locations. Modeling location A represents monitoring location 1 in front of 320 Tremont Street, southwest of the Project. This location is representative of the closest residential receptor southwest of the Project. Modeling location B represents monitoring location 2 on the sidewalk at 285 Tremont Street at Eliot Norton Park, west of the Project. This location is representative of the closest residential receptor west of the Project. Modeling location C represents monitoring location 3 at 290 Tremont Street and the corner of 821 Washington Street, south of the Project. This location represents the Double Tree Hotel adjacent to the southern property line and with their guests, conservatively represents the closest residential receptor due to any residential location could not be any closer than the hotel. Modeling location D represents monitoring location 4 on the eastern sidewalk of Washington Street, in front of Tufts Health Sciences Campus east of the Project. This location is representative of the closest institutional receptor east of the Project. Modeling location E represents Tufts Health Sciences Campus, which is along Washington Street and north of the Project. This location is representative of the institutional receptors that continue to run along Washington Street to the north and east of the Project. Modeling location F represents the northwest corner of 200 Harrison Avenue, which is a part of Tufts College Trustees and represents institutional receptors further east of the Project. This location has a clear line of sight of the Project down Nassau Street. Modeling location G represents a residential receptor along the northern façade of the Oak Terrace Apartments to the southeast of the Project, along Oak Street. The modeling receptors, which correspond to residential and institutional uses in the community, are depicted in Figure 3.10-2. The predicted exterior Project-only sound levels range from 31 to 46 dBA at nearby receptors. The City of Boston Residential and Institutional limits have been applied to the appropriate locations. Predicted sound levels from Project-related equipment are within the broadband and octave-band nighttime limits under the City Noise Standards at the modeling locations. The evaluation results are presented in Table 3.10-6.

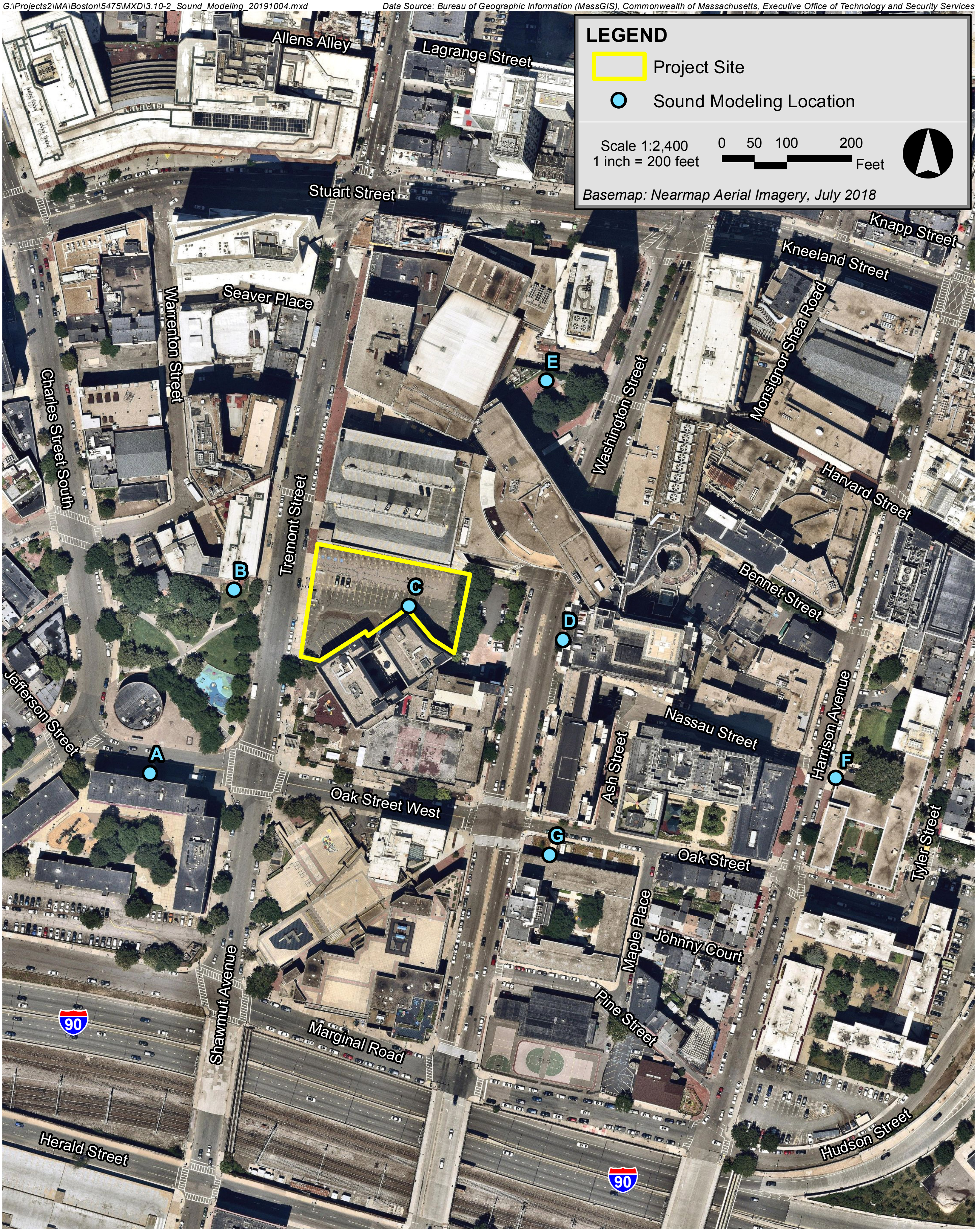

LEGEND
Project Site
Sound Modeling Location
Scale 1:2,400
1 inch = 200 feet
0 50 100 200
Feet
Basemap: Nearmap Aerial Imagery, July 2018
Allens Alley
Lagrange Street
Stuart Street
Knapp Street
Kneeland Street
Seaver Place
Warrenton Street
Charles Street South
Monsignor Shea Road
Washington Street
Harvard Street
Tremont Street
Bennet Street
Jefferson Street
Nassau Street
Harrison Avenue
Ash Street
Oak Street West
Oak Street
Tyler Street
Maple Place
Johnny Court
Pine Street
Shawmut Avenue
Marginal Road
Hudson Street
Herald Street
90
A
B
C
D
E
F
G

Table 3.10-6 Comparison of Future Predicted Project-Only Nighttime Sound Levels to the City of Boston Limits

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
A	Residential	31	45	40	38	36	27	24	20	9	0
B	Residential	33	44	39	37	35	28	27	26	16	2
C	Residential	46	65	54	52	52	41	36	33	25	16
D	Institutional	36	51	43	41	41	32	29	26	14	0
E	Institutional	40	40	38	38	42	36	34	32	18	0
F	Institutional	38	39	36	36	40	34	34	31	18	0
G	Residential	32	46	40	37	37	28	24	20	8	0
City of Boston Limits	Residential/Institutional	50	68	67	61	52	46	40	33	28	26
	Business	65	79	78	73	68	62	56	51	47	44

3.10.12 Future Sound Levels – Daytime

As previously noted, the emergency generator will only operate during the day for brief, routine testing when the background sound levels are high, or during an interruption of power from the electrical grid. A second analysis combined noise from the Project's anticipated mechanical equipment and its emergency generator to reflect worst-case conditions during a period of equipment testing. The sound levels were calculated at the same receptors, as in the nighttime analysis and then evaluated against daytime limits. The predicted exterior Project-only daytime sound levels range from 34 to 49 dBA at nearby receptors. Predicted sound levels from Project-related equipment are within the daytime broadband and octave-band limits under the City Noise Standards at each of the modeled locations. This evaluation is presented in Table 3.10-7.

Table 3.10-7 Comparison of Future Predicted Project-Only Daytime Sound Levels to City Noise Standards

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
A	Residential	34	47	43	44	39	29	24	21	9	0
B	Residential	35	46	42	45	39	30	28	26	16	2
C	Residential	46	65	55	54	52	41	36	33	25	16
D	Institutional	44	51	46	52	48	39	37	33	24	8
E	Institutional	46	41	46	54	50	42	36	34	22	0
F	Institutional	45	46	46	54	50	41	36	33	20	0
G	Residential	49	50	51	59	55	46	38	34	23	5
City of Boston Limits	Residential/Institutional	60	76	75	69	62	56	50	45	40	38
	Business	65	79	78	73	68	62	56	51	47	44

3.10.13 Conclusions

Baseline noise levels were measured in the vicinity of the Project during the day and at night. At these and additional locations, future Project-only sound levels were calculated based on information provided on the expected mechanical equipment. Project-only sound levels were compared to applicable limits.

Predicted mechanical equipment noise levels from the Project at each receptor location, taking into account attenuation due to distance, structures, and noise-control measures, will be at or below the octave-band daytime and nighttime requirements of the City Noise Standards. The predicted sound levels from Project-related equipment, as modeled, are expected to remain below 50 dBA at residences/institutions and below 65 dBA at businesses during the nighttime and below 60 dBA and 65dBA during the daytime; therefore, within the nighttime and daytime residential/institutional and business zoning limits for the City of Boston at the nearest residential and business receptors. The results indicate that the Project can operate without substantial impact on the existing acoustical environment.

At this time, while the mechanical equipment and noise controls have been refined, they are still conceptual in nature. During the final design phase of the Project, mechanical equipment and noise controls will be specified and designed to meet the applicable broadband limit and the corresponding octave-band limits of the City Noise Standards.

3.11 Construction Impacts

3.11.1 Construction Management and Public Safety/Traffic

Proper pre-planning with the City and neighborhood will be essential to the successful construction of the Project.

A Construction Management Plan (CMP) in compliance with the City's Construction Management Program will be submitted to the BTD for review and approval prior to issuance of a building permit. The CMP will likely include several phases over the course of the Project. The construction manager will be required to comply with the details and conditions of the approved CMP.

The proximity of city streets and abutting properties to the Project site will require scheduling for material and deliveries with consideration of peak hour traffic and pedestrian volumes. It is likely that that major deliveries will take place after 5:00 p.m. and on weekends. Planning with the City and neighborhood will be essential to the successful construction of the Project.

The CMP will define truck routes which will help in minimizing the impact of trucks on local streets. Police detail will be provided to maintain access to adjacent properties and to direct pedestrian, bicycle, and vehicle flow, as required.

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

In addition, a name and phone number will be provided on the site fence for contact regarding any construction questions or concerns. The website will also provide contact information and a place to submit questions or concerns.

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

Throughout Project construction, a secure perimeter will be maintained to protect the public from construction activities. As the design of the Project progresses, the Proponent will meet with BTD to discuss the specific location of barricades, the need for lane closures, pedestrian walkways, and truck queuing areas. Secure fencing, signage, and covered walkways may be employed to ensure the safety and efficiency of all pedestrian and vehicular traffic flows. In addition, sidewalk areas and walkways near construction activities will be well marked and lighted to protect pedestrians and ensure their safety. Public safety for pedestrians on abutting sidewalks will also include covered pedestrian walkways when appropriate.

Streets will be swept clean as required by the pedestrian walkways adjacent to the site and kept free of snow and ice.

3.11.2 Construction Schedule

Project construction is estimated to commence in the second quarter of 2021 with initial occupancy by the second quarter of 2023.

Typical construction hours will be from 7:00 a.m. to 7:00 p.m. (deliveries could be later), Monday through Friday, with most shifts ordinarily ending at 3:30 p.m. If longer hours, additional shifts, or Saturday work is required, the construction manager will place a work permit request to Inspectional Services. A construction website and alerts will be used for major deliveries, crane activities, large concrete placements, oversize loads, etc.

3.11.3 Construction Staging/Access

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

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

The Proponent's contractor will file FAA FORM 7460, construction alteration for its crane and will coordinate all crane jumps with Massport and the FAA.

3.11.4 Construction Mitigation

The Proponent will follow City and MassDEP guidelines which will direct the evaluation and mitigation of construction impacts. As part of this process, the Proponent and construction team will evaluate the Commonwealth's Diesel Retrofit Program.

As described above, a CMP will be submitted to BTD for review and approval prior to issuance of a Building Permit. The CMP will include detailed information on specific construction mitigation measures and construction methodologies to minimize impacts. The CMP will also define truck routes which will help in minimizing the impact of trucks on City and neighborhood streets.

3.11.5 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. The Project will create approximately 680 construction jobs targeted at the new City workforce goals of 51% City of Boston residents, 40% minority, and 12% female. The Proponent will enter into jobs agreements with the City of Boston. The Proponent expects that either MBE or WBE firms perform a total of 20% of the total value of construction contracts.

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

3.11.6 Construction Truck Routes and Deliveries

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

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

3.11.7 Construction Air Quality

Short-term air quality impacts from fugitive dust may be expected during excavation and the early phases of construction. Plans for controlling fugitive dust during excavation and construction include mechanical street sweeping, wetting and/or misting portions of the site during periods of high wind, and careful removal of debris by covered trucks. The construction contract will provide for a number of strictly enforced measures to be used by contractors to reduce potential emissions and minimize impacts. These measures are expected to include:

- Using wetting agents on area of exposed soil on a scheduled basis;
- Using covered trucks;
- Monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized;
- Minimizing storage of debris on the site;
- Periodic street and sidewalk cleaning with water to minimize dust accumulations;
- Limit maximum travel speeds on unpaved areas; and
- Provide wheel wash stations to limit trackout of soil during the excavation phase.

Massachusetts law (MGL Chapter 90, Section 16A and 310 CMR 7.11 requires that vehicles idle for no more than five minutes. To reduce engine idling, the selected contractor(s) will be notified of the Massachusetts anti-idling regulations.

MassDEP implements the Diesel Retrofit Program for construction equipment engines. The Proponent will strive to comply with MassDEP’s Diesel Retrofit Program and will comply with requirements for the use of ultra-low sulfur diesel (ULSD) in off-road engines. The Diesel Retrofit Program, formerly called the Clean Air Construction Initiative of the Clean Construction Equipment Initiative, originated as an air quality mitigation measure for the Central Artery/Tunnel Project. The program encourages users of diesel construction equipment to install exhaust emission controls such as oxidation catalysts or particulate filters on their diesel engines.

The Proponent acknowledges the importance of emission controls and will encourage contractors to comply with the Diesel Retrofit Program. Proper emission controls, use of clean fuels, control of truck and equipment idling times, and conducting operations without affect to neighbors’ clean air are all important priorities to the Proponent.

In addition to the items listed above, all trucks leaving the site must have all dirt/mud removed from the wheels and undercarriage of the truck prior to leaving the site. In addition, any loads containing soil for off-site disposal will be covered. Construction vehicles and equipment will not be permitted to be washed in the streets outside of the Project site. Excess water from the wheel wash stations will be managed and catch basins in the surrounding street will be protected from potential runoff from the cleaning operations.

3.11.8 Construction Noise

The Proponent is committed to mitigating noise impacts from the construction of the Project. Periodic increased community sound levels, however, are an inherent consequence of construction activities. Construction work will comply with the requirements of the City of Boston Noise Ordinance. Every reasonable effort will be made to minimize the noise impact of construction activities, including:

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

3.11.9 Construction Vibration

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

3.11.10 Water Quality and Stormwater

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

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

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

Management of soil materials and groundwater during construction is discussed in Section 3.11.13.

3.11.11 Construction Waste Management

The Proponent will take an active role with regard to the reprocessing and recycling of construction waste. The disposal contract will include specific requirements that will ensure that construction procedures allow for the necessary segregation, reprocessing, reuse and recycling of materials when possible. Per the requirements for LEED Certifiability the Project will meet the LEED v4 Prerequisite for Construction and Demolition Waste Management Planning and will strive for points under the additional credit. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per MassDEP Regulations for Solid Waste Facilities, 310 CMR 16.00. This requirement will be specified in the disposal contract. Construction will be conducted so that materials that may be recycled are segregated from those materials not recyclable to enable disposal at an approved solid waste facility.

3.11.12 Utility Protection During Construction

The Project's construction manager will notify utility companies and call "Dig Safe" prior to excavation. During construction, infrastructure will be protected using sheeting and shoring, temporary relocations, and construction staging as required. The construction manager will be required to coordinate all protection measures, temporary shutdowns of all utilities with the appropriate utility owners and/or agencies. The construction manager 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 manager will be required to coordinate the shutdown with the utility owners and Project abutters to minimize impacts and inconveniences.

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

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

3.11.13 Rodent Control

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

3.11.14 Wildlife Habitat

The Project site is currently developed within a fully developed urban area and, as such, the Project will not impact wildlife habitats as designated on the National Heritage and Endangered Species Priority Habitats of Rare Species and Estimated Habitats of Rare Wildlife maps.

3.11.15 Construction Soil Management

During construction, the Owner's Licensed Site Professional (LSP) will have field personnel observing the excavation and removal of soil and groundwater from the site when required. Any material (soil or water) that is not consistent with the site's pre-characterization will be brought to the attention of the LSP immediately. The LSP will make a determination of the nature of the contamination and notify the appropriate parties (e.g., Owner, MassDEP, etc.) as required based on the contamination. The material of concern will be tested, handled, and disposed of in accordance with all City, State, and Federal requirements.

Chapter 4

Sustainable Design and Climate Change Resilience

4.0 SUSTAINABLE DESIGN AND CLIMATE CHANGE RESILIENCE

4.1 Introduction

The Project is a mixed-use project that prioritizes affordable housing, and in fact, the residential component is 100% affordable. The Project has a total area of up to approximately 426,500 gross square feet including a hotel and residential tower fronting Tremont Street and a garage extension connecting to the existing TSS garage on the northern edge of the site. Active uses will occupy the ground floor along Tremont Street with a pedestrian walkway to a landscaped courtyard at the center of the site. Ground floor uses include the residential lobby, a hotel lobby and café or retail space, an accessible pedestrian walkway (with limited access available to Project service vehicles), leading to a proposed courtyard, and a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library.

As the building design will be refined through the City's and community input, the design and program may evolve through that process. Additionally, the Project is seeking City and State funding and is therefore subject to a Per-Unit total development cost limitations. The Proponent will have to evaluate economic viability of the various components of the building to meet the City and State funding limits.

This past July, the sponsors of MassSave announced new Passive House Incentives and assistance to support the construction of multi-family high-rise buildings (four stories or higher). This incentive program offers feasibility study, energy modeling and pre and post-construction certification incentive programs for multi-family mid-rise and high-rise buildings.

The Project team engaged MassSave, through both Eversource and ICF, early in the incentive process to determine eligibility for a Passive House feasibility study. Upon confirmation that MassSave would fund all of the feasibility study, the team hired the renowned Passive House firm of Steven Winter and Associates to conduct a Passive House feasibility study.

On Monday, July 29, 2019, the team conducted a Passive House charrette with the design team, development team, and representatives from both ICF and Eversource. This charrette identified what systems could be used and façade performance metrics in order to achieve Passive House certification through Passive House International (PHI).

In addition, State Alternative Energy Credits (AECs) have been estimated for both electric alternatives and as part of the Passive House study. This revenue stream will be used to inform the selection and implementation of energy efficiency measures as the Project advances through design.

MassCEC incentives have been phased out for heat pump and VRF systems. The team will continue to engage with MassCEC to take full advantage of any new incentives that may apply to the Project.

4.2 Sustainable Design

The Project will incorporate a number of innovative sustainability strategies into the planning, design and construction and will strive for LEED Certifiability or higher. The Project is largely comprised of affordable housing units which requires a careful analysis of any components of the design that will increase costs. The team discussed which LEED Rating System would be most appropriate and concluded that because the program contains several different uses- residential units, a hotel, a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library and a parking garage- that LEED for Building Design and Construction (BD+C) version 4 would be the best fit. Version 4.1 of BD+C was released as a Pilot in January 2019. While 4.1 is still a beta program, the USGBC allows projects using LEED v4 the flexibility of choosing either version 4 or version 4.1 credits. Therefore, the LEED checklist created for this Project and included at the end of this summary uses LEED BD+C v4 as a base and has substituted individual v4.1 credits where noted.

For this initial filing, the preliminary sustainable design strategies for each LEED category and some of the key credits being pursued under each have been outlined below.

Integrative Process (IP)

During the conceptual design phase, the Project held an integrated team LEED charrette to identify sustainability goals and discuss the feasibility of all prerequisites and credits. Team members in attendance included the owner, architect, MEP engineer, and sustainability consultant. A preliminary energy model has been completed to fulfill the requirements, and preliminary water use calculations will be produced in schematic design.

Location and Transportation (LT)

<u>LT Credit: Sensitive Land Protection.</u> The development footprint of the Project is on a previously developed site and therefore automatically complies with this credit.

<u>LT Credit: High Priority Site and Equitable Development (v4.1).</u> The team is investigating whether the site will comply as either an Economically Disadvantaged Community per the LEED requirements or as a Brownfield, which it is likely to be.

<u>LT Credit: Surrounding Density and Diverse Uses.</u>

Option 1: Surrounding Density – The site will most likely comply with the required surrounding density metrics.

Option 2: Diverse Uses – The site will comply with the requirement for 8 or more diverse uses within 1/2 mile walking distance.

LT Credit: Access to Quality Transit (v4.1). There are two T stops and seven bus stops within 1/4 mile of the Project site. The number of points achieved in this credit will be determined by the calculation of the number of weekday and weekend trips provided by the transit options within 1/4 mile of the Project.

LT Credit: Bicycle Facilities. The Project site meets the credit requirements to, "Locate the project such that a functional entry or bicycle storage is within a 200-yard walking distance or bicycling distance (max. 3 miles) from a bicycle network that connects to at least one of the following:

- at least 10 diverse uses;
- a school or employment center, if the project total floor area is 50% or more residential; or
- a bus rapid transit stop, light or heavy rail station, commuter rail station, or ferry terminal."

Bicycle Storage and Shower Rooms – The Project will provide bike racks for all building users, lockers and showers for hotel employees.

LT Credit: Reduced Parking Footprint (v4.1). The current Project design will not provide any parking spaces for the new residential and hotel uses. All parking provided in the garage will be for use by the adjacent Tufts Health Sciences Campus. This credit has four different compliance paths for reducing the parking footprint as follows – Option 1) No off-street parking provided; Option 2) Reduce parking – Provide parking capacity that is a 30% reduction below the base ratios as defined in the LEED References Guide; Option 3) Carshare spaces – Provide dedicated parking for carshare vehicles; and Option 4) Unbundling parking – Sell parking separately from all property sales or leases. The team will further investigate the options for achieving this credit as the design progresses.

LT Credit: Green Vehicles. Green Vehicles – In order to comply with this credit, the Project will designate a minimum of 5% of all parking spaces as preferred parking for green vehicles. The Project will also comply with Option 1 for "alternative fuel stations" as outlined below.

Option 1 – Electric Vehicle Charging. To comply with this credit path, the Project will incorporate electric vehicle supply equipment at a minimum of 2% of all parking spaces, in addition to the green vehicle designated spaces referred to above.

Sustainable Sites (SS)

SS Prerequisite: Construction Activity Pollution Prevention. An erosion and sedimentation control plan (stormwater pollution prevention program – SWPPP) for all construction activities associated with the project will be created and implemented. The plan will conform to the requirements of the 2012 EPA Construction General Permit (CGP).

SS Credit: Site Assessment. To comply, a site survey or assessment must be completed that includes the following information: Topography, Hydrology, Climate, Vegetation, Soils, Human use, and Human Health Effects. The Environmental Impact Report required for MEPA should comply with many of the requirements for this credit and supplemental site assessment topics will be addressed where necessary.

SS Credit: Site Development – Protect or Restore Habitat (v4.1). The site is currently an at-grade surface parking lot and contains no greenfield area.. It is unlikely that 30% of the site area identified as previously developed will be restored using native or adapted vegetation. The team will determine compliance as the landscape design progresses.

SS Credit: Open Space. To comply the Project must provide outdoor space greater than or equal to 30% of the total site area (including building footprint). Plus, a minimum of 25% of that outdoor space must be vegetated or have overhead vegetated canopy. This may be feasible, and the team will determine compliance as the landscape design progresses.

SS Credit: Rainwater Management (v4.1). The site is in the Boston Groundwater Conservation Overlay District, therefore the Project plans to capture rainfall on site and allow for groundwater recharge. The civil engineer will perform stormwater calculations and check compliance with the new v4.1 requirements under Path 2 for a zero lot line condition. More detail on the Project rainwater management can be found in Sustainability Section 4.4.3 which addresses the increased frequency of storm events and the ways in which the Project will mitigate them. Infrastructure Section 7.3.2 discusses proposed stormwater management strategies, including the reduction of impervious area, and stormwater infiltration.

SS Credit: Heat Island Effect. The Project could potentially comply with Option 2 of this credit for Parking Under Cover. The credit is achieved if a minimum of 75% of the parking spaces are under cover and the roof material over the parking complies with one of the following: 1) have a three year aged Solar Reflectance Index (SRI) of at least 32, 2) be a vegetated roof, or 3) be covered by energy generation systems such as photovoltaics. Options for the roof/parking surface will be investigated as the design progresses.

SS Credit Light Pollution Reduction. There is minimal site lighting and minimal lighting on the building exterior of the Project so compliance may be feasible. A preliminary photometric plan will be completed for evaluation once lighting fixtures have been selected.

Water Efficiency (WE)

WE Prerequisite: Outdoor Water Use Reduction. The Project will install an irrigation system for plant establishment and maintenance but will include high-efficiency equipment and technology. Per the LEED prerequisite, the Project's landscape water requirement will be reduced by at least 30% from the baseline for the peak watering month. The reductions will be achieved through plant species selection and irrigation system efficiency.

WE Prerequisite: Indoor Water Use Reduction. Per this Prerequisite, all toilets, urinals, private lavatory faucets, and showerheads will be WaterSense labeled. Clothes washers and dishwashers will be Energy Star rated. In aggregate, all fixtures will reduce water consumption by 20% from the LEED baseline.

WE Prerequisite: Building-Level Water Metering. This Prerequisite will be achieved. Permanent water meters that measure the total potable water use for the building and associated grounds will be installed.

WE Credit: Outdoor Water Use Reduction. Once the landscape design and planting materials selection have progressed, the team will be able to size the irrigation system and calculate the associated water use. At this stage, we believe that the irrigation system and plant selections will be able to reduce the water requirement by 50% from the baseline, thereby achieving 1 point under this credit.

WE Credit: Indoor Water Use Reduction. As the design progresses and the indoor plumbing fixtures and fittings are selected, the team will perform indoor water use calculations. At this stage the Project strives to achieve a 30% reduction in water use, thereby achieving 2 points under this credit.

WE Credit: Cooling Tower and Process Water (v4.1). The Project's HVAC design currently includes a cooling tower. As the design progresses and the energy model is refined, the team will determine the final HVAC systems to be used and if applicable, will perform the calculations to determine if the cooling tower can meet the cycle parameters of this credit.

WE Credit: Water Metering. This credit requires the installation of permanent water meters for two or more water subsystems (beyond the overall water meter required by the prerequisite). As the mechanical and plumbing system designs progress, the team will investigate opportunities to submeter water systems in ways that will allow the facility management staff to monitor and maximize water use efficiency.

EA Prerequisite: Fundamental Commissioning and Verification. Fundamental commissioning process activities for mechanical, electrical, plumbing, and any renewable energy systems and assemblies will be completed by an independent commissioning authority. As such, this Prerequisite will be achieved.

EA Prerequisite: Minimum Energy Performance. The Project will perform whole-building energy modeling under Option 1 to demonstrate energy efficiency. For the prerequisite level, the Project will demonstrate a minimum 5% improvement compared to the baseline building modeled using ASHRAE Standard 90.1-2010.

EA Prerequisite: Building-Level Energy Metering. Building-level energy meters that can be aggregated to provide building-level data representing total building energy consumption (electricity, natural gas, chilled water, steam, fuel oil, etc.) will be installed.

EA Prerequisite: Fundamental Refrigerant Management. Heating, ventilating, air-conditioning, and refrigeration (HVAC&R) systems installed will not use chlorofluorocarbon (CFC)-based refrigerants.

EA Credit: Enhanced Commissioning. The Proponent will evaluate the costs and benefits of services related to enhanced commissioning, monitoring, and envelope commissioning.

EA Credit: Optimize Energy Performance. The preliminary energy modeling for the Project demonstrates the following:

21.8% energy savings over ASHRAE 90.1-2013 (the baseline for MA Stretch Energy Code) using the water source heat pump (WSHP) design scheme. LEED v4 uses ASHRAE 90.1-2010 as a baseline (which is less stringent) so Cosentini has estimated the modeled savings to be approximately 3% higher than the LEED baseline, so 22.45% energy savings over ASHRAE 90.1-2010. For the current design option, the Project team feels comfortable estimating that the Project will achieve approximately 22% improvement in energy use over the LEED baseline, potentially achieving 9 points.

Several additional envelope design and HVAC system alternates are shown in the conceptual energy modeling chart with increasing levels of energy savings up to 40.3% for a Passive House compliant envelope. Please refer to Section 8.1.12 for additional modeling details.

EA Credit: Advanced Energy Metering. In addition to the prerequisite which requires metering of whole-building energy sources used by the building, this credit is achieved if advanced energy metering is installed for any individual energy end uses that represent 10% or more of the total annual consumption of the building. This will be studied as the mechanical system design progresses.

EA Credit: Grid Harmonization (v4.1) (Previously called Demand Response in v4). There are three credit paths available under the revised v4.1 version of this credit: Case 1. Demand Response Program Available and Participation; Case 2. Demand Response Capable Building; and Case 3. Load Flexibility and Management Strategies. Utilizing demand response programs is more challenging in residential and hotel uses, but any potential options will be analyzed as the design progresses.

EA Credit: Renewable Energy (v4.1). The LEED v4.1 update now allows for both on-site and offsite renewable energy or the purchase of greenhouse gas emissions offsets under this umbrella Renewable Energy credit (These were previously contained in a separate credit called Green Power and Carbon Offsets). The MEP engineers have outlined a preliminary analysis of renewable energy sources including photovoltaics. PV will be studied further as the design progresses. Purchasing offsite renewable power or GHG offsets can also be considered to achieve this credit.

EA Credit: Enhanced Refrigerant Management. To achieve this credit, the refrigerants used in HVAC&R equipment must minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change and must comply with the formula given. As the mechanical systems design progresses, the Project team will evaluate the refrigerants necessary to meet the program requirements in order to determine if compliance can be achieved.

Materials and Resources (MR)

MR Prerequisite: Storage and Collection of Recyclables. This prerequisite will be achieved by providing dedicated areas for the collection and storage of recyclable materials for all uses in the building including mixed paper, corrugated cardboard, glass, plastics, and metals.

In addition, per the v4 requirements, appropriate measures will be implemented for the safe collection, storage, and disposal of two of the following hazardous waste streams: batteries, mercury-containing lamps, and electronic waste.

MR Prerequisite: Construction and Demolition Waste Management Planning (v4.1). In order to achieve this prerequisite, the general contractor will develop a construction and demolition waste management plan that will include the following:

- Establishment of waste diversion goals for the Project by identifying at least five materials targeted for diversion and the approximate percentage of the overall project waste for each material stream.

- Specify whether materials will be separated or comingled and describe the diversion strategies planned for the Project. Describe where the material will be taken and how the recycling facility will process the material.

MR Credit: Building Life-Cycle Impact Reduction. There are no existing historic buildings, blighted buildings to be reused or building materials to be reused on the site so this credit is not applicable. Option 4 rewards points for performing a whole building life cycle assessment (LCA) of the structure and encloser. 1 point is available for conducting the LCA and additional points are available beyond that for using the LCA information to reduce impact in several categories including greenhouse gas reductions. The Proponent will evaluate the costs and benefits of performing a whole building LCA within the confines of the Project being focused on housing affordability.

MR Credit: Building Product Disclosure and Optimization—Environmental Product Declarations (EPD's) (v4.1); MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials (v4.1); MR Credit: Building Product Disclosure and Optimization – Material Ingredients (v4.1). As the design progresses, the Project team will carefully review and evaluate all of the proposed materials, finishes and other products against the criteria of these three Materials and Resources credits. LEED v4.1 has recognized the challenges of obtaining some of this documentation in the current market and has revised the requirements to be somewhat less stringent. The Project team members do have extensive experience with sourcing sustainable materials for LEED projects under previous versions of LEED and feel optimistic that the Project can achieve two of the three credits.

MR Credit: Construction and Demolition Waste Management (v4.1). This LEED credit has historically required the diversion of at least 50% (1 point) or 75% (2 points) of the total construction and demolition material. An additional requirement in LEED v4, and now revised again in v4.1, is that the diverted materials must include at least two material streams (1 point) or three material streams (2 points) and/or to use a 'Certified Commingled Recycling Facility.'

Given the nature of existing recycling operations and processing facilities in Massachusetts, which focus on separating recyclable goods offsite but very few of which are Certified Facilities, the new requirement for source-separated material streams has made this credit more challenging than in prior versions of LEED, so at this time the Project team is conservatively estimating achieving 1 point.

Indoor Environmental Quality (EQ)

EQ Prerequisite: Minimum Indoor Air Quality Performance. To meet this prerequisite, the MEP engineer will determine the minimum outdoor air intake flow for mechanical ventilation systems using the ventilation rate procedure and meet the minimum requirements of ASHRAE Standard 62.1–2010, Sections 4–7. The Project will also meet all ventilation monitoring requirements per LEED.

EQ Prerequisite: Environmental Tobacco Smoke Control. Smoking will be prohibited inside the building. Smoking will also be prohibited outside within 25 feet of all entries, outdoor air intakes and operable windows. The v4.1 revision has eliminated the requirement for 'no smoking' signage and allows the owner to determine how best to communicate the policy. The updated language now also includes prohibition of the combustion of cannabis and electronic smoking devices.

EQ Credit: Enhanced Indoor Air Quality Strategies. To achieve Option 1 of this credit, all mechanically ventilated spaces must comply the mandated requirements for:

- Entryway systems- Install permanent entryway systems at least 10 feet long in the primary direction of travel to capture dirt and particulates entering the building at regularly used exterior entrances and maintain weekly.

- Interior cross-contamination prevention- Sufficiently exhaust each space where hazardous gases or chemicals may be present or used (e.g., garages, housekeeping and laundry areas). For each of these spaces, provide self-closing doors and deck-to-deck partitions or a hard-lid ceiling.

- Filtration- Each ventilation system that supplies outdoor air to occupied spaces must have particle filters or air-cleaning devices that meet the listed filtration media requirements.

To achieve Option 2, mechanically ventilated spaces must also comply with one of the following:

- Exterior contamination prevention;
- Increased ventilation;
- Carbon dioxide monitoring; or
- Additional source control and monitoring.

The team will investigate the feasibility of meeting the entirety of this credit as the design progresses.

EQ Credit: Low-Emitting Materials (v4.1). Under this credit, varying numbers of points are available (from 1-4) depending on the number of material categories in which all products comply with the emissions and VOC content limits for-

- Interior paints and coatings applied on site,
- Interior adhesives and sealants applied on site,
- Flooring,
- Wall Panels,
- Ceilings,
- Insulation,
- Furniture,
- Composite Wood.

At this stage and based on experience with other LEED projects, the Project team is confident that several of these product category credits can be achieved. During the schematic design and design development phases of the Project, the team will review all materials proposed to determine which items comply and to seek alternates where possible.

EQ Credit: Construction Indoor Air Quality Management Plan. In order to achieve this credit, the project team will develop and implement an indoor air quality (IAQ) management plan for the construction and preoccupancy phases of the building. The plans will address all of the required items listed in the credit requirements.

EQ Credit: Indoor Air Quality Assessment. The Project will assess achievement of this credit under "Option 1 Flush-out," and will determine the feasibility of building time into the schedule to allow for a building flush-out prior to occupancy.

EQ Credit: Thermal Comfort. This credit includes mandatory requirements for both Thermal Comfort Design and Thermal Comfort Control.

Thermal Comfort Design – As the design progresses, the MEP engineer for the Project will determine if the HVAC systems selected for the building will comply with the specific technical standards of ASHRAE Standard 55-2010-Thermal Comfort Conditions for Human Occupancy.

Thermal Comfort Control – As the design progresses, the MEP engineer for the Project will determine if the HVAC systems selected for the building allow for thermal comfort controls (thermostats) for at least 50% of the individual occupant spaces and group thermal comfort controls for all shared multi-occupant spaces.

<u>EQ Credit: Interior Lighting.</u> This credit has two options for achievement of 1-2 points.

Option 1- Lighting Control (1 point): For at least 90% of individual occupant spaces, individual lighting controls that enable occupants to adjust the lighting, with at least three lighting levels or scenes (on, off, mid-level) must be provided. The new v4 requirement for three lighting levels can make this challenging depending on the use. As the lighting design progresses, the design team will work to select light fixtures and controls that meet these specific lighting control requirements.

Option 2- Lighting Quality (1 point): For this option, four out of eight specific lighting quality strategies must be achieved. Again here, as the lighting design progresses, the design team will work to select light fixtures and controls that comply with the requirements to achieve this credit.

EQ Credit: Daylight (v4.1). Three different options are available to demonstrate compliance with the Daylight credit under the LEED v4.1 revisions.

Option 1 – Simulation of Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure requires computer simulations of all regularly occupied floor areas demonstrating compliance with both sDA and sunlight exposure thresholds.

Option 2 – Simulation, Illuminance Calculations requires computer modeling of illuminance levels for all regularly occupied floor areas, demonstrating compliance with thresholds.

Option 3 – Measurement does not require computer modeling but instead requires measurement of the actual daylight illuminance levels of finished spaces to determine compliance once the Project construction and fitout is complete.

The design team is balancing the desire for daylight in the spaces for the residential units, the hotel rooms and the community spaces with the desire to reduce solar gain in the summer and heat loss in the winter, thereby reducing the overall energy load, by designing with a low window-to-wall ratio. As the design progresses, the team will determine if the daylight provided complies with the LEED requirements.

EQ Credit: Quality Views. As noted above under Daylight, the project is being designed with an aggressive goal to reduce overall energy consumption and therefore, has a low window-to-wall ratio. Smaller window areas will impact the ability to meet the LEED requirements for quality views as follows:

- Achieve a direct line of sight to the outdoors via vision glazing for 75% of all regularly occupied floor area.
- Additionally, 75% of all regularly occupied floor area must have at least two of the four kinds of views outlined in the requirements.

EQ Credit: Acoustic Performance. This credit requires that all occupied spaces must meet the acoustics requirements listed for HVAC background noise, sound isolation, reverberation time, and sound reinforcement and masking. Compliance with this credit will be determined as the design progresses.

Innovation (IN)

Projects may achieve up to five Innovation points by demonstrating significant, measurable environmental performance using a strategy not addressed in the LEED green building rating system being pursued. Credits from other LEED Rating Systems may be pursued under Innovation. The team will identify possible Innovation credits to be investigated through the design phase.

IN Credit: LEED Accredited Professional. The LEED Consultant on the team holds the LEED Accredited Professional BD+C credential as required for this credit.

Regional Priority (RP)

Regional Priority credits have been identified by the USGBC regional councils and chapters as having additional importance for the project's region. The database of Regional Priority credits is listed by project zip code on the USGBC website and a project may earn up to four of the six Regional Priority credits.

The RP credits for this site that the team has identified for potential achievement are:

- High Priority Site
- Rainwater Management
- Cooling Tower Water Use
- Optimize Energy Performance (8 points= 20%)

LEED v4/v4.1 for BD+C: New Construction and Major Renovation

Project Checklist - Conceptual Design Phase

Project Name: Parcel P12c, Boston, MA

Date: September 24, 2019

Y	?	N			
1			Credit	Integrative Process	1

14	2	16		**Location and Transportation**	**16**
		16	Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
1	1		Credit	High Priority Site	2
5			Credit	Surrounding Density and Diverse Uses	5
4	1		Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

2	8	0		**Sustainable Sites**	**10**
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	2		Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
	3		Credit	Rainwater Management	3
	2		Credit	Heat Island Reduction	2
	1		Credit	Light Pollution Reduction	1

4	3	0		**Water Efficiency**	**11**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1			Credit	Outdoor Water Use Reduction	2
2	1		Credit	Indoor Water Use Reduction	6
	2		Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

10	13	3		**Energy and Atmosphere**	**33**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
	6		Credit	Enhanced Commissioning	6
9	2		Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
	2		Credit	Demand Response	2
	2	3	Credit	Renewable Energy Production	3
	1		Credit	Enhanced Refrigerant Management	1
			Credit	Green Power and Carbon Offsets (In v4.1 this credit is combined with Renewable Energy credit)	2

3	2	8		**Materials and Resources**	**13**
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
		5	Credit	Building Life-Cycle Impact Reduction	5
1		1	Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1		1	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
1	1		Credit	Construction and Demolition Waste Management	2

6	8	2		**Indoor Environmental Quality**	**16**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1	1		Credit	Enhanced Indoor Air Quality Strategies	2
1	2		Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
1		1	Credit	Indoor Air Quality Assessment	2
	1		Credit	Thermal Comfort	1
1	1		Credit	Interior Lighting	2
	2	1	Credit	Daylight	3
1			Credit	Quality Views	1
	1		Credit	Acoustic Performance	1

3	2	1		**Innovation**	**6**
2	2	1	Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

1	3	0		**Regional Priority**	**4**
	1		Credit	Regional Priority: High Priority Site	1
	1		Credit	Regional Priority: Rainwater Management	1
1			Credit	Regional Priority: Optimize Energy Performance 20%	1
	1		Credit	Regional Priority: Cooling Tower Water Use	1

44	41	30	**TOTALS**	Possible Points:	**110**

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

4.3 Zero Carbon Building Assessment

The Boston Zoning Article 37 Interagency Green Building Committee (IGBC) recently released the 'Zero Carbon Building Assessment' in alignment with the City of Boston's stated goals to be carbon neutral by 2050. As part of the Zoning Code Article 37 Green Buildings and Climate Resiliency Requirements, the IGBC now requests that the project team submit a project-specific Zero Carbon/Zero Energy Building Analysis.

As stated by the policy, "The goal of the Analysis is to determine the most effective solution(s) for reducing carbon emissions. The design solution should optimize building performance and manage construction costs while fully considering additional benefits and financial opportunities over the building life cycle."

The policy states that the Analysis should include the following sections:

1. *Low Energy (Low Carbon) Buildings*- This section lists a number of recommended performance goals pertaining to the building materials and assemblies, HVAC systems and construction air tightness with the goal of achieving as close to zero energy/zero carbon as feasible.

The development and design team for the Project have invested resources during the conceptual design phase to study various options for reducing energy consumption in line with the goal of reducing operational energy and carbon of the Project. The architects and MEP engineers have studied and produced several energy modeling iterations for different envelope and mechanical system design options. A preliminary Passive House feasibility study has been completed by a Certified Passive House Consulting firm.

The current proposed scheme incorporates some of the suggested performance goals including a low window to wall ratio of 24%, a water source heat pump system for heating and cooling the residential units, efficient lighting and Energy Star labeled appliances. As a result, the energy model is showing a 21.8% reduction in energy use from the Energy Code baseline of ASHRAE 90.1-2013.

1a. All Electric Building Systems- The energy modeling analysis should include an all-electric low energy building solution.

The GHG Analysis in Chapter 8 includes two alternatives for using electric systems for the residential and hotel spaces. It also includes a Passive House compliant design. Please refer to Chapter 8 for additional details. In summary, alternative 1 tests air-cooled variable refrigerant flow (VRF) in the residential units, keeping WSHPs in the Hotel and alternative 2 tests air-cooled VRF in the residential units and water-cooled VRF in the Hotel portion.

The technology required to heat and cool as well as to heat domestic hot water for large scale buildings using electricity only in a cold climate is not yet robust enough for market uptake. For example, Cosentini notes that the technology available for low temperature air source heat pumps that can provide heat consistently during colder months is not fully developed yet. At low temperatures, moisture in the air will freeze on the condensers, necessitating defrost with electric heat and creating periods of time when tenants will not have heat under cold conditions. Air source heat pump equipment for domestic hot water heating is generally available in small equipment sizes suitable for homes and small multifamily apartment buildings. Large commercial size equipment required for large residential and hotel developments like this Project have very limited availability in the US.

From a utility perspective, electricity is currently about three times higher than the cost of natural gas so the operations cost for the same services would be much higher with an all-electric building, something that is of concern particularly for an affordable housing development.

In addition, true renewable and carbon-free energy – solar and wind – make up a very small portion of the electricity grid here in New England and although renewables are on the rise, they are not projected to increase significantly until well after completion of this Project.

All of that said, there is a push in Massachusetts and in Boston to transition to carbon-free renewable energy quickly which will hopefully drive development and innovation in the electricity sector. With that in mind, the Project is undertaking a study of incorporating electric HVAC systems as noted in the Chapter 8, and will analyze them from a carbon reduction perspective as well as from a first cost and life cycle operations cost perspective. In addition, the Proponent has studied what the resulting electric load on the building would be if the Project used all-electric domestic hot waters for production of domestic hot water. This additional load of approximately 900 kW to provide domestic hot water would necessitate increasing the electrical load into the building (i.e. addition of one utility transformer) as well increase the size of the building switchgear and associated electrical distribution vertically up the building. This would require additional space within the utility vault, within the building and the added premium, deducting the associated gas infrastructure could exceed $750,000.

The Proponent will continue to study electrified options and if at some point in the future these options become more economical, whether it be through market adoption and/or incentives, the Project will provide future-ready options such as pathways and space to electrify these MEP systems.

2. Renewable and Clean Energy:

2a. On-site Renewable, Clean Energy Sources and Storage- The project should demonstrate consideration of onsite renewable energy and in particular, onsite solar PV systems.

2b. Off-site Renewable / Clean Energy Sources and Credits- The project should identify potential offsite renewable sources or credits for purchase.

The MEP engineers on the Project completed a preliminary analysis of renewable energy sources including photovoltaics (PV). PV will be studied further as the design progresses.

Purchasing offsite renewable power or GHG offsets can also be considered towards the goal of approaching zero carbon. The Proponent will further study this as the design progresses.

3. *Annual Net Performance Calculation*- The project should perform a calculation showing the Building Energy Loads minus any On-site Renewable Energy Sources, minus any Off-site Renewable Energy Sources with a goal of achieving as close to net zero energy and zero carbon as possible.

This calculation will be performed and analyzed as the design progresses.

4. *First and Life Cycle Cost Assessment*- This section should include analysis of all of the Construction Costs, Energy Efficiency Assistance and Incentives, Building Life Cycle Savings and Net Value Cost/Savings.

The team will further explore the energy savings and other benefits as well as the cost considerations of the alternative options as the design progresses. As stated above, the Project is largely comprised of affordable housing units which requires a careful analysis of any components of the design that will increase first costs. The team has already engaged with Mass Save/ICF for energy efficiency assistance and incentives with the Passive House feasibility study and will continue looking at options as these become available. As each piece of further analysis is done, the team will complete the sections of the Zero Carbon Building Assessment as outlined above.

4.4 Climate Change Resilience

4.4.1 Introduction

Climate change conditions considered by the Project team and reviewed below include higher maximum and mean temperatures, more frequent and longer extreme heat events, more frequent and longer droughts and more severe rainfall events. Copies of the completed Climate Change Questionnaire is included in Attachment F.

4.4.2 Extreme Heat Events

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

- High performance building envelopes;

---

1 Climate Ready Boston, December 7, 2016.

- Light or reflective roofs;
- Heat or Energy Recovery;
- Demand-controlled ventilation;
- Reduced lighting power densities;
- High-efficiency HVAC equipment;
- High performance exterior lighting;
- Energy Star appliances;
- PV-Ready garage;
- Low-flow fixtures;
- Recycling collection areas; and
- Construction waste recycling.

The Proponent is also studying measures to further improve the building envelope to minimize the cooling needs of the building.

4.4.3 Rain Events

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

To mitigate the effects of extreme precipitation events, the Project's stormwater management system will be designed to minimize the volume of stormwater runoff from the Project site and promote groundwater recharge to the greatest extent practicable. The Project will infiltrate at least 1.25 inches of stormwater runoff for the 24-hour storm event over the site impervious area. It will also increase the amount of pervious space on the site, reducing the rate and volume of stormwater leaving the site.

4.4.4 Drought Conditions

Under the high emissions scenario evaluated by Climate Ready Boston, the occurrence of droughts lasting one to three months could increase by as much as 75% over existing conditions by the end of the century. The Project will approach potential drought impacts by reducing the amount of water used both within the building and across the Project site for irrigation.

To minimize the Project's susceptibility to drought conditions the landscape design is anticipated to incorporate native and adaptive plant materials. The Project will include low-flow fixtures and water conserving appliances to the extent feasible to minimize the amount of water used by the building's occupants.

Chapter 5

Urban Design

5.0 URBAN DESIGN

5.1 Tremont Street Activities

The existing site is located on Tremont Street between the Tufts Shared Services Garage to the north and the YMCA and the Double Tree Hotel to the south. It is currently used as a surface parking lot and results in a “missing tooth” on an otherwise rather continuous urban edge. The Project aims to extend the energetic pedestrian zone of Tremont Street, and add to the already vibrant street activities.

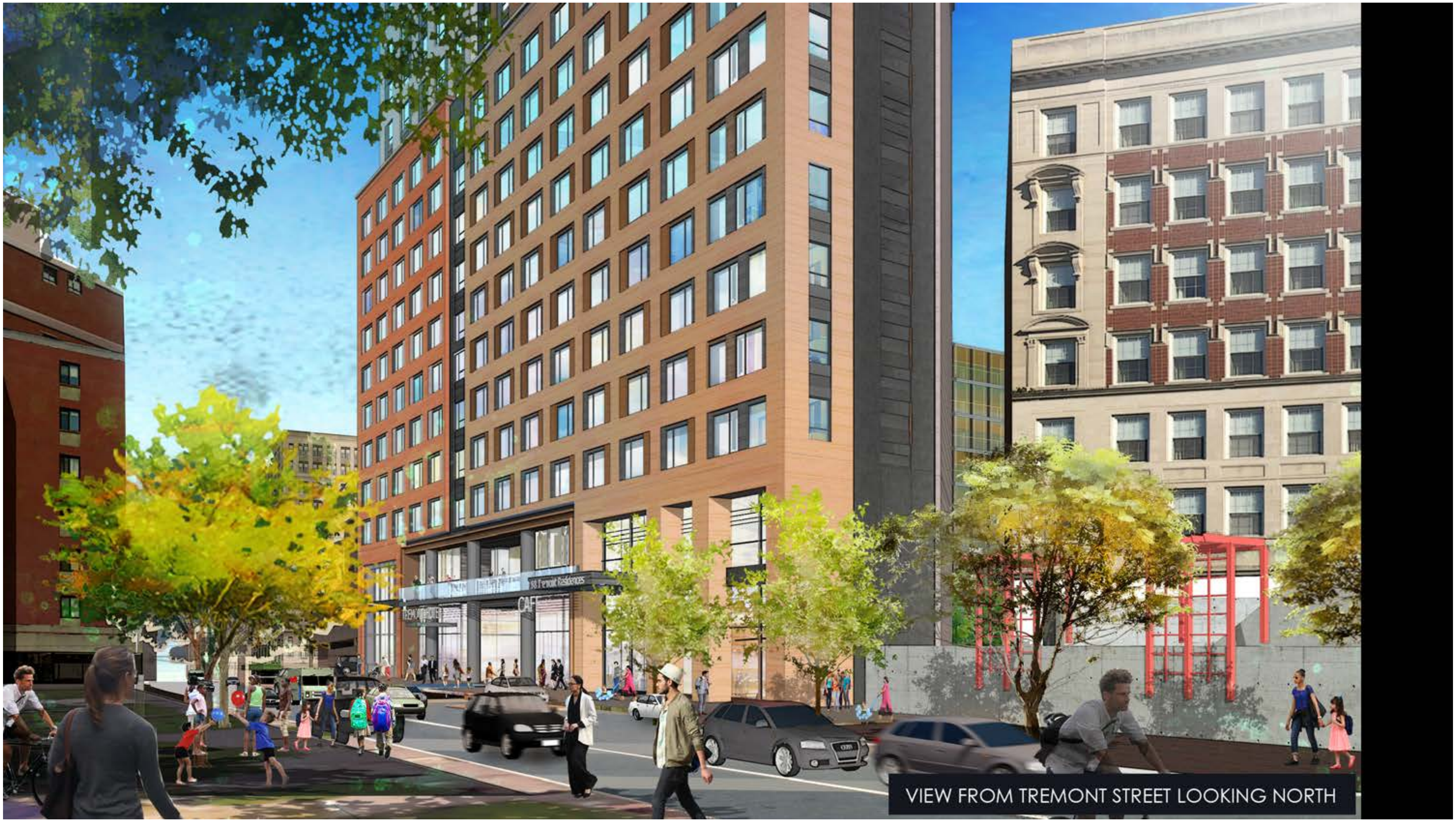
At the base of the building, the street-facing programs are prioritized with lobbies for the Hotel, Residential programs, and a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library. A pedestrian passage, flanked by the glass storefronts of the hotel lobby and a café, leads pedestrians into a landscaped courtyard at the center of the site. Building service elements such as loading, trash and mechanical equipment access points are located away from the active street front. On the second floor facing Tremont Street are the hotel dining and lounge programs. An indoor/outdoor “loggia” is located above the pedestrian passage to the courtyard, extending the height, and architecturally emphasizes the passageway. See Figures 5-1, 5-2 and 5-3, respectively.

Rising above the active base are nine floors of hotel guest rooms and 19 floors of affordable housing units, which are setback a few feet from the hotel podium. Directly across from Tremont Street is the Eliot Norton Park, a cherished urban refuge with a playground for the neighborhood. The Project completes the gap between the Tufts Shared Services Garage and the YMCA, and thus forms a continuous and active backdrop for the park. See Figure 5-4.

5.2 Massing and Façade Material

The Project is visible from a few major urban corridors, the most prominent being approaching from the west on Tremont Street where the slim edge of the tower is in full view. The west façade has a high visibility as well thanks to the Eliot Norton Park across Tremont Street. Due to its height, the top of the building is also visible from many locations further away from the site. Considering its visual impact on the urban realm, the tower massing is divided into multiple portions to appear slenderer in the skyline.

The Proponent will continue to evaluate Passive House and will seek to incorporate Passive House principles into the Project such as building energy reduction measures, which requires more opacity on the façade and more regular geometry to avoid thermal exposure. The massing gestures, as a result, are more restrained yet effective. The east and west elevations are both separated into four quadrants, with the vertical division terminating at the pedestrian passage at the base of the building, and the horizontal division occurring between the hotel and residential program. The large elevation areas are further reduced in scale when distinguished using different window groupings and façade colorations.



Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 5-1
View from Tremont Street Looking North

Figure 5-2
View from the Inner Courtyard

Parcel P-12C Boston, Massachusetts

Stantec D/R/E/A/M COLLABORATIVE ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 5-3

View from Tremont Street Looking South

Figure 5-4
Aerial Perspective of the Building

The south and north facades adopt similar strategies of partitioning into primarily vertical massing components. Warm-colored precast concrete with various finishes makes up the majority of the façade, and dark gray metal panels are used as accents. Large expanses of glass surfaces are only used at the base of the building to activate the street front and improve the thermal performances of the façade system. The outcome of these massing gestures and material selections is a simple and elegant building, and a contextual addition to the Boston skyline.

5.3 Courtyard and Pedestrian Passage

At the center of the block is an intimately scaled courtyard, spatially defined by the existing Double Tree Hotel to the south, a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library and the Tufts Shared Services Garage expansion to the north, the new tower to the west and a vacant parcel to the east that is anticipated to be a future residential building. The irregular shape and lack of year-round solar exposure challenge the design to take a different approach: shade friendly planting is introduced to create an oasis backdrop for the hoped-for library reading rooms. Playful seating elements are placed among planting for outdoor reading, gathering and relaxation.

The courtyard is connected to Tremont Street pedestrian activities via a passageway at the base of the tower. The walkway continues along the hoped-for library façade into the courtyard at the center of the site and facilitates an anticipated continuation of the walkway to Washington Street. The passage is designed to have active uses along its length, such as hoped for library reading rooms, lobbies, cafes and residential amenity spaces. Although service vehicles share the same opening as the passageway on Tremont Street, the driveway length is minimized, and is separated from pedestrian passage by bollards. Different paving materials are introduced to visually signal the change of function and ensure pedestrian safety. Overall, the passage creates both a visual and physical connection between the two major streets, in term connecting Bay Village and Chinatown Neighborhood through the Project site. Please see Figure 5-5.

Rather than being treated as a leftover space, the courtyard and the passageway is designed to encourage pedestrian activities and be celebrated as an outdoor extension of the hoped-for library functions as well as the residential and hotel functions.

5.4 Façade Design Inspiration: Chinese Bamboo Slip

Situated at the Chinatown neighborhood, the Project is a mixed-use tower including residential, hotel, parking and retail uses. The base of the tower also houses a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library. Inspired by its diverse program and site context, the exterior design pays homage to the traditional Chinese bamboo slip, a type of ancient manuscript that carries significant Chinese philosophical and historical text before the widespread usage of paper. Chinese characters are painted or carved on narrow strip of seasoned bamboo oriented vertically. The slips are then hand strung together with fine threads. See Figure 5-6.

Figure 5-5

View from Tremont Street Looking Towards the Inner Courtyard

Figure 5-6
Bamboo Slip

The composition of the bamboo slip is manifested on the façade through vertical groupings of windows as well as the overall massing divisions into vertical parts. The horizontal threads are represented with precast concrete ribbing patterns weaving between the window openings. In the courtyard, the Tufts Shared Services Garage addition above the hoped-for library is screened with a series of slender vertical perforated metal panels at similar proportion as a bamboo slip book. The making of the bamboo slip embodies dedication towards craft and a rich tradition of storytelling, which is symbolic to what the design team aims to achieve for this Project.

5.5 Evolution of Design

The Project arrived at its current massing after exploring a few iterations of tower placement. One of the versions stacked the tower on top of the garage expansion, but it was deemed not suitable for residences due to the irregular shape of the southern lot line and the proximity of the northern lot line that would limit residential units' window openings.

Earlier versions of façade design included a more planar language with precast concrete fins extending beyond faces of the exterior walls. The current façade design minimized protruding elements to maximize the envelope's thermal performance per Passive House Standards suggestions. In addition, window sizes for residential units were reduced to minimize energy consumption from heating and cooling the building interiors.

Chapter 6

Historical and Archaeological Resources

6.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The Historic and Archaeological Resources section describes the historic and archaeological resources within and in the vicinity of the Project site.

6.1 Project Site

No historic resources listed in the State and National Registers of Historic Places or included in the Inventory of Historic and Archaeological Assets of the Commonwealth are within the Project site.

The approximately 0.67-acre Project site is located in the South Cove Urban Renewal Area in Boston, Massachusetts at 286-290 Tremont Street and currently includes a surface parking lot. The site is bound by the Tufts Shared Services parking garage to the north, the Double Tree hotel to the south (the former Don Bosco Technical High School), Tremont Street to the west and an adjacent lot not owned by the Proponent to the east. Access to the site is from Tremont Street.

6.2 Historic Resources Within the Vicinity of the Project Site

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

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

No.	Historic Resource	Address	Designation*
1	Boston Public Garden	Bound by Arlington, Boylston, Charles and Beacon Streets	LL, NHL, NRDIS
2	Boston Common and Public Garden	Bound by Park, Tremont, Boylston, Beacon, and Arlington Street and bisected by Charles Street	NRDIS
3	Boston Common	Bound by Park, Tremont, Boylston, Charles and Beacon Streets	LL, NHL, NRDIS
4	Tremont Street Block between Avery and Boylston	Tremont Street between Avery and Boylston	NRDIS, NRDOE, NRMRA
5	Piano Row Historic District	Roughly follows Tremont and Boylston Streets Intersection at SE corner of Boston Common	NRDIS, NRMRA
6	Liberty Tree District	Located at intersection of Essex Street and Washington Street	NRDIS, NRMRA
7	Park Square - Stuart Street Historic District	The area is roughly bounded by Park Square to the east, Columbus Avenue to the south, Cahner Place, Clarendon Street, and Trinity Place on the west; and St. James Avenue, Providence Street, and Boylston Street on the north	INV

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

No.	Historic Resource	Address	Designation*
8	Beach – Knapp District	Located at intersection of Beach and Knapp Streets	NRDIS, NRMRA
9	Leather District	Roughly bound by Atlantic Ave, Kneeland, Lincoln and Essex Streets	NRDIS, NRDOE
10	Bay Village Historic District	Roughly bound by Piedmont, Broadway, Tremont, Cortez, Isabella, and Arlington Streets	LHD
11	Knox Street Area	9-13 Knox Street	INV
12	Lyndeboro Place Area	Junction of Broadway and Carver Streets	INV
13	Saint James the Greater Roman Catholic Church	125 Harrison Avenue	INV
14	Bennet Street, 38-48 and Harvard Street, 13-25	38-48 Bennet Street and 13-25 Harvard Street	INV
15	Boston Dispensary	25-37 Bennet Street	INV
16	55-63 Harvard Street	55-63 Harvard Street	INV
17	New England Medical Center Area	14 Nassau Street/185 Harrison Avenue	INV
18	Tyler Street, 70-85	70-85 Tyler Street	INV
19	71-79 Hudson Street	71-79 Hudson Street	INV
20	Nassau Street, 1-17	1-17 Nassau Street	INV
21	94-106 Tyler Street	94-106 Tyler Street	INV
22	89-103 Hudson Street	89-103 Hudson Street	INV
23	Johnny Court, 1-9	1-9 Johnny Court	INV
24	South End Landmark District	Roughly bounded by the Southwest Corridor, Tremont Street, East Berkeley Street, Washington Street, Harrison Avenue, and Northampton and Camden Streets	LHD
25	South End Landmark District Protection Area	Follows the northeast and eastern boundary of the South End Landmark Area along Harrison Avenue, Washington Street, East Berkeley Street, Tremont Street, Herald Street and Albany Street	INV
26	South End Industrial Survey Area	Roughly bounded by Shawmut Avenue, Herald Street, Albany Street, Union Park Street, and Washington Street	INV
27	Boston Edison Illuminating Company	25-39 Boylston Street	NRDOE, NRIND, NRMRA
28	Young Men's Christian Union	48 Boylston Street	LL, NRIND, NRMRA
29	Boylston Building	2-22 Boylston Street	LL, NRIND, NRMRA
30	Hayden Building		LL, NRIND, NRMRA
31	Jacob Wirth Building	31-39 Stuart Street	LL, NRIND, NRMRA
32	Dill Building	11-25 Stuart Street	NRIND, NRMRA
33	Wilbur Theatre	244-248 Tremont Street	LL, NRIND, NRMRA
34	Shubert Theatre	263-265 Tremont Street	NRIND, NRMRA
35	Metropolitan Theatre	252-272 Tremont Street	LL, NRIND, NRMRA
36	Charles Playhouse	76-78 Warrenton Street	NRIND, NRMRA

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

No.	Historic Resource	Address	Designation*
37		1 Bay Street	LHD, NRIND
38	Quincey Grammar School	88-90 Tyler Street	NRIND, NRMPS

*Designation Legend

NRIND	Individually listed on the National Register of Historic Places
NRDIS	National Register of Historic Places historic district
NRDOE	Determined eligible for inclusion in the National Register of Historic Places
NRMRA	National Register Multiple Resource Area
NHL	National Historic Landmark
LHD	Local Historic District
LL	Local Landmark
INV	Inventory

6.3 Archaeological Resources Within the Project Site

A review of Massachusetts Historical Commission's online archaeological base maps was conducted on September 17, 2019. It found no known archeological sites within the Project site or the immediate vicinity.

6.4 Potential Impacts to Historic Resources

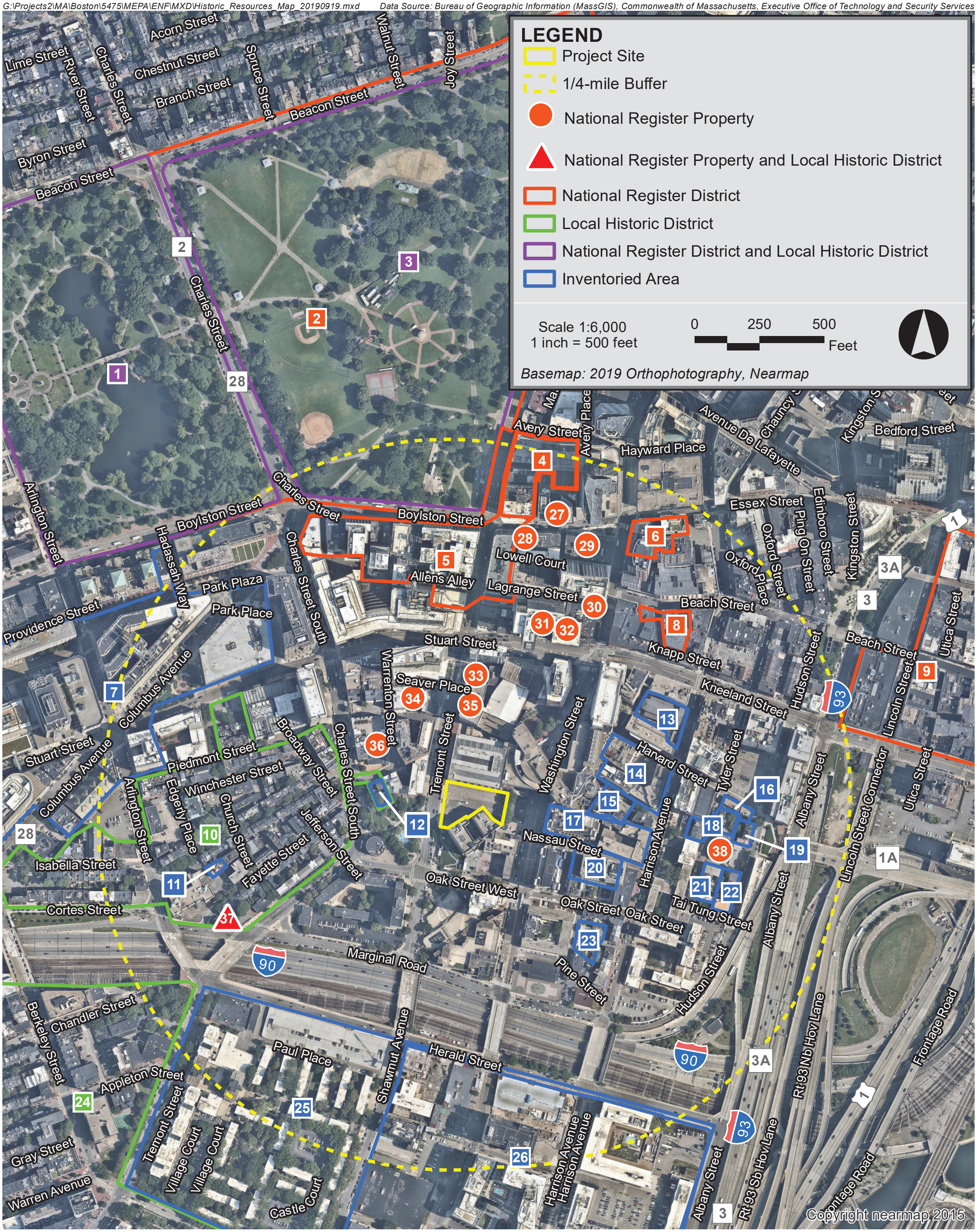
6.4.1 Urban Design

As described in Chapter 5.0, the existing site is located on Tremont Street between the Tufts Shared Services Garage to the north and the YMCA and the Double Tree Hotel to the south. It is currently used as a surface parking lot and results in a "missing tooth" on an otherwise rather continuous urban edge. The Project aims to extend the energetic pedestrian zone of Tremont Street, and add to the already vibrant street activities.

At the base of the building, the street-facing uses are prioritized with lobbies for the Hotel and Residential uses, and a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library. A pedestrian passage, flanked by the glass storefronts of the hotel lobby and a café, leads pedestrians into a landscaped courtyard at the center of the site. On the second floor facing Tremont Street are the hotel dining and lounge programs. An indoor/outdoor "loggia" is located above the pedestrian passage to the courtyard, extending the height, and architecturally emphasizes the passageway. Rising above the active base are nine floors of hotel guest rooms and 19 floors of affordable housing units, which are setback a few feet from the hotel podium.

The Project is exploring Passive House Certification and building energy reduction measures, which requires more opacity on the façade and more regular geometry to avoid thermal exposure. The massing gestures, as a result, are more restrained yet effective. The east and west elevations are both separated into four quadrants, with the vertical division terminating at the pedestrian

G:\Projects2\MA\Boston\5475\MEPA\ENF\MXD\Historic_Resources_Map_20190919.mxd   Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



286-290 Tremont Street   Boston Massachusetts

Epsilon
ASSOCIATES INC.

Figure 6-1
Historic Resources

passage at the base of the building, and the horizontal division occurring between the hotel and residential program. The large elevation areas are further reduced in scale when distinguished using different window groupings and façade colorations. The south and north facades adopt similar strategies of partitioning into primarily vertical massing components. Warm-colored precast concrete with various finishes makes up the majority of the façade, and dark gray metal panels are used as accents. Large expanses of glass surfaces are only used at the base of the building to activate the street front and improve the thermal performances of the façade system. The outcome of these massing gestures and material selections is a simple and elegant building, and a contextual addition to the Boston skyline.

6.4.2 Visual Impacts to Historic Resources

The Project is located at the western edge of the Chinatown neighborhood of Boston, with close proximity to several of the City's active neighborhoods including Bay Village, South Cove, Park Plaza and downtown Boston, home to multiple properties listed on the State and National Registers of Historic Places. Several listed properties are located in the immediate vicinity of the Project site including, but not limited to, the Charles Playhouse, Shubert Theatre and the Metropolitan Theatre.

The proposed building has an 11-story base and a 19-story tower above. The base is similar in height to other buildings in the area, keeping a consistent streetwall within large ground floor storefront windows and multi-light upper story windows similar to the surrounding buildings. The slender tower is designed to be set back from the base and has a much narrower frame than is typical of other tall buildings in Boston.

While the Project is within the viewshed of a number of nearby historic properties due to its height, the mass of the building is minimized by its small frame. The entrances on the east elevation will scale down the building to street level, while maintaining a sense of depth from the sidewalk. The proposed Project is in keeping with the architectural character of the surrounding neighborhood.

6.4.3 Shadow Impacts to Historic Resources

The Project complies with the Boston Common and Boston Public Garden shadow laws (Chapter 362 of the Acts of 1990 and Chapter 384 of the Acts of 1992, each as amended by Chapter 57 of the Acts of 2017, "An Act Protecting Sunlight and Promoting Economic Development in the City of Boston").

As illustrated in the shadow study diagrams (Figures 6-2 to 6-15 at the end of this chapter), during isolated time periods the Project will cast minimal net new shadow on the properties at the eastern terminus of the Bay Village Local Historic District, the Charles Playhouse, The Wang Theatre, and the Shubert Theatre.

New shadow on these historic resources is limited to new shadow at 9:00 a.m. (Charles Playhouse and Bay Village LHD) and 12:00 p.m. (Shubert Theatre) on March 21, 9:00 a.m. (Bay Village LHD) on June 21, 9:00 a.m. (Charles Playhouse and Bay Village LHD) and 12:00 p.m. (Shubert Theatre) on September 21, and 9:00 a.m. (Charles Playhouse) and 12:00 p.m. (Wang Theatre) on December 21. The new shadow on historic resources will be minimized by the existing shadow cast from other multi-story buildings in the area as well as the thin frame of the proposed tower. Most historic resources will only have a moving narrow band of new shadow cast upon them and only at isolated times. Net new shadow created by the Project is not expected to have significant impacts on historic resources.

6.4.4 Wind Impacts to Historic Resources

The Project entails the construction of a new building which will result in localized changes in wind conditions. Within the surrounding area, wind condition at pedestrian level will both improve and degrade in small measures depending upon the location. Wind conditions at most locations studied are predicted to remain comfortable for walking or better. Based on the wind analysis described in Section 3.1, the Project is not expected to impact nearby historic properties.

6.5 Consistency with Other Historic Reviews

6.5.1 Boston Landmarks Commission Article 80 Review

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

6.5.2 Massachusetts Historical Commission

The MHC has review authority over projects requiring state or federal licensing, permitting and/or approvals, or utilize state or federal funding. The Proponent initiated review of the Proposed Project by MHC via the filing of the ENF. In an August 12, 2019 letter, following review of the ENF, MHC requested that the Proponent conduct shadow studies to assist in determining the effects of shadows on the Wang Theatre, Wilbur Theatre, Shubert Theatre, Charles River Playhouse, and the Bay Village Historic District. The Proponent has submitted a copy of this PNF/DEIR including shadow studies to the MHC.

Parcel P-12C Boston, Massachusetts

Stantec D/R/E/A/M COLLABORATIVE ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 6-2

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

Parcel P-12C Boston, Massachusetts

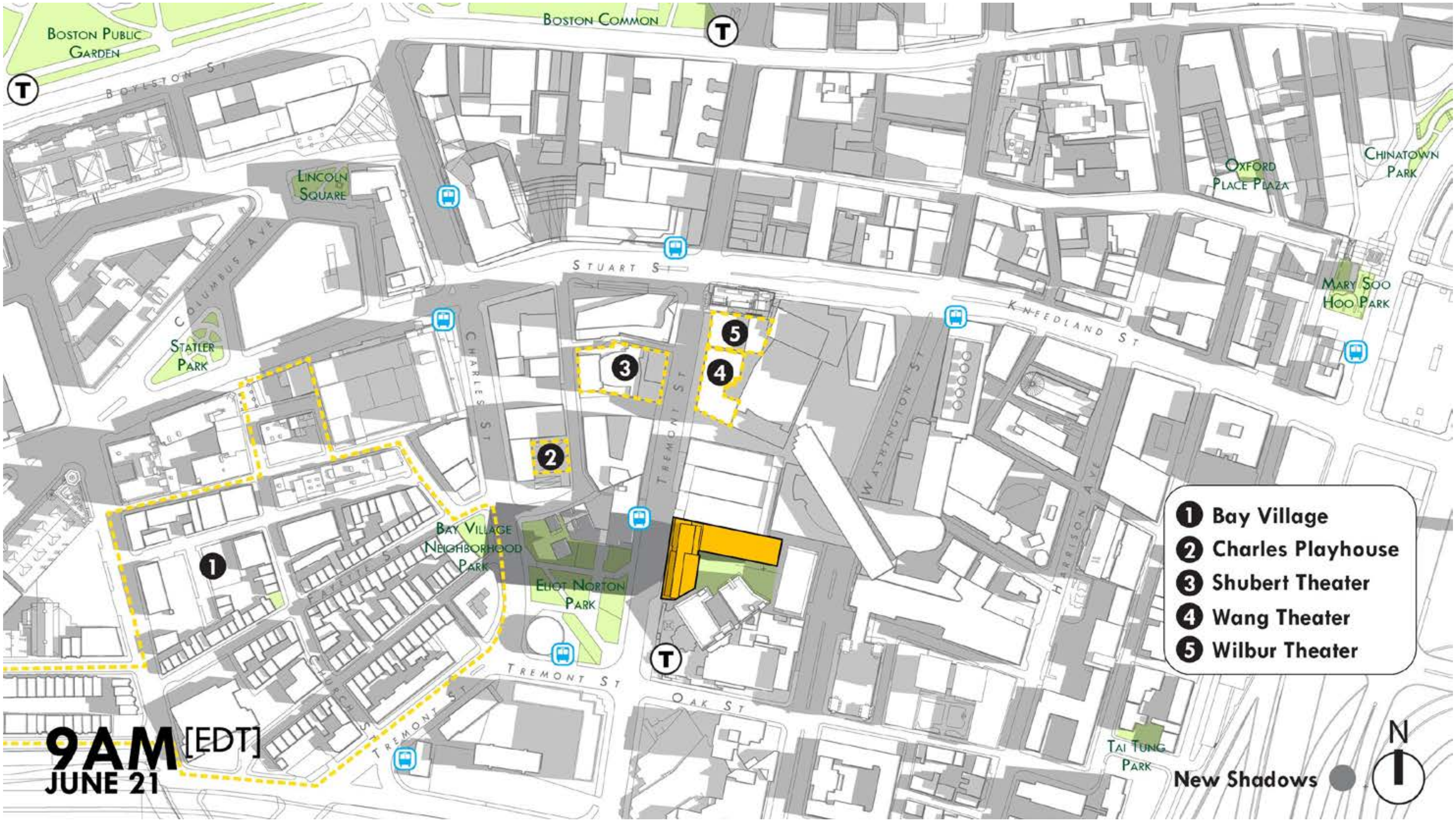
Stantec D/R/E/A/M COLLABORATIVE ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 6-3

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

Parcel P-12C Boston, Massachusetts

Figure 6-4
Shadow Study, March 21, 3:00 p.m.



Parcel P-12C Boston, Massachusetts

Figure 6-5

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

Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE ARCHITECTURE | REAL ESTATE DEVELOPMENT

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

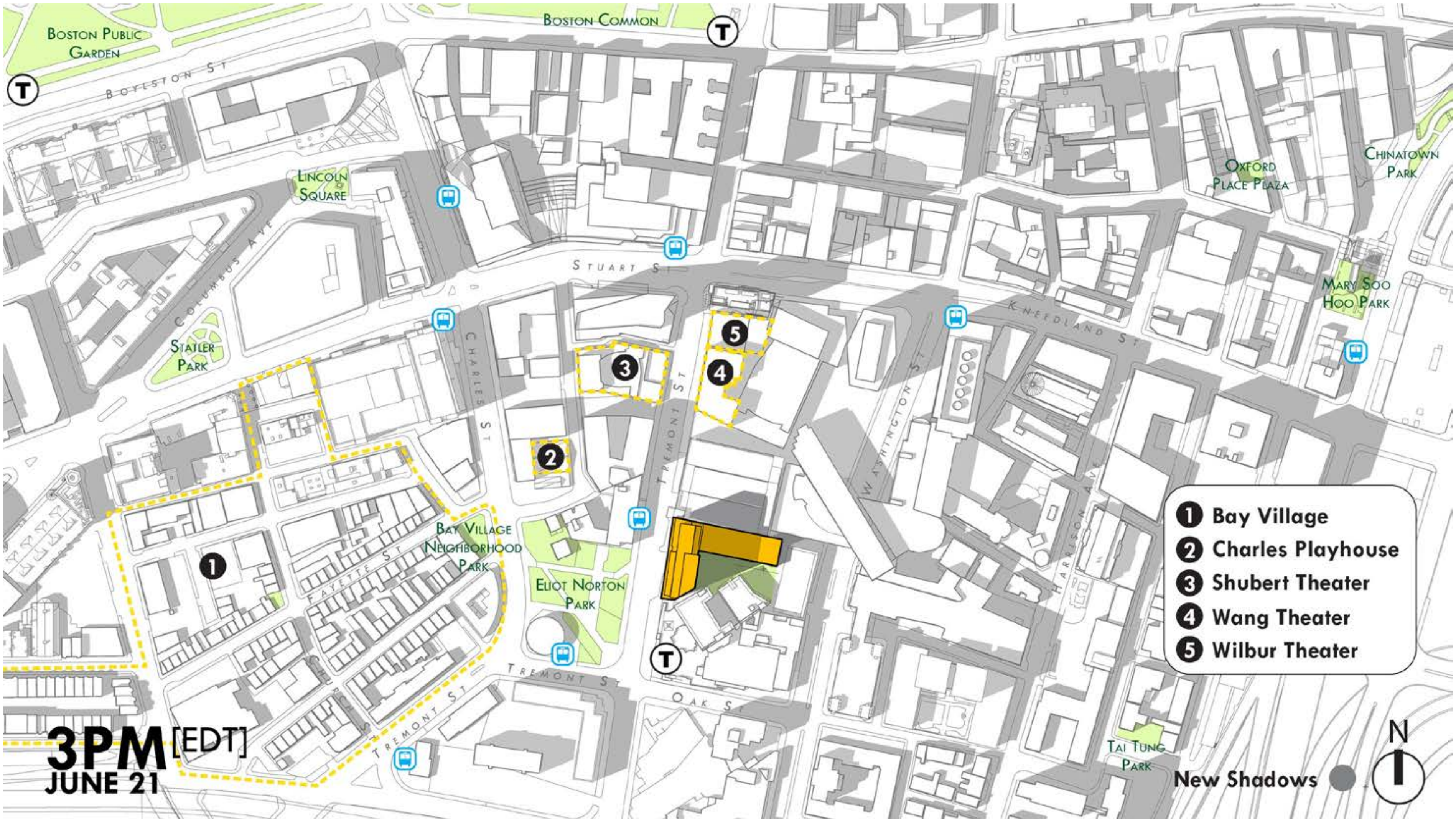


Figure 6-7
Shadow Study, June 21, 3:00 p.m.

Parcel P-12C **Boston, Massachusetts**

Figure 6-8
Shadow Study, June 21, 6:00 p.m.

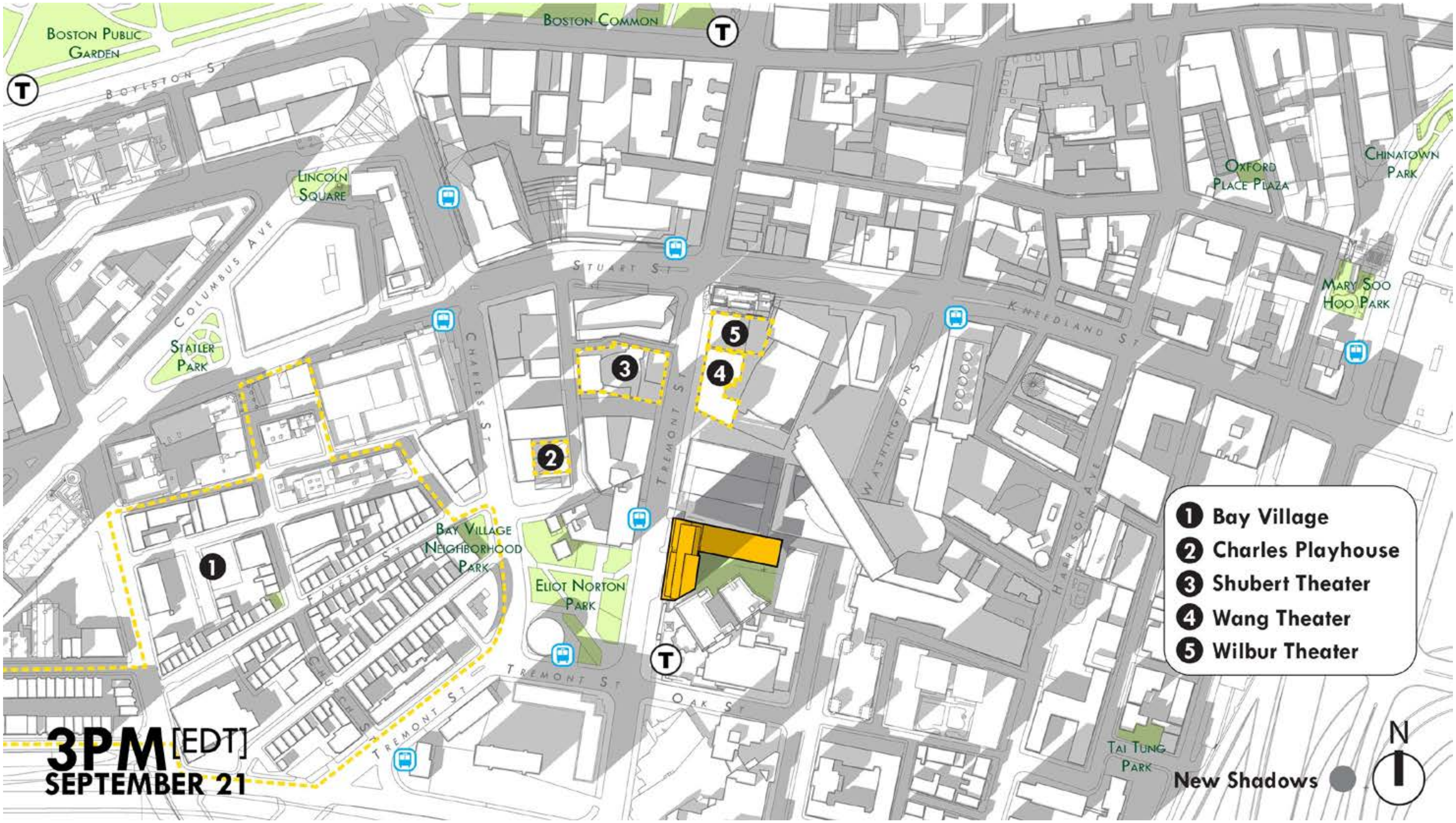
Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 6-9
Shadow Study, September 21, 9:00 a.m.

Figure 6-10

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



Parcel P-12C Boston, Massachusetts

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

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

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

Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Figure 6-13
Shadow Study, December 21, 9:00 a.m.

Figure 6-14
Shadow Study, December 21, 12:00 p.m.

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

Chapter 7

Infrastructure

7.0 INFRASTRUCTURE

This section outlines the existing utilities surrounding the proposed Project site, the proposed connections required to provide service to the new structure, and any impacts on the existing utility systems that may result from the construction of the Project.

7.1 Water Supply

7.1.1 Existing Water Supply System

Water for the Project site is provided by the Boston Water and Sewer Commission (BWSC). There are six different water systems within the City of Boston, and these provide service to portions of the city based on ground surface elevation. The six systems are southern low (commonly known as low service), southern high (commonly known as high service), southern extra high, northern low, northern high and the high-pressure fire service:

- There is a 12-inch southern high water main, a 12-inch southern low water main and a 16-inch high pressure fire service main beneath Tremont Street; and

- There is a 12-inch southern high water main, a 16-inch southern low water main and a 16-inch high pressure fire service main beneath Washington Street.

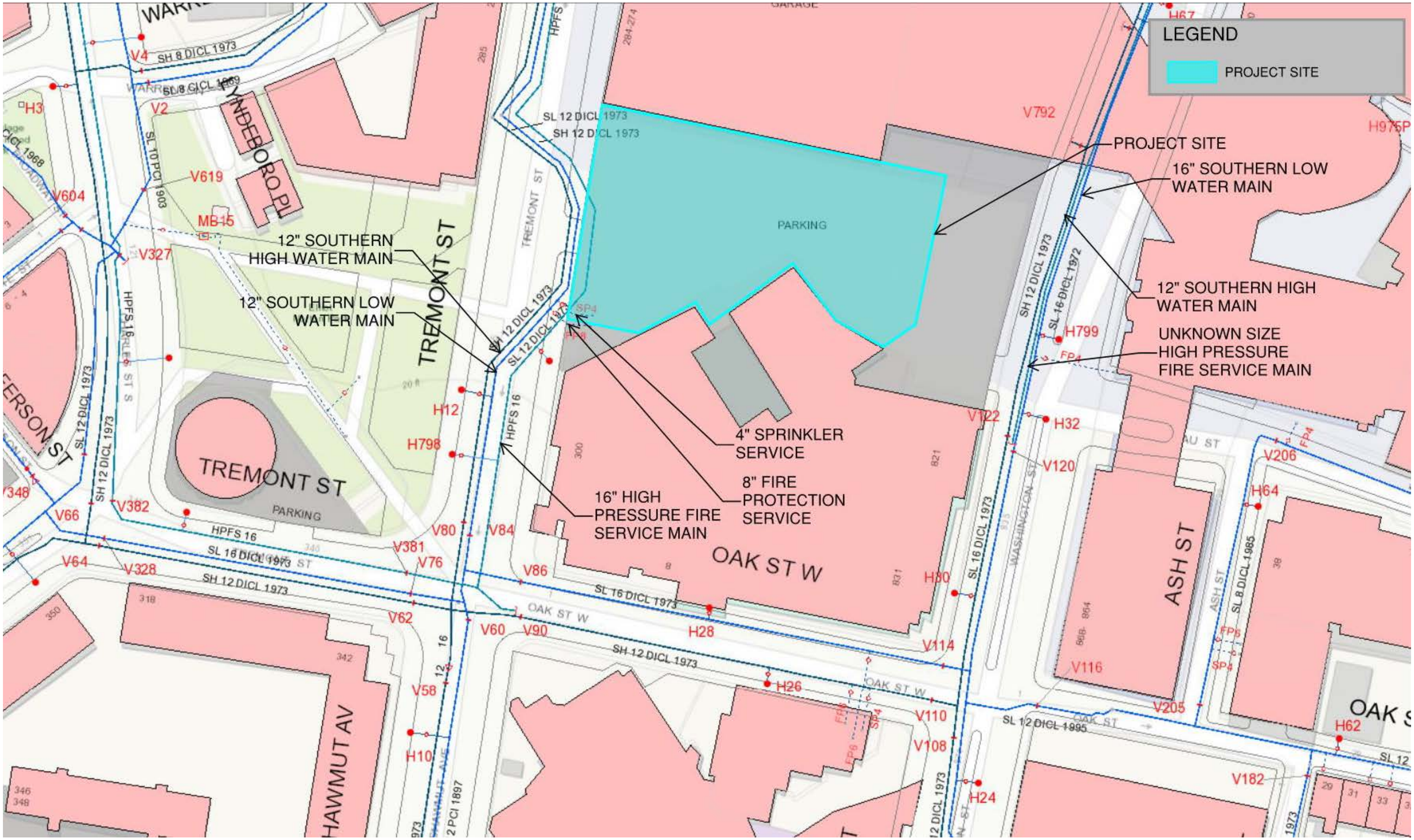
The existing water system is illustrated in Figure 7-1.

The three water mains under Tremont Street are located under the existing sidewalk adjacent to the project site and appear to be located to avoid the abandoned MBTA green line tunnel and portal.

There are two water services that serve the Doubletree Hotel and connect to the 12-inch southern low main in Tremont Street; one 4-inch domestic service and one 8-inch fire protection service. These services appear to traverse the Project Site and will be relocated if necessary to support construction of the new building.

7.1.2 Estimated Project Water Use

The water demand estimate for domestic services is based on the Project's estimated sewage generation, described below. A conservative factor of 1.1 (10 percent) is applied to the estimated average daily wastewater flows calculated with 310 CMR 15.00 values to account for consumption, system losses, and other usages to estimate an average daily water demand. The Project will require up to approximately 64,779 gpd of domestic water. This number will be updated once the Article 80 process is complete and the program finalized. The water for the Project will be supplied by the BWSC system. Peak water demand will be determined during the design phase based on the final plumbing fixture count and the make-up water needs of the mechanical systems in the building; and will be submitted to BWSC as part of the site plan approval process.



Parcel P-12C **Boston, Massachusetts**

Nitsch Engineering

Figure 7-1

Existing Water System

7.1.3 Project Connections and Impacts

BWSC record hydrant flow test data has been requested, but not yet received.

The proposed domestic water services for the Project will connect to the 12-inch southern low water main in Tremont Street. The Project will be considered a high-rise and will require two redundant fire protection services. Fire protection services for the proposed Project will connect to the 12-inch southern high water main in Tremont Street. A new isolation valve will be installed between the two fire protection services to meet code. All new services will extend approximately 10-feet into the public right-of-way.

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

No water capacity problems are anticipated within the BWSC system as a result of the proposed Project.

7.1.4 Infrastructure Improvements and Water Conservation

The State Building Code requires the use of water-conserving plumbing fixtures, and all efforts to reduce water consumption will be made. Water conservation measures such as low-flow toilets and restricted-flow faucets will help reduce the domestic water demand on the existing distribution system. The installation of sensor-operated sinks with water-conserving aerators and sensor-operated toilets in all the commercial area restrooms will be incorporated into the design plans for the Project. Exterior landscaping will consist of native and drought tolerant plants and a high-efficiency irrigation system.

All new water services will be installed in accordance with the latest Local, State, and Federal codes and standards. Backflow preventers will be installed at both domestic and fire protection service connections. Abatement meters will be provided at the cooling towers and stormwater reused system. New meters will be installed with Meter Transmitter Units (MTUs) as part of the BWSC's Automatic Meter Reading (AMR) system.

7.2 Wastewater

7.2.1 Existing Wastewater System

There are existing BWSC sanitary sewer mains and combined sewer mains located in Tremont Street and Washington Street adjacent to the Project site:

- There a 12-inch sanitary sewer beneath Tremont Street which flows in a southerly direction;

- There is a 42-inch combined sewer beneath Washington Street that flows in the southerly direction; and

- There is a 10-inch sanitary sewer beneath Washington Street that flows in the southerly direction.

All sewers adjacent to the Project site flow to a combined sewer main, and ultimately to the Deer Island Waste Water Treatment Plant.

The existing sewer system is illustrated in Figure 7-2.

7.2.2 Estimated Project Wastewater Generation

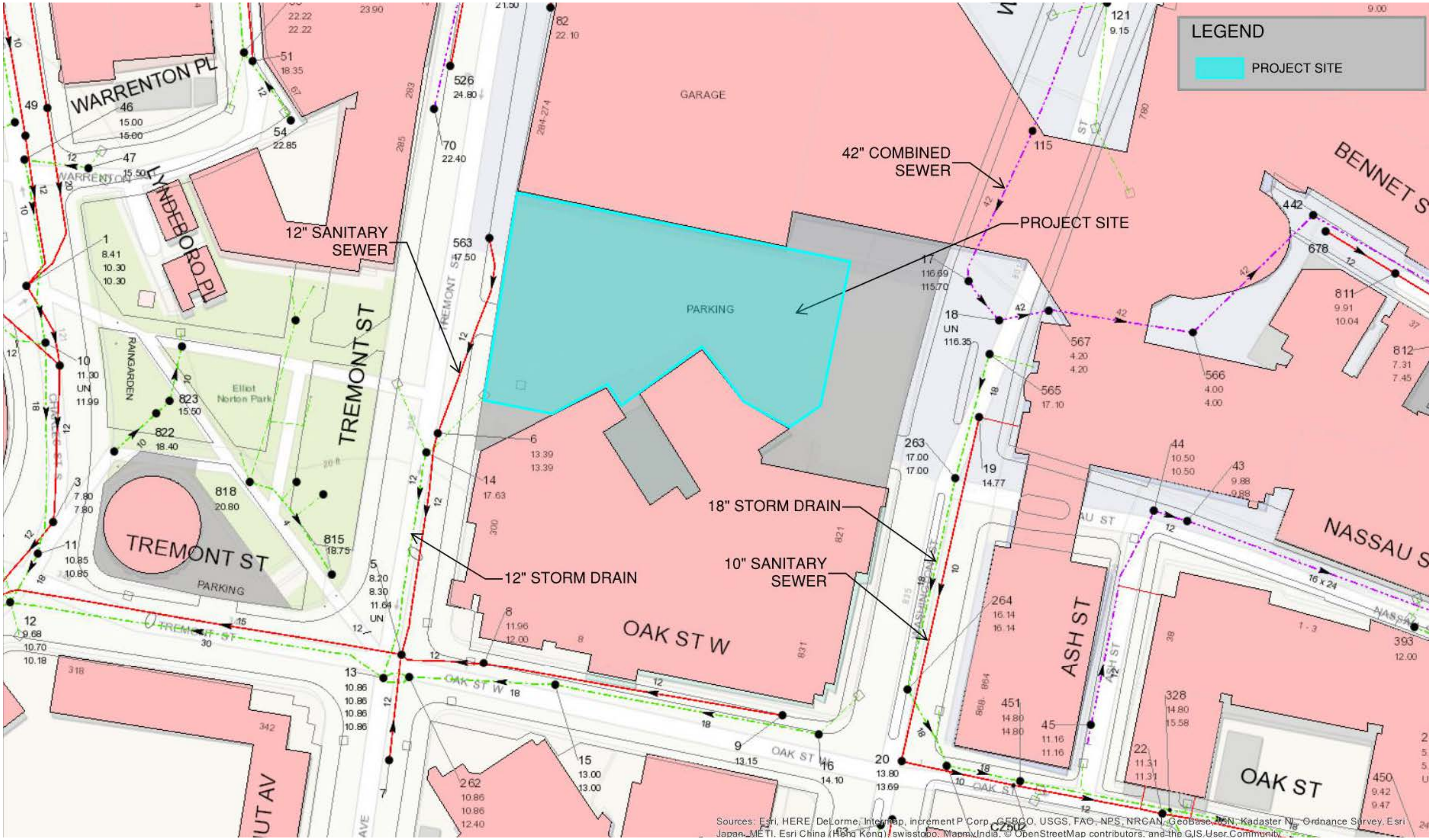
The Project's sewage generation rates, shown in Table 7-1, were estimated using 310 CMR 15.00, The State Environmental Code Regulating Septic Systems (Title 5). 310 CMR 15.203 lists the typical generation values reflected in the sewage generation calculations for the proposed uses. Typical generation values are generally conservative values for estimating the sewage flows from new construction.

Table 7-1 Proposed Maximum Project Wastewater Generation

Room Use	Size		310 CMR Value (gpd/unit)		Total Flow (gpd)
Residential	180,000 sf	304 bedrooms	110	/bedroom	33,440
Café	2,500 sf	40 seats	20	/seat	1,000
Bar		40 seats	35	/seat	1,400
Library/Community Space	14,000 sf	14,000 sf	75	/1,000 sf	1,050
Hotel	130,000 sf	200 bedrooms	110	/bedroom	22,000
Proposed Sewer Flows (gpd):					58,890

7.2.3 Sewage Capacity and Impacts

The Proponent analyzed the Project's likely impact on the existing BWSC systems in Tremont Street. The existing sewer system capacity calculations are presented in Table 7-2.



Parcel P-12C Boston, Massachusetts

Nitsch Engineering

Figure 7-2
Existing Sewer System

Table 7-2 Sewer Hydraulic Capacity Analysis

Manhole (BWSC Number)	*Distance (feet)*	*Invert Elevation (up)*	*Invert Elevation (down)*	*Slope (%)*	*Diameter (inches)*	*Manning's Number*	*Flow Capacity (cfs)*	*Flow Capacity (MGD)*
563 to 6	215	17.5	13.39	1.9%	12	0.013	4.93	3.18
6 to5	245	13.39	11.64	0.7%	12	0.013	3.01	1.95

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

The adjacent roadway sewer system in Tremont Street and potential building service connections to the sewer system were analyzed.

Results shown in Table 7-2 indicate the hydraulic capacity of the sewer systems located near the Project. The minimum hydraulic capacity is 1.95 million gallons per day (MGD), or 3.02 cubic feet per second (cfs), for the 12-inch main in Tremont Street. Based on a maximum average daily flow estimate for the Project of 56,040 GPD (or 0.09 cfs), and with a factor of safety of 10 (total estimate = 0.09 cfs x 10 = 0.9 cfs), no capacity problems are expected within either the Tremont Street or Washington Street systems. The existing sewer systems will be video inspected to confirm their condition.

7.2.4 Proposed Conditions and Infrastructure Improvements

The Proponent will coordinate with BWSC on the design and capacity of the proposed connections to the sewer system. The Project is expected to generate new wastewater flows of up to approximately 56,040 gpd. Approval for the net increase in flow will come from BWSC.

Sewer services for the Project will connect to the 12-inch sanitary sewer in Tremont Street.

This Project will result in a net increase in flows of greater than 15,000 gpd and will therefore be required to contribute an Inflow and Infiltration (I/I) fee to BWSC. The sewer flows indicated in this document are maximum numbers that will be modified as the Project progresses. This fee will be finalized during the BWSC site plan review process based on the building program at that time. The Project will comply with the BWSC 4:1 I/I mitigation program.

Drainage from enclosed garage spaces will be routed to Oil/Water separators and directed to the sanitary sewer system.

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

7.3 Stormwater Management

7.3.1 Existing Conditions

There are existing BWSC storm drains located in Tremont Street adjacent to the Project site:

- There is a 12-inch storm drain beneath Tremont Street; and
- There is an 18-inch storm drain beneath Washington Street.

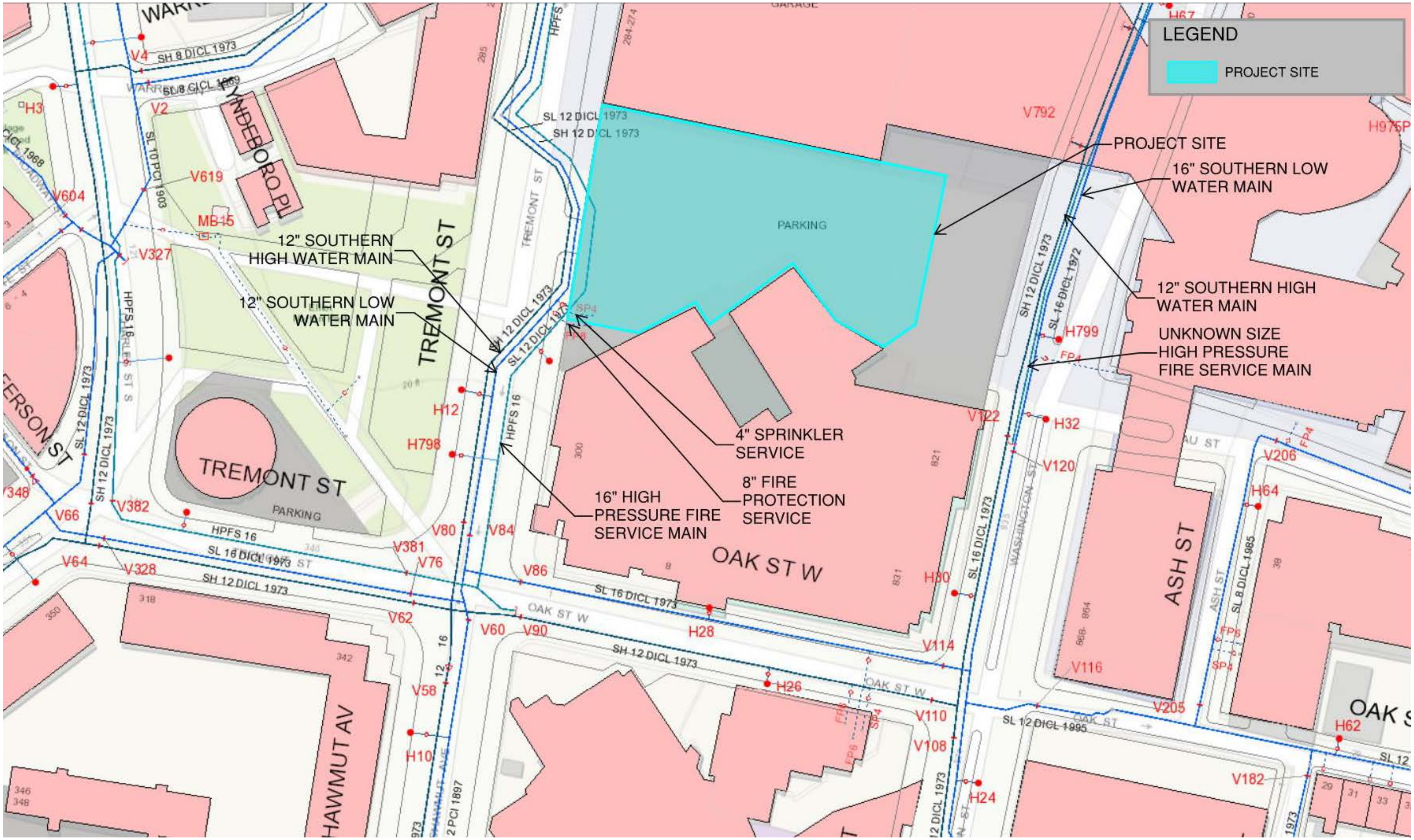
The existing site stormwater runoff from the parking lot is collected into three catch basins. Most of the existing site is collected into a catch basin at the southwest corner of the site and discharges to the existing 12-inch storm drain. A small portion of the existing site to the east is collected into a series of two catch basins and likely directed out to the storm drain in either Tremont Street or Washington Street.

The existing BWSC storm drain systems adjacent to the Project site, eventually connect to combined sewers and discharges to the Deer Island Waste Water Treatment Plant. If this system were separated in the future, the site would fall in the Boston Harbor watershed if the storm drainage were directed to the 18-inch storm drain in Washington Street. The site would fall in the Charles River watershed if storm drainage is directed to the 12-inch storm drain in Tremont Street. The existing BWSC storm drain system is illustrated in Figure 7-3.

7.3.2 Proposed Stormwater Management

The Project will likely result in a net decrease in impervious area with the addition of a courtyard. The Project site under existing conditions is 97 percent impervious, and a landscaped courtyard is part of the Project. The Project will be required to infiltrate the first inch and a quarter of stormwater over the site impervious area from the stormwater to meet the requirements for BWSC and the Boston Planning and Development Agency. The Project will be required to infiltrate approximately 3,050 cubic feet stormwater in a recharge system that will likely be located under the courtyard. The stormwater overflow will connect in Tremont Street to the existing 12-inch storm drain main at approximately 60 linear feet and may require an additional manhole to make the connection.

The Project is located in the Groundwater Conservation Overlay District (GCOD), and is required to infiltrate the first inch of stormwater runoff over site impervious areas. Additionally, because the Project will be over 100,000 square feet, the project will be required to retain the first 1.25 inches of stormwater over site impervious areas. The Project will comply with both of these requirements.



Parcel P-12C Boston, Massachusetts

Nitsch Engineering

Figure 7-3
Existing Drainage System

All improvements and connections to BWSC infrastructure will be reviewed as part of BWSC's site plan review process. This process includes a comprehensive design review of the proposed service connections, assessment of project demands and system capacity, and establishment of service accounts. Attachment I includes the Boston Smart Utilities checklist which assesses green infrastructure on the Project site.

7.3.3 Compliance with MassDEP Stormwater Management Standards

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

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

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

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

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

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

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

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

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

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

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

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

Compliance: The proposed design will comply with this Standard. The Project will not discharge untreated stormwater to a critical area.

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

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

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

Compliance: The Project will comply with this standard. Sedimentation and erosion controls will be incorporated as part of the design of the project. These controls will be constructed and maintained as part of the construction logistics of the Project.

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

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

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

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

Chapter 8

Greenhouse Gas Analysis

8.0 GREENHOUSE GAS ANALYSIS

This Chapter presents a greenhouse gas (GHG) analysis that complies with the MEPA Greenhouse Gas Emissions Policy and Protocol (GHG Policy) of May 2010, and which responds to the Secretary's Certificate on the ENF.

8.1 Introduction and Project Overview

8.1.1 MEPA Greenhouse Gas Emissions Policy and Protocol

This Chapter addresses GHG emissions generated by operation of the Project and associated traffic and options that may reduce those emissions in accordance with the MEPA GHG Policy. The GHG Policy requires, for certain projects undergoing review by the MEPA Office and required to prepare an EIR, that GHG emissions be quantified and measures to avoid, minimize, or mitigate such emissions be identified. The GHG Policy requires proponents to quantify the impact of proposed mitigation in terms of energy savings and GHG emissions.

On September 12, 2019, the Proponent and the Project team met with the MEPA Office and the Department of Energy Resources (DOER) to outline the methodology and mitigation expectations for the Project. This analysis follows the process outlined in that meeting and the follow-up communication.

The analysis provided herein focuses on emissions of carbon dioxide (CO2). As noted in the GHG Policy, although there are other GHGs, CO2 is the predominant contributor to global warming. Furthermore, CO2 is by far the predominant GHG emitted from the types of sources related to the Project, and CO2 emissions can be calculated for these source types with readily available data.

GHG emissions sources can be categorized into two groups: stationary sources, or emissions related to activities that are stationary on the site; and mobile sources, or emissions related to transportation. Stationary sources can be further broken down into direct sources and indirect sources. Direct sources include GHG emissions from fuel combustion, and indirect sources include GHG emissions associated with electricity and other forms of energy that are imported from off-site power plants via the regional electrical grid or local steam distribution system for use on-site.

The GHG Policy requires the Proponent to calculate and compare the GHG emissions for two cases; base and proposed, each of which considers stationary source and transportation components.

8.1.2 Stationary Sources

The base case is the baseline from which progress in energy use and GHG emissions reductions is measured. Per the GHG Policy, the baseline is a building designed to meet the applicable state building code (Code) that is in effect at the time the ENF is filed.

That edition of the Code will remain the baseline for all future development energy modeling for GHG Policy compliance. The baseline is a reference point from which to measure the effectiveness of energy efficiency improvements in the proposed development.

The Code at the time of this filing is the 9th Edition, amended to incorporate the building energy provisions of International Energy Conservation Code (IECC) 2015. This, together with the guidance of the modeling protocol of ASHRAE 90.1 Appendix G, defines the baseline for this GHG analysis.

For the stationary sources component, Case 2 presents the proposed Project including GHG mitigation measures anticipated to be incorporated into the building designs.

At a minimum, all Project buildings subject to the Commonwealth's Stretch Energy Code will achieve a ten percent reduction in energy use from a baseline of IECC 2015 (ASHRAE 90.1-2013) and will comply with the Stretch Code as required by the City of Boston.

8.1.3 Mobile Sources

The mobile source GHG analysis was developed using the traffic study presented in Chapter 2.0. Transportation-related GHG emissions are presented for four typical cases: 2019 Existing, 2026 No-Build, 2026 Build and 2026 Build with Mitigation.

For the GHG analysis, the Proponent can only take credit for improvements above and beyond the Project at its minimum requirements ("base" case). However, traffic is expected to change due to other development in the area. Thus, the difference between the Build cases and the No-Build case are the GHG emissions attributable to the Project.

The transportation analysis for the 2026 Build with Mitigation case includes the positive effects of any Transportation Demand Management (TDM) program elements as well as any roadway and signalization improvements proposed by the Proponent, as outlined in Chapter 2.

8.1.4 Project Overview

The Project is a mixed-use project that prioritizes affordable housing, and in fact, the residential component is 100% affordable. The Project has a total area of up to approximately 426,500 gross square feet including a hotel and residential tower fronting Tremont Street and a garage extension connecting to the existing Tufts Shared Services, Inc. garage on the northern edge of the site. Active uses will occupy the ground floor along Tremont Street with a pedestrian walkway to a landscaped courtyard at the center of the site. Ground floor uses include the residential lobby, a hotel lobby and café or retail space, an accessible pedestrian walkway (with limited access available to Project service vehicles), leading to a proposed courtyard, and a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library.

As the building designs will be refined through the City's and community input, the design and program may evolve through that process. Additionally, the Project is seeking City and State funding and is therefore subject to Per-Unit total development cost limitations. The Proponent will have to evaluate economic viability of the various components of the building to meet the City and State funding limits.

8.1.5 DOER Comments

The majority of the Draft EIR scope centers on the recommendations made by DOER in their ENF comment letter. They are:

- Electrification of space and water heating with heat pump/VRF systems;
- Passive House (PHI or PHIUS method);
- Maintain envelope integrity with framed, insulated walls with continuous insulation above code minimum levels;
- Avoid glass curtain wall assemblies and excessive windows;
- Energy recovery ventilation and waste-water systems; and
- LED lighting and integrated lighting controls.

The following sections address these and additional comments.

8.1.6 Electrification of Space and Water Heating

The mechanical design has been thoroughly evaluated for any opportunities to reduce GHG emissions. Various mechanical alternatives were modeled, including selective and comprehensive electrification strategies. As the electric grid is projected to continue its downward GHG emissions trend due to a greater reliance on renewable sources as time goes on, electrification of HVAC systems would ensure Project GHG emissions mirror that downward trend. The design team has considered available incentives and operational savings in evaluation of these alternatives.

<u>Proposed Case</u>

In the residential units and hotel guestrooms, high efficiency vertical stack water source heat pumps (WSHPs) tempered with condensing gas fired boilers and variable speed evaporative cooling towers will be utilized for space heating and cooling. Condensing domestic water heaters will supply the domestic hot water. Commercial spaces will be served by variable air volume units and back of house spaces by water cooled DX units or heat pumps.

Electric Alternatives

Numerous electric options have been studied for the Project. Alternative 1 tests air-cooled variable refrigerant flow (VRF) in the residential units, keeping WSHPs in the Hotel. This alternative showed improved GHG reduction. Alternative 2 tests air-cooled variable refrigerant flow (VRF) in the residential units and water-cooled VRF in the Hotel portion. Again, GHG reduction was improved. Please refer to Section 8.1.12 for further detail and modeling output for each of these alternatives.

Air source heat pumps (ASHPs), especially cold climate ASHPs, are generally available in small sizes suitable for homes and small multifamily apartment building. Electric water heating for projects of this scale is not typical. Large commercial size equipment required for large residential and hotel developments like this project have limited availability in the US. The equipment that is available at this scale, including AERMEC NRB and NRL units, do not have a cold climate option and will generally not produce hot enough air when ambient temperatures drop below 20^{o} Fahrenheit, requiring additional equipment that relies on electric resistance or natural gas. Because these heat and hot water systems have not been widely adopted there is still a cost premium associated with them.

For Alternative 1, Residential VRF, the utility savings would equal approximately $38 thousand dollars over the proposed WSHP scheme. State AECs would equal approximately $230 thousand dollars. For Alternative 2, Residential VRF, Hotel Water-cooled VRF, the utility savings would equal approximately $62 thousand dollars over the proposed WSHP scheme. State AECs would equal approximately $458 thousand dollars. Please refer to Attachment G for AEC calculations.

While these electric alternatives yield varying levels of GHG reduction over the proposed case, each has mechanical and economical drawbacks. ASHPs require refrigerant piping from the roof to each floor. The height of the tower will exceed the maximum recommended refrigerant run length. Given the affordable nature of this building, space cannot be removed from each floorplate to allocate space for ASHPs on each floor. The proposed design currently includes individual high-efficiency gas-fired heaters, which are easy to maintain and have a low first cost. ASHPs would have a higher upfront cost. While State and Utility incentives decrease this capital cost, utility savings are realized by the tenants. Thus, the upfront cost does not pay back to the owner/developer. Selective electrification will continue to be evaluated as the design progresses. If these strategies are deemed to be economically viable, they will be further evaluated during the design phase.

8.1.7 Passive House

The Project has been evaluated for Passive House design. Newly released MassSave incentives, if available at the time of construction, would help to offset the added cost of Passive House. Steven Winters Associates (SWA) was retained to perform a Passive House Analysis on the Project. Please refer to Attachment G for their Passive House report.

Some of the advanced energy conservation measures proposed for the building include:

- 24 percent window to wall ratio;
- High-efficiency water-source heat pumps;
- High-efficiency wall assembly;
- Energy recovery system; and
- Reduced lighting power density.

A Passive House Alternative was modeled for the Project. Results indicate that a Passive House project would reduce GHG emissions by approximately 33% compared to the Base case. Please refer to the modeling results in Section 8.1.12 for additional details.

A preliminary cost analysis has been performed to evaluate the economic viability of Passive House for the Project. Please refer to Table 8-1.

Table 8-1 Parcel P 12 C Passive House Cost Estimate

Description	Unit	Value	Remarks
Residential Area	SF	190,000	
Number of units		171	
Passive House Incremental Cost per SF	$/SF	$8.88	Estimated added-cost over the Proposed Case
Total Upfront Incremental Cost	$	$1,687,200	
MassSave Passive House Incentives	$	($513,000)	Potential for $3,000 per unit if certified
AEC Incentives	$	($384,750)	includes Passive House bonus multiplier
Net Capital Cost for Passive House	$	$789,450	
Annual Utility Cost Savings	$/year	$90,615	Estimated annual cost savings over Proposed Case
Simple Payback	years	8.7	If Owner/Developer realized operational saving
Simple Payback to the Owner/Developer		Never	Added cost of Passive House does not pay back for the Owner/Developer

As indicated above, after factoring in currently available incentives, the payback period for a Passive House residential building could be approximately 8.7 years, if the owner/developer benefited from reduced operational savings, which they do not. This extended payback period is the most likely explanation for the slower adoption for market-driven Passive House projects that do not have institutional investment horizons or that are not supported by significant financial incentives, zoning bonuses or subsidies. This preliminary cost estimate is based on a figure of $8.88 per square foot. Given the expected $81.1 million capital cost of the residential portion of the project over 190,000 sf, $8.88 represents a 2% added cost. It has been the Proponent's experience that Passive House construction on a high-rise tower would likely increase costs by upwards of 3%. Therefore, the actual cost of Passive House for this Project would likely be significantly higher than described above.

Additionally, the Project prioritizes affordable housing and seeking City and State funding and is therefore subject to a Per-Unit total development cost limitation. While the State and Utility incentives make the Passive House case stronger, the majority of these incentives are not awarded until the project is complete and cannot be considered a guaranteed funding source, meaning the full $1.68 Million dollar added cost of Passive House would be included in the Project financials. The added cost of Passive House increases the total development cost beyond the allowed per-unit cost limits.

The Passive House analysis revealed the following considerations relative to implementation of Passive House on the residential portion of the Project:

- ♦ Passive House can achieve meaningful energy use and GHG reductions.
- ♦ Passive House can provide attractive benefits to occupants including: noise reduction, indoor air quality improvements, thermal comfort improvements and higher quality doors and windows.
- ♦ There are currently available incentives that can reduce the payback periods associated with Passive House.
- ♦ Passive House comes at a cost premium and payback periods are significant.
- ♦ The owner/developers do not see a return on their Passive House investment through reduced annual energy costs because tenants pay the electric and gas expenses.
- ♦ The local construction market, building trades, designers and lenders have limited familiarity or experience with projects seeking Passive House certification at any scale and the attendant benefits, costs and risks. Thus, the pool of qualified professionals who can deliver a building to market is limited. This increases the cost of Passive House projects and potentially acts as a barrier to broader market adoption.
- ♦ While incentives help to offset the added cost of Passive House, their late award and incentive-based nature of this money means it cannot be included in the capital funding analysis of the Project.

The Proponent will continue to evaluate Passive House and will seek to incorporate Passive House principles into the Project. As design progresses, the Proponent will continue to evaluate the Passive House Study accordingly.

8.1.8 High Performing Envelope Construction

A high-performing building envelope is essential to any emissions reduction strategy. The design team has endeavored to maximize envelope performance by implementing the measures detailed below.

Limiting or eliminating use of glass “curtain wall” and spandrel assemblies

There is no glass curtain wall within the tower and only the street level retail portion of the Project has storefront/curtain wall systems.

Maximizing framed, insulated walls sections

Most of the vertical walls are framed and insulated.

Minimizing window areas

The building will have a window-to-wall ratio (WWR) less than 24%.

Reducing air-leakage

For modeling purposes, the air leakage rate has been held at the Reference Building rate of 0.038 cfm50 per square foot of envelope.

Table 8-2 details the expected envelope performance of the Project. Please refer to Attachment G for additional modeling input details.

Table 8-2 Parcel P 12 C Envelope Performance

Measure	Baseline		Proposed	
	%	U	%	U
Framed & insulated wall	76	0.055	76	0.050
Spandrel	0	-	0	-
Vision glass	24	0.42	24	0.42
Aggregate vertical assembly	100	0.143	100	0.139
Percent Improvement				13.9%

8.1.9 Energy recovery ventilation and waste-water systems

Ventilation Energy Recovery

Ventilation energy recovery will be provided through a central energy recovery ventilator equipped with a 75% efficient total energy recovery wheel that preheats and precools the entering outdoor air with toilet exhaust. As the supply air CFM will be greater than the exhaust CFM, the net operating efficiency of the wheel will be 60%.

Wastewater Energy Recovery

Energy recovery from wastewater has not been widely used in the Boston market and most engineers and contractors are not familiar with it. This technology would typically require dual sanitary waste systems throughout the building: one for toilets and one for showers/sinks so that heat can be recovered from shower/sink drains carrying warm water separate from cold and solid waste laden sanitary drainage from toilets. In addition, the heat recovery plant will include multiple pieces of equipment including sump tanks, pumps, stainless steel double wall heat exchangers, etc. which will result in added up-front and installation expenses. Given the affordable nature of this Project, wastewater heat recovery will not be utilized on the Project.

8.1.10 LED lighting and integrated lighting controls

All common and amenity spaces with glazing exposure will be designed to include daylight photocell sensors wherever possible. Vacancy sensors will automatically shut off lighting to spaces within 20 minutes of occupants leaving a common space with enclosed partitions. In addition, high efficacy fixtures will be selected to reduce the connected load by at least 20% in all common spaces.

8.1.11 Maximizing Rooftop Solar Photovoltaic (PV) Readiness

Residential

The residential building is tall and narrow. The roof is approximately 9,100 sf, the majority of which will be covered with mechanical units. There will likely be little space for a roof-top PV array.

Garage

The attached parking garage has an approximate 9,900 sf top level. Shadow studies have been performed on the parking garage, please refer to Section 3.2. They are generally favorable, though the extent of potential PV area has yet to be determined. Additionally, the Project is located in an area where the grid cannot accept excess power generated on-site. Nevertheless, the Proponent is committed to making the top level of the parking structure PV ready, meaning structurally capable of accepting a future PV canopy.

A canopy installation of approximately 9,900 sf would yield a 76 kW system. This system could be capable of generating 99 MWh annually. This equates to a GHG reduction of approximately 33.8 tons.

8.1.12 Building Energy Modeling

Building energy modeling was performed by Cosentini. Modeling was conducted using the latest version of eQuest, following the protocol of ASHRAE 90.1, Appendix G. To properly capture massing, fenestration, and other variables, the proposed building was modeled.

The Baseline Cases represent the buildings built to the standards of IECC 2015 (ASHRAE 90.1-2013) and other parameters as required by ASHRAE 90.1-2013, Appendix G. The base case includes three IECC Section C406.1 measures as required by the anticipated Stretch Energy Code update, 780 CMR. The Proposed Case represents the Project with the features described above.

Modeling inputs and results are discussed further in the Table of Modeling Input, included in Attachment G. Attachment G also contains the eQuest output tables for each case.

Modeling results are summarized in Table 8-3. Compared to code-compliant buildings, the Project is expected to decrease GHG emissions by approximately 15.9%, or approximately 268 tons of CO_2/year.

Energy Use Intensity (EUI) is a measure of annual building energy use per square foot of conditioned space. EUI values for the Project and Alternatives are included in Table 8-3.

8.1.13 Incentives

This past July, the sponsors of MassSave announced new Passive House Incentives and assistance to support the construction of multi-family high-rise buildings (four stories or higher). This incentive program offers feasibility study, energy modeling and pre and post-construction certification incentive programs for multi-family mid-rise and high-rise buildings.

The Project team engaged MassSave, through both Eversource and ICF, early in the incentive process to determine eligibility for a Passive House feasibility study. Upon confirmation that MassSave would fund all of the feasibility study, the team hired the renowned Passive House firm of Steven Winter and Associates to conduct a Passive House feasibility study.

On Monday, July 29, 2019, the team conducted a Passive House charrette with the design team, development team, and representatives from both ICF and Eversource. This charrette identified what systems could be used and façade performance metrics in order to achieve Passive House certification through Passive House International (PHI).

In addition, State Alternative Energy Credits (AECs) have been estimated for both electric alternatives and as part of the Passive House study. This revenue stream will be used to inform the selection and implementation of energy efficiency measures as the Project advances through design.

MassCEC incentives have been phased out for heat pump and VRF systems. The team will continue to engage with MassCEC to take full advantage of any new incentives that may apply to the Project. Please refer to Attachment G for AEC calculations.

8.1.14 Green Vehicle Infrastructure

Recent European Climate Foundation-commissioned studies indicate that replacing a fossil fuel-powered vehicle with an electric vehicle can cut that vehicle's lifetime GHG emissions by half. The Proponent recognizes the opportunity to make a significant impact to Project-wide GHG reductions by encouraging the use of Green Vehicles.

The Project hopes to achieve the LEED Green Vehicles credit. In order to comply with this credit, the Project must designate a minimum of 5% of all parking spaces as preferred parking for green vehicles. The Project will also comply with Option 1 for "alternative fuel stations" as outlined below.

Option 1 – Electric Vehicle Charging. To comply with this credit path, the Project will incorporate electric vehicle supply equipment at a minimum of 2% of all parking spaces, in addition to the green vehicle designated spaces referred to above.

8.1.15 Project GHG Mitigation Technologies

The GHG Policy requires the Proponent to identify, evaluate, and discuss mitigation measures that could reduce GHG emissions. These potential mitigation technologies have been summarized in The GHG Mitigation Technologies Matrix, included in Attachment G.

In the table, each building use is represented, and the applicability of each technology is characterized as:

- P – included in the design and building energy modeling of the Proposed case;
- A – an alternative that is preliminarily evaluated in this analysis;
- S – to be studied later as building designs progress; or
- X – rejected as a technology that is either not applicable to the use or is deemed to be technically or economically infeasible.

Table 8-3 Parcel P12 C Building Energy Performance

Parcel P12C Residential Building						
Modeled Conditioned space	311,000	sf				
Design Conditioned space	311,000	sf				
Factor	1.0					
		Baseline Case (ASHRAE 90.1-2013, App. G)	**Proposed WSHP**	**Alternative 1: Residential VRF, WSHP Hotel**	**Alternative 2: Residential Air Cooled VRF, Hotel Water Cooled VRF**	**PH Alternative WSHPs with Passive House Envelope**
DIRECT (NATURAL GAS)		MMBtu/yr	MMBtu/yr	MMBtu/yr	MMBtu/yr	MMBtu/yr
Space Heating		8,901	4,316	2,335	1,481	1,444
Domestic Hot Water		3,881	3,263	3,263	3,263	3,263
Misc. Equipment		0	0	0	0	
	subtotal	12,782	7,579	5,598	4,744	4,707
INDIRECT (ELECTRICITY)		MWh/yr	MWh/yr	MWh/yr	MWh/yr	MWh/yr
Lights		782	679	679	679	657
Task Lights		0	0	0	0	0
Misc. Equipment		685	685	685	685	685
Space Heating		0	246	307	332	3
Space Cooling		451	343	222	179	346
Heat Rejection		0	7	2	0	5
Pumps & Aux		19	177	95	6	82
Vent Fans		810	719	719	719	718
Refrig. Display		0	0	0	0	0
HT Pump Suplemental		0	0	51	73	0
Domestic Hot Water		0	0	0	0	0
External Usage		0	0	0	0	0
	subtotal	2,747	2,855	2,759	2,673	2,495
ENERGY USE INDEX	PNNL reference[3]	kBtu/sf/yr	kBtu/sf/yr	kBtu/sf/yr	kBtu/sf/yr	kBtu/sf/yr
	73.3	71.2	55.7	48.3	44.6	42.5
Diff, % (compared to baseline)			**-22%**	**-32%**	**-37%**	**-40%**
GHG EMISSIONS		tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
Direct	Gas-burning	748	443	327	278	275
Indirect	Electricity	937	974	941	911	851
	Total	1,685	1,417	1,268	1,189	1,126
	Diff, tpy		**-268**	**-416**	**-496**	**-558**
Diff, % (compared to baseline)			**-15.9%**	**-24.7%**	**-29.4%**	**-33.1%**
CO_2 Emission Factors:						
Electricity [1]	682	lb/MWh				
Natural Gas [2]	117	lb/MMBtu				

[1] 2016 ISO New England Electric Generator Air Emissions Report

[2] EIA Fuel Emissions Factors, Weighted National Average (1029 Btu/scf)

[3] Pacific Northwest National Laboratory study, Massachusetts Zone 5A, ASHRAE 90.1-2013, Mid-Rise Apt.

8.2 Mobile Source of Greenhouse Gas Emissions

As part of the greenhouse gas evaluation, emissions of carbon dioxide from regional traffic associated with the Project were evaluated.

8.2.1 Traffic GHG Analysis

In accordance with the MEPA GHG Policy, GHG emissions were estimated for mobile sources within the transportation study area (see Chapter 2 for the transportation analysis). For mobile source GHG emissions, the methodology follows the same methodology that is outlined in MassDEP guidance for mesoscale analyses.[1] The analysis includes a comparison of the future Build conditions to the No-Build condition. If emissions are greater for the Build conditions, reasonable and feasible mitigation measures will be evaluated. The methodology and parameters for the mesoscale analysis follow methodology approved by MassDEP.

The mesoscale analysis performed for the Project predicts the change in regional CO_2 emissions due to the Project. The total vehicle pollutant burden was estimated for the 2019 Existing conditions and the No-Build and Build conditions for the year 2026. Traffic conditions are described in more detail in Chapter 2.

The EPA's MOVES computer program was adopted in 2013 to supersede Mobile 6.2 for traffic emissions analysis. In April 2014, MassDEP provided the state-specific inputs to be able to run MOVES, completing the transition. MOVES was used to estimate motor vehicle emission factors of CO_2e on the roadway network in the Project area. A peak travel day (estimated to be a weekday in March) was used in MOVES. Daily and yearly emission estimates were calculated using the vehicle count data, mileage between intersections, modeled signalized intersection delay times, and emission factors.

The traffic volumes provided in Chapter 2 form the basis of the study. Peak hour traffic volumes were provided by the transportation consultant. Estimates of Average Daily Trips (ADT) were made from the peak hour volumes assuming a 10% K-Factor. Average speeds were assumed for all roadways. Distances for the links were estimated using Google Earth.

Average per-vehicle idle times were based on delay times reported in the SYNCHRO intersection modeling output reports provided by Howard Stein Hudson (see Chapter 2) to calculate emissions from idling vehicles. The mobile source GHG totals were calculated from preliminary traffic analyses. It is expected that GHG emissions differences associated with the final design would yield similar conclusions.

All related calculations, including the 2019 and 2026 emissions estimates, are presented in Attachment E.

---

[1] MassDEP, Guidelines For Performing Mesoscale Analysis Of Indirect Sources, May 1991.

8.2.2 *Traffic GHG Analysis Results*

Table 8-4 represents the difference between the Existing case and the future No-Build case (i.e., traffic expected without the addition of the Project to the area). Anticipated improvements in vehicle engine and emissions technologies, which are expected to reduce the per-vehicle emission rates, typically reduce future emissions. This results in a 16% reduction in GHG, even with increased traffic from general growth from 2019 to 2026.

Table 8-4 Regional Traffic GHG Emissions Analysis Summary (No-Build)

Pollutant	*CO_2e (lbs/day)*	*CO_2e (tons/yr)*
2019 Existing	5,071	925
2026 No-Build	4,247	775
Difference Difference (%)	-823 -16%	-150 -16%

Table 8-5 represents the differences between the No-Build case and the Build case (i.e., traffic associated with the addition of the Project to the area without any Proponent-proposed mitigation).

As shown, the 2026 Build condition exhibits an increase of CO_2e emissions compared to 2026 No-Build conditions. This is due to an increase in vehicular traffic and subsequent increased delay times generated by the Project alone. The increased traffic results in increases of approximately 5% of CO_2e emissions in the Build condition compared to the No-Build condition.

Table 8-5 Regional Traffic GHG Emissions Analysis Summary (Build)

Pollutant	*CO_2e (lbs/day)*	*CO_2e (tons/yr)*
2025 No-Build	4,247	775
2025 Build	4,470	816
Difference Difference (%)	223 5%	41 5%

There is no traffic mitigation proposed for this Project.

8.2.3 *Summary*

Table 8-6 shows the details of the GHG analysis from case to case. Changes are based on the prior case. Vehicle miles traveled (VMT) represents the approximate mileage of all vehicles traveling on the modeled roadway network, and the net VMT change represents the difference from the prior case. A zero change in VMT means there are no vehicles added or removed from the network for that case. Net delay represents the time sum of all idle traffic at all network intersections over the course of a day. Increases in intersection volumes without any revisions to the signal network tend to increase idling for vehicles waiting for signal lights to change. Typically, mitigation includes adjusting these signals to better handle traffic flow, and in turn reducing delay times and, as a result, idling emissions.

Table 8-6 Regional Traffic GHG Emissions Analysis Summary

	units	*2019 Existing*	*2026 No-Build*	*2026 Build*
Daily VMT	veh-miles/day	4,783	5,036	5,301
Net VMT Change	veh-miles/day	-	253	266
Net Delay	veh-hrs/day	78	90	94
Net Delay Change	veh-hrs/day	-	12	5
Roadway CO_2e	tpy	820	680	716
Intersection CO_2e	tpy	106	95	100
Net CO_2e Emissions	tpy	925	775	816
Net CO_2e Change	tpy	-	-150	41

Greenhouse gas emissions reductions through different build alternatives are measured against the emissions attributable to the base project. Therefore, for mobile source GHG emissions, the emissions due to background traffic must be removed. Table 8-7 shows the net emissions with the 2026 No-Build case results removed from the Build case.

Since there is no traffic mitigation proposed for this Project, there is no additional GHG improvement over the Project.

Table 8-7 Project Traffic GHG Emissions Analysis Summary

	units	*2026 Build minus 2026 No-Build*
Daily VMT	miles/day	266
Net Change	miles/day	-
Net Delay	hrs/day	4.5
Net Change	hrs/day	-
Roadway CO2e	tpy	36
Intersection CO2e	tpy	5
Total CO2e Emissions	tpy	41
Net CO_2e Change	tpy	-
Percent Change		-

8.3 Summary and Mitigation Commitments

8.3.1 Project GHG Summary

Table 8-8 presents a composite of the building GHG emissions for the Baseline and Proposed cases.

Table 8-8 Project GHG Emissions Summary

	Baseline	Proposed	Difference	
	tons/yr			Percent Change
Stationary Sources	1,685	1,417	-268	-15.9%
Mobile Sources	41	41	0	0%

8.3.2 Proponent's Commitments to GHG Reduction

The Proponent has detailed their commitments to mitigate Project GHG emissions. Additional mitigation measures have not been quantified, primarily because the degree of accuracy or the reliability of the quantification method is uncertain.

The Proponent is committed to environmental stewardship. As design develops further, the Proponent expects that additional technologies described previously, or possibly new technologies developed in the interim period, may be adopted that will further decrease GHG emissions, but these are not yet ripe for selection. The Proponent will encourage the continued evaluation of energy efficiency and renewable energy measures throughout the life of the Project.

The Proponent is committed to the following mitigation elements for the Project:

- High performance building envelopes;
- Light or reflective roofs;
- Heat or Energy Recovery;
- Demand-controlled ventilation;
- Reduced lighting power densities;
- High-efficiency HVAC equipment;
- High performance exterior lighting;
- Energy Star appliances;
- PV-Ready garage;
- Low-flow fixtures;

- ♦ Recycling collection areas; and
- ♦ Construction waste recycling.

The Proponent has included in the design of the building, all feasible GHG emissions mitigation in order to avoid, reduce, minimize, or mitigate damage to the environment.

The Proponent is committed to implementing the energy efficiency and GHG emission reduction measures presented in this analysis but must retain an amount of design flexibility to allow for changes that will inevitably occur as design progresses. If, during design of the buildings, a specific combination of design strategies proves more advantageous from an engineering, economic, or space utilization perspective, the design of the buildings may vary from what has been described herein. Energy performance minima and associated GHG emission reductions will be adhered to.

Upon completion of the building, the Proponent will submit a self-certification to the MEPA Office, prepared in accordance with the GHG Policy. This certification will identify the GHG mitigation measures incorporated into the building and will illustrate the degree of GHG reduction from a Baseline case, as Baseline is defined herein, and how such reductions are achieved. Details of the Proponent's implementation of operational measures will also be included.

Chapter 9

Coordination with other Governmental Agencies

9.0 COORDINATION WITH OTHER GOVERNMENTAL AGENCIES

9.1 Architectural Access Board Requirements

An Accessibility Checklist and related plans are included in Attachment H.

9.2 Massachusetts Environmental Policy Act (MEPA)

The Project is undergoing review in accordance with the requirements of the Massachusetts Environmental Policy Act, MGL c. 30, §§61-62H (MEPA), and the MEPA regulations at 301 CMR 11.00 (MEPA Regulations). MEPA applies to certain actions undertaken and certain permits granted by agencies, departments, boards, commissions, and authorities of the Commonwealth of Massachusetts and other authorities or political subdivisions of the Commonwealth. According to the MEPA Regulations, MEPA review is required if a project exceeds certain thresholds specified in the MEPA Regulations and the project involves a state agency transferring an interest in real property, providing financial assistance or issuing a permit or approval. MEPA review is generally only required if a state agency approval is required and the project exceeds a MEPA threshold. Specifically, pursuant to 301 CMR 11.01(2)(b), the MEPA office only has jurisdiction when "the subject matter of the review threshold is conceptually or physically related to the subject matter of one or more required [permits from a state agency]."

The Project is subject to MEPA and this Draft EIR/Expanded PNF is being filed in part, in response to the Certificate issued on the Environmental Notification Form outlining the Scope of the Draft EIR.

9.3 Massachusetts Historical Commission State Register Review

The Project will require review by MHC under State Register review regulations (950 CMR 71.00).

The MHC has review authority over projects requiring state or federal licensing, permitting and/or approvals, or utilize state or federal funding. The Proponent initiated review of the Proposed Project by MHC via the filing of the ENF as part of the MEPA process. In an August 12, 2019 letter, following review of the ENF, MHC requested that the Proponent conduct shadow studies to assist in determining the effects of shadows on the Wang Theatre, Wilbur Theatre, Shubert Theatre, Charles River Playhouse, and the Bay Village Historic District. The Proponent has submitted a copy of this PNF/DEIR including shadow studies to the MHC.

9.4 Other Permits and Approvals

Section 1.8 provides a list of agencies from which it is anticipated that permits and approvals for the Project will be sought.

Chapter 10

Proposed Section 61 Findings & Mitigation Summary

10.0 PROPOSED SECTION 61 FINDINGS & MITIGATION SUMMARY

10.1 Introduction

M.G.L.c.30, s.61 requires that "[a]ll authorities of the Commonwealth … review, evaluate, and determine the impact on the natural environment of all works, projects or activities conducted by them and … use all practicable means and measures to minimize [their] damage to the environment. … Any determination made by an agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the project and a finding that all feasible measures have been taken to avoid or minimize said impact." Each state agency that issues a permit for the Project shall issue a Section 61 Finding in connection with permit issuance, identifying mitigation that is relied upon to satisfy the Section 61 requirement. A proposed Section 61 Finding is provided in Section 10.3, and a table of mitigation measures is included as part of the Section 61 Finding. All mitigation will be the responsibility of the Proponent. Section 1.4 includes a description of the Project Benefits.

10.2 Anticipated State Permits and Approvals

Table 10-1 identifies the Agencies that are expected to take Agency Action on the proposed Project and, therefore, issue Section 61 Findings. It also identifies the Agency Actions anticipated to be required.

Table 10-1 Agency Actions Required for the Project

Agency Name	State Action/Permit
Massachusetts Historical Commission	Determination of No Adverse Effect
Massachusetts State Building Code Appeals Board	Variances
Massachusetts Architectural Access Board	Variances
Massachusetts Water Resources Authority	Construction Dewatering Permit
Boston Planning and Development Agency	Ground Lease
Department of Housing and Community Development	Affordable Housing Financial Assistance
MassHousing and/or MassDevelopment	Affordable Housing Financial Assistance

10.3 Proposed Section 61 Finding

Project Name	Parcel P-12C
Project Location	286-290 Tremont Street
Project Proponent	288 Tremont Street Partners LLC, A collaborative partnership between Asian Community Development Corporation, Corcoran Jennison Company, Inc., MPB Tremont LLC (an affiliate of MP Boston) and Tufts Shared Services, Inc.,
EEA Number	16072
Date Noticed in Monitor	July 24, 2019

The potential environmental impacts of the Project have been characterized and quantified in the ENF dated July 24, 2019, which is incorporated by reference into this Section 61 Finding. Throughout the planning and environmental review process, the Proponent has been working to develop measures to mitigate significant impacts of the Project. Upon review of the proposed mitigation measures, which are to be carried out in cooperation with state agencies, the [Agency] finds that there are no significant unmitigated impacts.

The Proponent recognizes that the identification and implementation of effective mitigation throughout the life of the Project is central to its responsibilities under the Massachusetts Environmental Policy Act (MEPA). Accordingly, the Proponent has prepared the annexed Table of Impacts and Mitigation Measures that specifies, for each potential state permit category, the mitigation measures that the Proponent will undertake.

Now, therefore, [Agency], having reviewed the MEPA filing for the Project, including the mitigation measures itemized on the annexed Table of Impacts and Mitigation Measures, finds pursuant to M.G.L C. 30, S. 61, upon the implementation of the aforesaid measures, all practicable and feasible means and measures will have been taken to avoid or minimize potential damage from the project to the environment.

____
[Agency]

____
[By]

____
[Date]

Table 10-2 describes the measures to be implemented to mitigate the effects of the Project related to the required state actions and the schedule for implementation.

Table 10-2 Summary of Mitigation Measures

<table>
<tr><th>Mitigation</th><th>Responsible Party</th><th>Schedule</th><th>Cost</th></tr>
<tr><td colspan="4">Overall Project Impacts on the Community</td></tr>
<tr><td>The Project's proposed public benefits, which will be determined through consultation with the Boston Planning and Development Agency and the community, are in acknowledgement of the Project's proposed impacts on its surroundings. The Project's proposed public benefits include construction of up to 171 units of affordable housing. Approximately 110 affordable residential units are a direct result of the Inclusionary Development Policy requirements in the Winthrop Center Project currently under construction in Downtown Boston. All of the housing units will be deed restricted and the City, State, and the Proponent are working together so as to target households earning from 30% to 80% of the Area Mean Income (AMI).</td><td>Proponent</td><td>During design, construction and operation</td><td>Included in overall Project costs</td></tr>
<tr><td colspan="4">Transportation</td></tr>
<tr><td>The Proponent is committed to implementing Transportation Demand Management (TDM) measures to minimize automobile usage and Project related traffic impacts. In addition to the measures described below, the Proponent will continue to work with the City to create a complete street environment along Tremont Street that supports safe facilities for pedestrians, bicycles, and vehicles. The Proponent will encourage the use of alternative travel modes, such as public transportation, bicycling, and walking and has committed to the following measures:
♦ Designating a transportation coordinator to oversee transportation issues, including service and loading and deliveries;
♦ Working with the hotel operator to raise awareness of public transportation, bicycling, and walking opportunities;
♦ Providing orientation packets to new tenants containing information on available transportation, including public transportation routes and schedules, nearby vehicle sharing and bicycle sharing locations, and walking opportunities;
♦ Providing an annual (or more frequent) newsletter or bulletin summarizing transit, ridesharing, bicycling, alternative work schedules, and other travel options; and
♦ Providing information on travel alternatives for employees and visitors via the Internet and in the building lobby.</td><td>Proponent</td><td>During operation</td><td>Included in overall Project costs</td></tr>
</table>

Table 10-2 Summary of Mitigation Measures (Continued)

Mitigation	*Responsible Party*	*Schedule*	*Cost*
Transportation			
Proposed promotions and incentives to encourage bicycle and pedestrian trips are as follows: ♦ Providing bicycle and pedestrian access information via the Project website; ♦ Providing covered, secure bicycle storage for building occupants (approximately 171 secure bicycle spaces for residents) and spaces for hotel employees; ♦ Providing lockers and showers for hotel employees who walk or bicycle to work; and ♦ Providing on-site external bicycle racks for visitors.		During operation	Included in overall Project costs
The goal of the following promotion and incentive measures is to increase public transit use to and from the site: ♦ Providing real-time transit information in the lobbies of all Project buildings; ♦ Providing transit access information on the Project website, including information on bus and subway routes and schedules; ♦ Encouraging employers to subsidize monthly transit passes for on-site full time employees; and ♦ Promoting to the hotel operator that, as employers, they can save on payroll-related taxes and provide employee benefits when they offer transportation benefits such as subsidized public transportation.		During operation	Included in overall Project costs
Cultural Resources			
While the Project is within the viewshed of a number of nearby historic properties due to its height, the mass of the building is minimized by its small frame. The entrances on the east elevation will scale down the building to street level, while maintaining a sense of depth from the sidewalk. The proposed Project is in keeping with the architectural character of the surrounding neighborhood.	Proponent	During design, construction and operation	Included in overall Project costs
The Project complies with the Boston Common and Boston Public Garden shadow laws (Chapter 362 of the Acts of 1990 and Chapter 384 of the Acts of 1992, each as amended by Chapter 57 of the Acts of 2017, “An Act Protecting Sunlight and Promoting Economic Development in the City of Boston”).	Proponent	During design, construction and operation	Included in overall Project costs

Table 10-2 Summary of Mitigation Measures (Continued)

Mitigation	Responsible Party	Schedule	Cost
Cultural Resources			
Wind conditions at most locations studied are predicted to remain comfortable for walking or better. Pedestrian level winds resulting from the Project are not expected to impact nearby historic properties.	Proponent	During design, construction and operation	Included in overall Project cost
Air Quality			
Transportation-related adverse air quality impacts are not anticipated.			
Infrastructure			
During construction, infrastructure will be protected using sheeting and shoring, temporary relocations, and construction staging as required.	Construction manager	During construction	Included in overall Project costs
Water Use			
Water conservation measures such as low-flow toilets and restricted-flow faucets will help reduce the domestic water demand on the existing distribution system. The installation of sensor-operated sinks with water-conserving aerators and sensor-operated toilets in all the commercial area restrooms will be incorporated into the design plans for the Project. Exterior landscaping will consist of native and drought tolerant plants and a high-efficiency irrigation system.	Proponent	During operation	Included in overall Project costs
Wastewater Generation			
The Project will comply with the BWSC 4:1 I/I mitigation program.	Proponent	During design, construction and operation	Included in overall Project costs
Drainage from enclosed garage spaces will be routed to Oil/Water separators and directed to the sanitary sewer system.	Proponent	During design, construction and operation	Included in overall Project costs
All improvements and connections to BWSC infrastructure will be reviewed as part of the BWSC's site plan review process. This process includes a comprehensive design review of the proposed service connections, an assessment of Project demands and system capacity, and the establishment of service accounts.	Proponent	During design, construction and operation	Included in overall Project costs

Table 10-2 Summary of Mitigation Measures (Continued)

Mitigation	*Responsible Party*	*Schedule*	*Cost*
Stormwater			
The Project site is 97 percent impervious under existing conditions, and the Project will likely result in a net decrease in impervious area with the addition of a landscaped courtyard.	Proponent	During design, construction and operation	Included in overall Project costs
The Project will infiltrate at least 1.25 inches of stormwater runoff for the 24-hour storm event over the site impervious area. The Project will be required to infiltrate approximately 3,050 cubic feet stormwater in a recharge system that will likely be located under the courtyard. It will also increase the amount of pervious space on the site, reducing the rate and volume of stormwater leaving the site.	Proponent	During operation	Included in overall Project costs
Greenhouse Gas Emissions and Climate Change			
Ventilation energy recovery will be provided through a central energy recovery ventilator equipped with a 75% efficient total energy recovery wheel that preheats and precools the entering outdoor air with toilet exhaust.	Proponent	During operation	Included in overall Project costs
All common and amenity spaces with glazing exposure will be designed to include daylight photocell sensors wherever possible.	Proponent	During operation	Included in overall Project costs
The Project will incorporate a number of innovative sustainability strategies into the planning, design and construction and will strive for LEED Certifiability or higher.	Proponent	During design, construction and operation	Included in overall Project costs
The Project design plans to incorporate climate change adaptation measures, including: ♦ High performance building envelopes; ♦ Light or reflective roofs; ♦ Heat or Energy Recovery; ♦ Demand-controlled ventilation; ♦ Reduced lighting power densities; ♦ High-efficiency HVAC equipment; ♦ High performance exterior lighting; ♦ Energy Star appliances; ♦ PV-Ready garage; ♦ Low-flow fixtures; ♦ Recycling collection areas; and ♦ Construction waste recycling.	Proponent	Included in design, construction and operation	Included in overall Project costs

Table 10-2 Summary of Mitigation Measures (Continued)

Mitigation	*Responsible Party*	*Schedule*	*Cost*
Greenhouse Gas Emissions and Climate Change			
The Project will include low-flow fixtures and water conserving appliances to the extent feasible to minimize the amount of water used by the building's occupants.	Proponent	During operation	Included in overall Project costs
Hazardous Waste			
No reported releases of oil or hazardous materials have occurred within the limits of the Project site. The Proponent will be conducting additional testing to further characterize and classify the soil to be generated from excavation and foundation spoils for off-site removal to appropriate facilities. Materials excavated during construction of the Project will be managed in accordance with applicable regulatory requirements including, a Release Abatement Measure (RAM) Plan under the MCP.	Proponent	During construction and operation	Included in overall Project costs
Construction			
The Proponent intends to follow the guidelines of the City of Boston and the MassDEP, which direct the evaluation and mitigation of construction impacts.	Construction manager	During construction	Included in overall Project costs
The construction contract will provide for a number of strictly enforced measures to be used by contractors to reduce potential emissions and minimize impacts. These measures are expected to include: • Using wetting agents on area of exposed soil on a scheduled basis; • Using covered trucks; • Monitoring of actual construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized; • Minimizing storage of debris on the site; • Periodic street and sidewalk cleaning with water to minimize dust accumulations; • Limit maximum travel speeds on unpaved areas; and • Provide wheel wash stations to limit trackout of soil during the excavation phase.	Construction manager	During construction	Included in overall Project costs

Table 10-2 Summary of Mitigation Measures (Continued)

<table>
<tr><th>Mitigation</th><th>Responsible Party</th><th>Schedule</th><th>Cost</th></tr>
<tr><td colspan="4">Construction</td></tr>
<tr><td>The Proponent is committed to mitigating noise impacts from the construction of the Project. Periodic increased community sound levels, however, are an inherent consequence of construction activities. Construction work will comply with the requirements of the City of Boston Noise Ordinance. Every reasonable effort will be made to minimize the noise impact of construction activities, including:
• Instituting a proactive program to ensure compliance with the City of Boston noise limitation policy;
• Using appropriate mufflers on all equipment and ongoing maintenance of intake and exhaust mufflers;
• Muffling enclosures on continuously running equipment, such as air compressors and welding generators;
• Replacing specific construction operations and techniques by less noisy ones where feasible;
• Selecting the quietest of alternative items of equipment where feasible;
• Scheduling equipment operations to keep average noise levels low, to synchronize the noisiest operations with times of highest ambient levels, and to maintain relatively uniform noise levels;
• Turning off idling equipment; and
• Locating noisy equipment at locations that protect sensitive locations by shielding or distance.</td><td>Construction manager</td><td>During construction</td><td>Included in overall Project costs</td></tr>
<tr><td>The CMP will define truck routes which will help in minimizing the impact of trucks on local streets.</td><td>Construction manager</td><td>During construction</td><td>Included in overall Project costs</td></tr>
<tr><td>Construction methods that ensure public safety will be employed. Techniques such as barricades, walkways, painted lines, and signage will be used as necessary.</td><td>Construction manager</td><td>During construction</td><td>Included in overall Project costs</td></tr>
<tr><td>The Proponent will continue to work and coordinate with the BWSC and the utility companies to ensure safe and coordinated utility operations in connection with the Project.</td><td>Construction manager</td><td>During construction</td><td>Included in overall Project costs</td></tr>
<tr><td>Erosion and sediment control measures will be implemented during construction to minimize the transport of site soils to offsite areas and BWSC storm drain systems.</td><td>Construction manager</td><td>During construction</td><td>Included in overall Project costs</td></tr>
</table>

Table 10-2 Summary of Mitigation Measures (Continued)

Mitigation	*Responsible Party*	*Schedule*	*Cost*
Construction			
All means and methods for performing work at the site will be evaluated for potential vibration impacts on adjoining property, utilities, and adjacent existing structures.	Construction manager	During construction	Included in overall Project costs
Performance criteria will be established in the Project specifications for the foundations and lateral excavation support system with respect to ground vibrations, movements, water-tightness and the construction sequence of the below-grade portion of the work.	Construction manager	During construction	Included in overall Project costs
Geotechnical instrumentation will be installed and monitored prior to and during the below-grade portion of the work to evaluate the performance of the excavation, adjacent structures and utilities, and area groundwater levels.	Construction manager	During construction	Included in overall Project costs
Additional Overall Project Mitigation			
The Project will increase pedestrian and bicycle activity with widened sidewalks, bicycle parking and other site improvements. The improved facilities and slower vehicle travel speeds will result in a safer environment for pedestrians and bicyclists.	Proponent	During operation	Included in overall Project costs
The program includes community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library	Proponent	During operation	Included in overall Project costs
Approximately 680 construction jobs and approximately 90 permanent jobs will be created as a result of the Project.	Proponent	During construction and operation	Included in overall Project costs
The Project will promote economic inclusion and equity in the development by providing Project participation, access and training opportunities to people of color, women and Minority and Women-Owned Business Enterprises (M/WBEs).	Proponent	During design, construction and operation	Included in overall Project costs
MPB Tremont LLC, CJ and TSS will pay at construction completion over $14 million to the BPDA on a present value basis for the land, plus another $5 million from MPB Tremont LLC at construction completion for affordable housing.	Proponent	During design, construction and operation	Up to 19 million
Up to approximately $903,000 in housing linkage fees and $177,000 in jobs linkage fees will be paid by the commercial uses in the Project.	Proponent	During operation	Up to $1,080,000

Table 10-2 Summary of Mitigation Measures (Continued)

Mitigation	Responsible Party	Schedule	Cost
Additional Overall Project Mitigation			
The Proponent will construct new sidewalks adjacent to the Project site in accordance with Boston Complete Streets guidelines and requirements of the Americans with Disabilities Act and Massachusetts Architectural Access Board (ADA/AAB) to the extent feasible.	Proponent	During operation	Included in overall Project costs

Chapter 11

Response to Comments

11.0 RESPONSE TO COMMENTS

11.1 Introduction

This Chapter provides responses to the comment letters from governmental agencies, private organizations and others received on the ENF submitted July 15, 2019. A copy of the Secretary's Certificate is included in this section. Each letter has been assigned an abbreviation; the MEPA Certificate and related comment letters are listed below in Table 11-1. The comment letters are reprinted in this section, and specific comments within each letter are noted in the margin with an abbreviation and a sequential numbering. Following each letter is a listing of the comments accompanied by a response to each.

Table 11-1 Secretary's Certificate and Comment Letters

Commenter	Abbreviation
Boston Water and Sewer Commission	BWSC
Massachusetts Water and Resources Authority	MWRA
Massachusetts Department of Transportation	DOT
Massachusetts Historical Commission	MHC
Department of Energy Resources	DOER

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Charles D. Baker
GOVERNOR

Karyn E. Polito
LIEUTENANT GOVERNOR

Kathleen A. Theoharides
SECRETARY

Tel: (617) 626-1000
Fax: (617) 626-1181
http://www.mass.gov/envir

August 23, 2019

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Parcel P-12C
PROJECT MUNICIPALITY	: Boston
PROJECT WATERSHED	: Boston Harbor
EEA NUMBER	: 16072
PROJECT PROPONENT	: 288 Tremont Street Partners
DATE NOTICED IN MONITOR	: July 24, 2019

Pursuant to the Massachusetts Environmental Policy Act (M.G.L. c. 30, ss. 61-62I) and Section 11.03 of the MEPA Regulations (301 CMR 11.00), I hereby determine that this project **requires** the preparation of a mandatory Environmental Impact Report (EIR). The Proponent should submit a Draft EIR in accordance with the Scope included in this Certificate.

Project Description

As described in the Environmental Notification Form (ENF), the project consists of an approximately 416,500 square foot (sf) mixed use development consisting of a 200-key hotel (130,000 sf), 171 affordable housing units (180,000 sf), 14,000 sf of community space; approximately 2,500 sf of retail/café space and 90,000 sf of garage parking with 374 parking spaces. The parking component of the project will be an extension of the Tremont Street Garage associated with Tufts Medical Center and will be accessed from the Tremont Street Garage entrance to the north of the project. Ground floor uses include the residential and hotel lobbies, retail space, community space and accessible pedestrian walkway leading to a courtyard. The project includes an approximately 7,000 sf courtyard.

The affordable housing will consist of units ranging from 30 to 90 percent of the average median income (AMI). It is anticipated that the Boston Public Library's Chinatown Branch will occupy the community space included in the development.

Project Site

The 0.67-acre project site consists of a surface parking lot with 100 spaces. The site is bounded by the Tufts Shared Services parking garage to the north, a DoubleTree hotel to the south, Tremont Street to the west and a surface parking lot to the east. The project site is located within the South Cove Urban Renewal Area. The site is also located in the City of Boston's Groundwater Conservation Overlay District (GCOD).

Environmental Impacts and Mitigation

Potential environmental impacts are associated with the alteration of 0.67 acres of land; generation of 4,510 new average daily trips (adt) (5,110 adt total); creation of 274 new parking spaces (374 spaces total); 64,779 gallons per day (gpd) of water demand and 58,890 gpd of wastewater generation.

The ENF identifies the following measures to avoid, minimize, and mitigate project impacts: reduction in impervious area of 0.06 acres, installation of a stormwater management system; implementation of transportation improvements including Transportation Demand Management (TDM) measures to minimize single-occupant vehicle (SOV) trips to the site; and energy efficiency measures. Mitigation measures will be further developed through MEPA review.

Jurisdiction and Permitting

The project is undergoing MEPA review and is subject to a mandatory EIR pursuant to 301 CMR 11.03(6)(a)(6) of the MEPA regulations because it requires Agency Actions and will generate 3,000 or more new adt on roadways providing access to a single location. The project also exceeds the ENF threshold at 11.03(6)(b)(14) because it will generate 1,000 or more new adt and involves the construction of 150 or more new parking spaces at a single location. The project is subject to the MEPA Greenhouse Gas Policy and Protocol (GHG Policy).

The project requires review by the Massachusetts Historical Commission (MHC). The project requires a National Pollution Discharge and Elimination System (NPDES) Construction General Permit from the U.S. Environmental Protection Agency (EPA). The project will undergo Article 80B Large Project Review by the Boston Planning and Development Agency (BPDA). The project requires Site Plan Review by the the Boston Water and Sewer Commission (BWSC).

The Proponent is seeking Financial Assistance from the Department of Housing and Community Development (DHCD), MassHousing and/or MassDevelopment; therefore, MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause Damage to the Environment, as defined in the MEPA regulations. These include land alteration, transportation, water demand, wastewater, and climate change.

Review of the ENF

The ENF provided a description of existing and proposed conditions, preliminary project plans, an alternatives analysis and measures to avoid, minimize and mitigate environmental impacts.

The Alternatives Analysis considered a No-Build Alternative, an As-of-Right Alternative and the Preferred Alternative. Under the No-Build Alternative, the property would continue to provide surface parking. The site would remain entirely impervious and would not provide affordable housing, community space or other amenities associated with the Preferred Alternative. The As-of-Right Alternative would include approximately 168,100 sf of residential space (177 units); 55,100 sf of hotel space (122 hotel keys); approximately 9,000 sf of restaurant space and 137 parking spaces. The As-of-Right Alternative would generate 1,930 adt (2,580 less adt than the Preferred Alternative) and would reduce parking by 237 spaces (from 374 to 137). The Preferred Alternative will provide more community benefits than the As-of-Right Alternative.

SCOPE

General

The DEIR should follow Section 11.07 of the MEPA regulations for outline and content,
as modified by this Scope. It should include a detailed description of the proposed project and MEPA.1
describe any changes to the project since the filing of the ENF. The DEIR should clearly identify MEPA.2
the project purpose and goal. The DEIR should identify, describe, and assess the environmental MEPA.3
impacts of any changes in the project that have occurred since the ENF review. The DEIR should MEPA.4
include updated site plans for existing and post-development conditions at a legible scale.

The DEIR should provide a brief description and analysis of applicable statutory and MEPA.5
regulatory standards and requirements and describe how the project will meet those standards. It MEPA.6
should include a list of required State Permits, Financial Assistance, or other State approvals and
provide an update on the status of each of these pending actions. The DEIR should include an MEPA.7
update on local, regional or federal permitting as applicable.

The DEIR should include an updated building program (including an updated summary MEPA.8
of floor area by use, number of stories and maximum height) and accompanying narrative that
identifies changes to the program and describes the process and timeframe for refining the
building program.

Transportation

According to the ENF, the surface parking lot generates 600 adt. The project will generate an
additional 4,510 unadjusted adt or 1,956 new adjusted adt. The ENF indicated that trip generation
was derived from the Institute of Transportation Engineer's (ITE) Trip Generation Manual (10^{th}
Edition) using Land Use Code (LUC) 221 (Multifamily Housing Mid-Rise), LUC 310 (Hotel)
and LUC 590 (Library). The DEIR should describe how the mode share credit was derived. The MEPA.9
ENF identified Massachusetts Bay Transportation Authority (MBTA) transit services in the

project area including the Green Line (at Boylston Station), Orange Line (Tufts Medical Center), Silver Line (Tufts Medical Center) and several MBTA bus routes.

The ENF indicates that the project will not impact State-jurisdictional roadways and the project does not require any State Permits. MassDOT did provide comments on transportation issues. The DEIR should include data prepared in accordance with BTD requirements for BPDA MEPA.10
review for the purposes of evaluating the project's potential impacts on traffic and transportation resources and identifying appropriate mitigation measures. I expect that this data will include a capacity analysis for transit services to determine whether there is sufficient capacity on existing transit services. I recommend that the Proponent consult with MassDOT and the MEPA office on the development of any transit analysis. The DEIR should include a comprehensive TDM MEPA.11
Program that evaluates all feasible measures to reduce trip generation associated with the project. The DEIR should describe any proposed transit improvement in the vicinity of the project that MEPA.12
are being evaluated by MassDOT, the City of Boston and/or the MBTA.

The project will include a total of 374 parking spaces (274 new) which will be used by Tufts Medical Center to address the shortage of parking for patients and visitors. As described in the ENF, dedicated on-site parking will not be provided for the residential, hotel and community space. Valet service will be provided for hotel guests and vehicles will be parked at an existing off-site lot. A vehicle pick-up/drop-off zone is proposed along Tremont Street. As described in MEPA.13
MassDOT's comment letter, the DEIR should provide a parking study that identifies how parking supply for the Preferred Alternative was determined. The DEIR should detail the MEPA.14
relationship between the proposed expansion of the Tuft's parking garage, use of their existing garage, anticipated use by the hotel and residential users and anticipated use by the neighborhood at-large. The number of proposed spaces should be compared to the amount required based on information contained in ITE's Parking Generation (4th Edition) and required by local zoning.

The DEIR should identify the location of any proposed pick-up/drop-off parking areas MEPA.15
on project plans. It should include graphics (and supporting narrative) depicting circulation patterns (vehicles, pedestrian, and bicycles) and assess how changes will be integrated with circulation within the project area. The DEIR should identify pedestrian infrastructure MEPA.16
improvements at study area intersections where necessary, particularly for routes of travel from transit services. Provision of safe and convenient pedestrian and bicycle accommodations throughout the study area should be prioritized as part of the mitigation program.

Stormwater

The DEIR should describe the proposed stormwater management system, including MEPA.17
connection points to off-site stormwater conveyance infrastructure, Best Management Practices (BMPs), and applicable Total Maximum Daily Load (TMDL) compliance requirements (if applicable). The DEIR should describe BMPs proposed to retain and/or recharge stormwater on- MEPA.18
site in accordance with BWSC requirements. The DEIR should identify specific stormwater BMPs to be used in the parking garages to mitigate stormwater runoff, particularly oil separators or similar BMPs.

The DEIR should discuss opportunities to provide low impact design stormwater management measures including, but not limited to, porous hardscape surfaces, rain gardens, vegetative swales, infiltration basins, and tree box filters. The DEIR should discuss opportunities to incorporate these measures into project design and explain, in reasonable detail, why certain measures, which could promote infiltration while reducing impervious surface were not selected. MEPA.19

Water/Wastewater

The project will connect to BWSC water and sewer infrastructure. The project will generate approximately 58,890 gpd of wastewater flow. The DEIR should discuss how the project intends to meet the requirement to offset new flows on a 4:1 basis in accordance with MassDEP, MWRA and BWSC policies and requirements. The Proponent should consult with MWRA and BWSC to develop a mitigation plan. The DEIR should discuss the outcome of these consultations and proposed infiltration/inflow (I/I) mitigation commitments. Comment letters from MWRA and BWSC provide additional guidance on this issue. MEPA.20 MEPA.21

Water demand will be approximately 64,779 gpd. The DEIR should describe water conservation efforts to be incorporated into the project, including, but not limited to, installation of low-flow fixtures, use of captured rainwater or reclaimed wastewater for irrigation, and use of drought-tolerant native landscaping. I refer the Proponent to BWSC's comment letter which identifies additional information to be provided during permitting. MEPA.22

Cultural Resources

As described in MHC's comment letter, the project is in close proximity to the Wang Theatre (BOS.2315), Wilbur Theatre (BOS.2314), Shubert Theatre (BOS.2317) and Charles River Playhouse (BOS.2319) which are listed in the State and National Registers of Historic Places. The project site is also located near the Bay Village Historic District (BOS.BQ) which is listed in the State Register of Historic Places. The DEIR should include a shadow analysis to support a determination regarding the project's effect on historical resources. MEPA.23

Climate Change

Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth (EO 569) was issued on September 16, 2016. EO 569 recognizes the serious threat presented by climate change and directs state agencies to develop and implement an integrated strategy that leverages state resources to combat climate change and prepare for its impacts. The Order seeks to ensure that Massachusetts will meet GHG emissions reduction limits established under the Global Warming Solution Act of 2008 (GWSA) and will work to prepare state government and cities and towns for the impacts of climate change. As noted below, the DEIR should address the potential effects of climate change on the project site.

The GHG Policy and requirements to analyze the effects of climate change through EIR review is an important part of this statewide strategy. These analyses advance proponents' understanding of a project's contribution and vulnerability to climate change. The Proponent should consider cross-cutting measures, such as Passivehouse design, incorporation of MEPA.24

renewables and inclusion of Low Impact Design measures in site design, which can improve the project's resiliency, reduce GHG emissions and conserve and sustainably employ the natural resources of the Commonwealth.

Greenhouse Gas Emissions

The project is subject to review under the May 5, 2010 MEPA GHG Policy. The DEIR should include an analysis of GHG emissions and mitigation measures in accordance with the standard requirements of the GHG Policy, which requires projects to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate these emissions. The analysis should quantify the CO_2 emissions associated with building energy use (stationary sources), transportation-related emissions (mobile sources) and loss of carbon sequestration associated with extensive land alteration. The DEIR should identify and commit to measures to reduce GHG emissions. The Proponent should refer to the GHG Policy for additional guidance on the GHG analysis. I encourage the Proponent to consult with staff from the MEPA office and the Department of Energy Resources (DOER) regarding the analysis prior to submission of the DEIR. MEPA.25 MEPA.26

Stationary Sources

The DEIR should include a GHG analysis that calculates and compares GHG emissions associated with 1) a Base Case corresponding to the 9th Edition of the Massachusetts Building Code; and 2) a Preferred Alternative that achieves greater reductions in energy use and GHG emissions than required by the Building Code. The 9th edition of the Building Code references the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) 90.1-2013 and the International Energy Conservation Code (IECC) 2015. MEPA.27

For each use, the GHG analysis should model energy use, GHG emissions, and mitigation measures associated in accordance with the GHG Policy and comments DOER. The GHG analysis should clearly demonstrate consistency with the objectives of MEPA review, one of which is to document the means by which Damage to the Environment can be avoided, minimized, and mitigated to the maximum extent feasible. The Proponent should identify the model used to analyze GHG emissions, clearly state modeling assumptions for each project element, explicitly note which GHG reduction measures have been modeled, and identify whether certain building design or operational GHG reduction measures will be mandated by the Proponent to future occupants or merely encouraged for adoption and implementation. The DEIR should include the modeling printout for each alternative and emission tables that compare base case emissions in tons per year (tpy) with the Preferred Alternative showing the anticipated reduction in tpy and percentage by emissions source (direct, indirect and transportation). This information should be provided for each building in a format consistent with the example table provided in DOER's comment letter. Other tables and graphs may be included to convey the GHG emissions and potential reductions associated with mitigation measures. MEPA.28 MEPA.29 MEPA.30

The DEIR should present an evaluation of mitigation measures identified in the DOER comment letter. The feasibility of each of the mitigation measures should be assessed for each major project element, and if feasible, GHG emissions reduction potential associated with mitigation should be evaluated to assess the relative benefits of each measure. The DEIR should MEPA.31

explain, in reasonable detail, why certain measures that could provide significant GHG reductions were not selected – either because it is not applicable to the project or is deemed technically or financially infeasible.

The following strategies should be prioritized for adoption: MEPA.32

- Maintain envelope integrity with framed, insulated walls with continuous insulation;
- Avoidance of glass curtain wall assemblies and excessive windows;
- Passivehouse design (PHI or PHIUS method);
- Electrification of space and water heating with heat pump/Variable Refrigerant Flow (VRF) systems;
- Use of energy recovery ventilation and wastewater systems;
- LED lighting and integrated lighting controls.

The DEIR should include a feasibility analysis for the incorporation of Passivehouse for MEPA.33
the office building component of the project that meets either Passive House Institute United States (PHIUS) or Passive House Institute (PHI) standards. Both standards are recognized by the Massachusetts Building Code. Passivehouse is an effective GHG emission reduction strategy and will also provide many attractive benefits to the developer and for the future occupants including greater affordability, indoor air quality improvements, improved resiliency and noise reduction. At a minimum, the Proponent should analyze building envelopes that exceed the prescriptive envelope standards of the Building Code.

Use of electric heat pumps could reduce GHG emissions, reduce operating costs, and may reduce development costs by eliminating infrastructure costs associated with providing gas service to the site. The DEIR should include an analysis that evaluates the feasibility of using MEPA.34
cold-climate air source heat pumps (ASHPs) and VRF equipment for space heating and ASHPs for water heating and documents the associated energy savings and reduction in GHG emissions. The analysis should incorporate the financial incentives identified in DOER's comment letter. If gas is eliminated as a source for space heating and hot water systems, this should be noted in the DEIR. The analysis should include a narrative and data to support the adoption (or dismissal) of ASHPs or VRF equipment for water and space heating.

The DEIR should clarify which areas will be constructed and fitted-out by the Proponent MEPA.35
and which buildings will be fitted-out by future tenants. The DEIR should indicate if building MEPA.36
systems (i.e., HVAC, etc.) will be completed as part of core and shell improvements or left to the tenant or future owner for installation. While I encourage the Proponent to adopt those GHG reduction measures that are integrated into the building's core, shell and infrastructure, I understand that some measures may be transient or dependent on operational procedures implemented by the future occupants. In those instances, the Proponent should consider reasonable measures to educate and create incentives for the tenants to adopt energy efficiency/renewable generation measures. The DEIR should address the Proponent's MEPA.37
commitment to providing energy efficiency consulting services and information and developing Tenant Guidelines and/or green lease agreements that require or strongly support GHG reduction measures. For those components that will be the tenants' responsibility, the DEIR should identify specific strategies to encourage their adoption (e.g. design assistance, financial

incentives, providing a list of approved fit-out material performance standards, etc.). The DEIR MEPA.38
should confirm that the modeling of elements specifically delegated to the tenant fit-out process are consistent with those that will be mandated as minimum requirements in proposed green tenant lease agreements/guidance.

Mobile Sources

The GHG analysis should include an evaluation of potential GHG emissions associated MEPA.39
with mobile emissions sources. The DEIR should follow the guidance provided in the GHG Policy for *Indirect Emissions from Transportation* and use data gathered as part of the traffic study to determine mobile emissions for Existing Conditions, Build Conditions, and Build with Mitigation Conditions. The Proponent should thoroughly explore means to reduce overall SOV MEPA.40
trips. The Build with Mitigation model should incorporate any roadway improvements, MEPA.41
improvements to transit and TDM measures implemented by the project and document the reductions in GHG emissions associated with the mitigation.

Adaptation and Resiliency

The DEIR should provide an analysis and discussion of vulnerabilities of the site to the MEPA.42
potential effects associated with climate change including increased frequency and intensity of precipitation events, and extreme heat events. To assist in this evaluation, the Proponent should review the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan[1] and review data available through the Climate Change Clearinghouse for the Commonwealth.[2]

The DEIR should evaluate incorporation of flood storage to accommodate the likelihood MEPA.43
of extended flood periods, LID elements, further reduction in impervious surfaces, and increased freeboard of at least one foot above base flood levels. In addition, the DEIR should evaluate the MEPA.44
feasibility of: measures to minimize flood intrusion; ground floor use limitations; elevation of infrastructure, electrical equipment and outlet feeds, communication equipment, back-up communication equipment; use of water-resistant materials for structural elements below base flood elevation; emergency power sources, and essential personal safety measures. The benefits MEPA.45
of Passivehouse design to resiliency of the proposed office building should be analyzed and presented. The analysis provided in the DEIR should demonstrate that the project will not exacerbate flooding of adjacent uses and properties.

Construction Period Impacts

The DEIR should identify the anticipated build-out period of the project as a whole and MEPA.46
describe potential project sequencing. It should provide a construction phasing figure and identify anticipated construction schedule and work hours. The DEIR should include a draft MEPA.47
Construction Management Plan (CMP) that identifies BMPs for erosion and sedimentation controls, construction staging areas, traffic management, and air/noise pollution. Due to the MEPA.48
extensive earth movement on-site to achieve final grades for development pads, the Proponent should outline measures to stabilize cleared areas and slopes throughout the site if construction in

[1] http://www.resilientma.org/
[2] https://www.mass.gov/files/documents/2018/10/26/SHMCAP-September2018-Full-Plan-web.pdf

these individual building locations is not imminent subsequent to earth movement activities. The MEPA.49
draft CMP should include appropriate erosion and sedimentation control BMPs. Because the MEPA.50
project is located close to several heavily travelled roadways, excessive dust may be a concern.
The CMP should commit to specific mitigation measures to address this issue. The Proponent MEPA.51
should commit to avoid use of blasting materials that contain perchlorate to avoid impacts to
water quality and wetlands. The DEIR should address potential noise and vibration MEPA.52
impacts associated with blasting and identify appropriate mitigation measures. The DEIR should MEPA.53
discuss specific BMPs to ensure that all drilling and/or blasting will be completed in accordance
with local and State regulations.

The DEIR should identify and describe proposed construction truck traffic routes to and MEPA.54
from the site and provide an estimate of the number of vehicle trips that will be generated during
the construction period. The DEIR should provide information on the emission controls that will MEPA.55
be used for all on-site construction vehicles in an effort to minimize construction vehicle
emissions. The DEIR should provide a discussion on using construction equipment with engines MEPA.56
manufactured to Tier 4 federal emission standards or best available control technology (BACT).
I remind the Proponent that Ultra Low Sulfur Diesel (ULSD) fuel be used in all off-road MEPA.57
construction equipment. The DEIR should confirm that the project will require its construction
contractors to use ULSD fuel in off-road equipment and indicate whether it will incorporate
additional measures to minimize construction-period emissions. The DEIR should also address MEPA.58
how the project will ensure compliance with the Massachusetts Idling regulation at 310 CMR
7.11.

The DEIR should discuss the solid waste and air quality regulatory requirements and the MEPA.59
project's generation, handling, recycling, and disposal of construction and demolition debris The MEPA.60
project must comply with MassDEP's Solid Waste and Air Pollution Control regulations,
pursuant to M.G.L. c.40, §54.

Mitigation and Draft Section 61 Findings

The DEIR should include a section that summarizes proposed mitigation measures and MEPA.61
provides draft Section 61 Findings for each Agency Action. It should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation.

In order to ensure that all GHG emissions reduction measures adopted by the Proponent MEPA.62
as the Preferred Alternative are actually constructed or performed by the Proponent, the Secretary requires proponents to provide a self-certification to the MEPA Office indicating that all of the required mitigation measures, or their equivalent, have been completed. The commitment to provide this self-certification in the manner outlined above should be incorporated into the draft Section 61 Findings included in the DEIR.

Responses to Comments

The DEIR should contain a copy of this Certificate and a copy of each comment letter MEPA.63
received. In order to ensure that the issues raised by commenters are addressed, the DEIR should MEPA.64

include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended, and shall not be construed, to enlarge the scope of the DEIR beyond what has been expressly identified in this certificate.

Circulation

The Proponent should circulate the DEIR to those parties who commented on the ENF, to MEPA.65
any State and municipal agencies from which the Proponent will seek permits or approvals, and
to any parties specified in section 11.16 of the MEPA regulations. The Proponent may circulate MEPA.66
copies of the DEIR to commenters other than State Agencies in a digital format (e.g., CD-ROM, USB drive) or post to an online website. However, the Proponent should make available a reasonable number of hard copies to accommodate those without convenient access to a
computer to be distributed upon request on a first come, first served basis. The Proponent should MEPA.67
send a letter accompanying the digital copy or identifying the web address of the online version of the DEIR indicating that hard copies are available upon request, noting relevant comment
deadlines, and appropriate addresses for submission of comments. The DEIR submitted to the MEPA.68
MEPA office should include a digital copy of the complete document. A copy of the DEIR MEPA.69
should be made available for review in Chinatown Branch of the Boston Public Library.

K. Theoharides

August 23, 2019	
Date	Kathleen A. Theoharides

Comments received:

08/08/2019	Boston Water and Sewer Commission (BWSC)
08/13/2019	Massachusetts Water Resources Authority (MWRA)
08/13/2019	Massachusetts Department of Transportation (MassDOT)
08/14/2019	Massachusetts Historical Commission (MHC)
08/16/2019	Department of Energy Resources (DOER)

KAT/EFF/eff

SECRETARY'S CERTIFICATE ON THE ENF

MEPA.1 The DEIR should follow section 11.07 of the MEPA regulations for outline and content, as modified by this Scope. It should include a detailed description of the proposed project and describe any changes to the project since the filing of the ENF.

Section 1.3 includes a detailed description of the Project and Section 1.4 addresses the changes to the Project since the filing of the ENF.

MEPA.2 The DEIR should clearly identify the project purpose and goal.

Section 1.3 includes a detailed description of the Project. The Project is a true mixed-use project that prioritizes affordable housing, while integrating neighborhood uses seamlessly into the Project to create a new and enlivened ground level experience through the center of the site, and a vibrant streetscape experience along Tremont Street. The Project will create up to 171 affordable units ranging from 30% to 80% of AMI, and the Proponent is exploring ways to increase the affordability of the units. The Project also includes a community space that the Proponent hopes will include a Chinatown branch of the Boston Public Library.

MEPA.3 The DEIR should identify, describe, and assess the environmental impacts of any changes in the project that have occurred since the ENF review.

There are no changes to the environmental impacts of the Project. The residential square footage has increased by 10,000 square feet, but the number of units and bedrooms has remained the same. In addition, the ENF had included a range of parking space up to 374 spaces. The maximum number of parking spaces has been reduced to up to 340 spaces.

MEPA.4 The DEIR should include updated site plans for existing and post-development conditions at a legible scale.

Please see Figures 1-2 and 1-3 for the existing site conditions, and Figure 1-10 for the proposed conditions.

MEPA.5 The DEIR should provide a brief description and analysis of applicable statutory and regulatory standards and requirements and describe how the project will meet those standards.

Please see Section 1.8 Statutory and Regulatory Standards and Approvals.

MEPA.6 **It should include a list of required State Permits, Financial Assistance, or other State approvals and provide an update on the status of each of these pending actions.**

- Massachusetts Historical Commission (MHC): the Project requires review by MHC. Per MHC's comment letter dated August 12, 2019, the Proponent has prepared shadow studies showing what effects (if any) the Project may have on the Wang Theater, Wilbur Theater, Shubert Theater, Charles River Playhouse and Bay Village Historic District. These studies are included in Chapter 6.

- State Funding: The Proponent plans to seek financial assistance from the Department of Housing and Community Development (DHCD), MassHousing and/or MassDevelopment. These have not yet been sought.

MEPA.7 **The DEIR should include an update on local, regional, or federal permitting as applicable.**

Table 1-2 identifies permits, reviews and approvals likely required for the Project, along with any updates.

MEPA.8 **The DEIR should include an updated building program (including an updated summary of floor area by use, number of stories and maximum height) and accompanying narrative that identifies changes to the program and describes the process and timeframe for refining the building program.**

Table 1-1 includes an updated program. The height or number of stories has not changed since the ENF. The building includes 30 stories and a mechanical penthouse.

MEPA.9 **The project will generate an additional 4,510 unadjusted adt or 1,956 new adjusted adt. The ENF indicated that trip generation was derived from the Institute of Transportation Engineer's (ITE) Trip Generation Manual (10th Edition) using Land Use Code (LUC) 221 (Multifamily Housing Mid-Rise), LUC 310 (Hotel) and LUC 590 (Library). The DEIR should describe how the mode share credit was derived.**

See Section 2.4.5, Travel Mode Shares.

MEPA.10 **The DEIR should include data prepared in accordance with BTD requirements for BPDA purposes of evaluating the project's potential impacts on traffic and transportation resources and identifying appropriate mitigation measures. I expect that this data will include a capacity analysis for transit services to determine whether there is sufficient capacity on existing transit services. I recommend that the Proponent consult with MassDOT and the MEPA office on the development of any transit analysis.**

See Sections 2.5 and 2.6 for a Transit Impact Analysis and Traffic Capacity Analysis.

MEPA.11 **The DEIR should include a comprehensive TDM Program that evaluates all feasible measures to reduce trip generation associated with the Project.**

See Section 2.7, Travel Demand Management.

MEPA.12 **The DEIR should describe any proposed transit improvement in the vicinity of the project that are being evaluated by MassDOT, the City of Boston and/or the MBTA.**

See Section 2.3.3, Proposed Infrastructure and Transit Improvements.

MEPA.13 **As described in MassDOT's comment letter, the DEIR should provide a parking study that identifies how parking supply for the Preferred Alternative was determined.**

See Section 2.4.2, Project Parking.

MEPA.14 **The DEIR should detail the relationship between the proposed expansion of the Tuft's parking garage, use of their existing garage, anticipated use by the hotel and residential users and anticipated use by the neighborhood at-large. The number of proposed spaces should be compared to the amount required based on information contained in ITE's Parking Generation (4th Edition) and required by local zoning.**

See Section 2.4.2, Project Parking.

MEPA.15 **The DEIR should identify the location of any proposed pick-up/drop-off parking areas on project plans. It should include graphics (and supporting narrative) depicting circulation patterns (vehicles, pedestrians, and bicycles) and assess how changes will be integrated with circulation within the project area.**

See Section 2.4.1, Site Access and Vehicle Circulation.

MEPA.16 **The DEIR should identify pedestrian infrastructure improvements at study area intersections where necessary, particularly for routes of travel from transit services. Provision of safe and convenient pedestrian and bicycle accommodations throughout the study area should be prioritized as part of the mitigation program.**

See Section 2.8, Transportation Mitigation Measures.

MEPA.17 **The DEIR should describe the proposed stormwater management system, including connection points to off-site stormwater conveyance infrastructure, Best Management Practices (BMPs), and applicable Total Maximum Daily Load (TMDL) compliance requirements (if applicable).**

The proposed stormwater management system, which consists of an underground infiltration system, is discussed in Section 7.3. Section 7.3.3 includes a discussion of Compliance with MassDEP Stormwater Management Standards. The BWSC storm drainage system in Tremont Street currently connects to a combined sewer as described in Section 7.3.1. If it were separated, it would flow to the Boston Harbor, which has a TMDL for pathogens. Infiltration systems provide treatment for pathogens that meets the intent of the TMDL.

MEPA.18 **The DEIR should describe BMPs proposed to retain and/or recharge stormwater on-site in accordance with BWSC requirements. The DEIR should identify specific stormwater BMPs to be used in the parking garages to mitigate stormwater runoff, particularly oil separators or similar BMPs.**

The proposed stormwater management system, which consists of an underground infiltration system, is discussed in Section 7.3. Oil separators will be installed in new garages to treat runoff from vehicles.

MEPA.19 **The DEIR should discuss opportunities to provide low impact design stormwater management measures including, but not limited to, porous hardscape surfaces, rain gardens, vegetative swales, infiltration basins, and tree box filters. The DEIR should discuss opportunities to incorporate these measures into project design and explain, in reasonable detail, why certain measures, which could promote infiltration while reducing impervious surfaces were not selected.**

Section 7.3 discusses low impact stormwater design strategies being pursued. Along Tremont Street, the furnishing zone will include permeable pavers except in areas with vehicular access. Within the pedestrian areas of the courtyard, the use of permeable paving will be investigated in coordination with the subsurface stormwater retention and infiltration. Planted areas within the courtyard will be designed to infiltrate the rainwater that falls directly upon them. Due to the small area of the courtyards relative to the building roof areas, large infiltration basins and rain gardens will not be included. Instead roof rain water will generally be directed to the subsurface infiltration systems under the courtyard. The overall impervious area of the site is being reduced by approximately 10%, which will promote infiltration and reduce the rate and volume of stormwater that leaves the site.

MEPA.20 **The project will connect to BWSC water and sewer infrastructure. The project will generate approximately 58,890 gpd of wastewater flow. The DEIR should discuss how the project intends to meet the requirement of offset new flows on a 4:1 basis in accordance with MassDEP, MWRA and BWSC policies and requirements.**

Section 7.2.4 indicates that the Project will comply with the BWSC 4:1 I/I program by making a one-time payment to the BWSC.

MEPA.21 **The Proponent should consult with MWRA and BWSC to develop a mitigation plan. The DEIR should discuss the outcome of these consultations and proposed infiltration/inflow (I/I) mitigation commitments. Comment letters from MWRA and BWSC provide additional guidance on this issue.**

Please see response to MEPA.20.

MEPA.22 **The DEIR should describe water conservation efforts to be incorporated into the project, including, but not limited to, installation of low-flow fixtures, use of captured rainwater or reclaimed wastewater for irrigation, and use of drought-tolerant native landscaping. I refer the Proponent to BWSC's comment letter which identifies additional information to be provided during permitting.**

Section 7.1.4 discusses water conservation strategies.

MEPA.23 **As described in MHC's comment letter, the project is in close proximity to the Wang Theatre (BOS.2315), Wilbur Theatre (BOS.2314), Shubert Theatre (BOS.2317) and Charles River Playhouse (BOS.2319) which are listed in the State and National Registers of Historic Places. The project site is also located near the Bay Village Historic District (BOS.BQ_ which is listed int eh State Register of Historic Places. The DEIR should include a shadow analysis to support a determination regarding the project's effect on historic resources.**

Chapter 6 includes an analysis of Cultural Resources including an analysis of shadow impacts on historic resources.

MEPA.24 **The GHG Policy and requirements to analyze the effects of climate change through EIR review is an important part of this statewide strategy. These analyses advance proponents' understanding of a project's contribution and vulnerability to climate change. The Proponent should consider cross-cutting measures, such as Passivehouse design, incorporation of renewables and inclusion of Low Impact Design measures in site design, which can improve the project's resiliency, reduce GHG emissions and conserve and sustainably employ the natural resources of the Commonwealth.**

Please refer to Chapter 8 for a GHG Analyses that examines multiple ways that the Project can and will reduce GHG emissions to the maximum extent feasible.

MEPA.25 **The project is subject to review under the May 5, 2010 MEPA GHG Policy. The DEIR should include an analysis of GHG emissions and mitigation measures in accordance with the standard requirements of the GHG Policy, which requires projects to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate these emissions. The analysis should quantify the CO2 emissions associated with building energy use (stationary sources), transportation-related emissions (mobile sources) and loss of carbon sequestration associated with extensive land alteration.**

Please refer to Chapter 8 for a GHG Analyses in accordance with the MEPA GHG Policy. The analysis quantifies GHG emissions and examines measures to avoid, minimize and mitigate GHG emissions to the maximum extent feasible. Stationary and Mobile sources are quantified. As the Project is located on a previously developed site, land alteration is not a consideration.

MEPA.26 **The DEIR should identify and commit to measures to reduce GHG emissions. The Proponent should refer to the GHG Policy for additional guidance on the GHG analysis. I encourage the Proponent to consult with staff from the MEPA office and the Department of Energy Resources (DOER) regarding the analysis prior to submission of the DEIR.**

GHG Section 8.3.2 contains the Proponent's commitments to GHG Reduction. The Proponent and team met with MEPA and DOER on September 12, 2019.

MEPA.27 **The DEIR should include a GHG analysis that calculates and compares GHG emissions associated with 1) a Base Case corresponding to the 9th Edition of the Massachusetts Building Code; and 2) a Preferred Alternative that achieves greater reductions in energy use and GHG emissions than required by the Building Code. The 9th edition of the Building Code references the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) 90.1-2013 and the International Energy Conservation Code (IECC) 2015.**

Please refer to Chapter 8 for a GHG Analysis the compares GHG emissions associated with the Base Case with a Preferred Alternative.

MEPA.28 **For each use, the GHG analysis should model energy use, GHG emissions, and mitigation measures associated in accordance with the GHG Policy and comments DOER. The GHG analysis should clearly demonstrate consistency with the objectives of MEPA review, one of which is to document the means by which Damage to the Environment can be avoided, minimized, and mitigated to the maximum extent feasible.**

Please refer to Chapter 8 for a GHG Analyses that examines multiple ways that the Project can and will reduce GHG emissions to the maximum extent feasible.

MEPA.29 **The Proponent should identify the model used to analyze GHG emissions, clearly state modeling assumptions for each project element, explicitly note which GHG reduction measures have been modeled, and identify whether certain building design or operational GHG reduction measures will be mandated by the Proponent to future occupants or merely encouraged for adoption and implementation.**

Section 8.1.12 and Attachment G discuss the modeling assumptions and input.

MEPA.30 **The DEIR should include the modeling printout for each alternative and emission tables that compare base case emissions in tons per year (tpy) with the Preferred Alternative showing the anticipated reduction in tpy and percentage by emissions source (direct, indirect and transportation). This information should be provided for each building in a format consistent with the example table provided in DOER's comment letter. Other tables and graphs may be included to convey the GHG emissions and potential reductions associated with mitigation measures.**

Please refer to Section 8.1.12 for emissions tables. Please refer to Attachment G for modeling output.

MEPA.31 **The DEIR should present an evaluation of mitigation measures identified in the DOER comment letter. The feasibility of each of the mitigation measures should be assessed for each major project element, and if feasible, GHG emissions reduction potential associated with mitigation should be evaluated to assess the relative benefits of each measure. The DEIR should explain, in reasonable detail, why certain measures that could provide significant GHG reductions were not selected – either because it is not applicable to the project or it is deemed technically or financially infeasible.**

Chapter 8 addresses each DOER comment. GHG emission reduction measures are quantified. When not selected, discussion is provided as to why.

MEPA.32 **The following strategies should be prioritized for adoption:**

- **Maintain envelope integrity with framed, insulated walls and continuous insulation;**
- **Avoidance of glass curtain wall assemblies and excessive windows;**
- **Passivehouse design (PHI or PHIUS method);**
- **Electrification of space and water heating with heat pump/Variable Refrigerant Flow (VRF) systems;**
- **Use of energy recovery ventilation and wastewater systems;**
- **LED lighting and integrated lighting controls.**

All of the above mitigation strategies have been addressed in Chapter 8.

MEPA.33 **The DEIR should include a feasibility analysis for the incorporation of Passivehouse for the office building component of the project that meets either Passive House Institute United States (PHIUS) or Passive House Institute (PHI) standards. Both standards are recognized by the Massachusetts Building Code. Passivehouse is an effective GHG emission reduction strategy and will also provide many attractive benefits to the developer and for the future occupants including greater affordability, indoor air quality**

improvements, improved resiliency and noise reduction. At a minimum, the Proponent should analyze building envelopes that exceed the prescriptive envelope standards of the Building Code.

Please refer to Section 8.1.7 for a Passive House analysis. Please refer to Attachment G for a Passive House study by Steven Winters Associates.

MEPA.34 **Use of electric heat pumps could reduce GHG emissions, reduce operating costs, and may reduce development costs by eliminating infrastructure costs associated with providing gas service to the site. The DEIR should include an analysis that evaluates the feasibility of using cold-climate air source heat pumps (ASHPs) and VRF equipment for space heating and ASHPs for water heating and documents the associated energy savings and reduction in GHG emissions. The analysis should include a narrative and data to support the adoption (or dismissal) of ASHPs or VRF equipment for water and space heating.**

Please refer to Section 8.1.6 for an electrification analysis. Please refer to Section 8.1.12 for the results of electric alternatives modeling.

MEPA.35 **The DEIR should clarify which areas will be constructed and fitted-out by the Proponent and which buildings will be fitted-out by future tenants.**

Residential units, hotel units and the parking garage will be fitted out by the Proponent. It is expected that the retail space and community space the Proponent hopes will include a Chinatown branch of the Boston Public Library will be delivered as a core and shell space and fitted out by the future tenant.

MEPA.36 **The DEIR should indicate if building systems (i.e., HVAC, etc.) will be completed as part of core and shell improvements or left to the tenant or future owner for installation. While I encourage the Proponent to adopt those GHG reduction measures that are integrated into the building's core, shell and infrastructure, I understand that some measures may be transient or dependent on operational procedures implemented by future occupants. In those instances, the Proponent should consider reasonable measures to educate and create incentives for the tenants to adopt energy efficiency/renewable generation measures.**

The Proponent will design and install all building systems in the residential units, hotel units and the parking garage. It is likely that retail tenants will install systems specific to their use. The Proponent will work with retail tenants to ensure installed systems are in keeping with the Project's GHG reduction goals.

MEPA.37 **The DEIR should address the Proponent's commitment to providing energy efficiency consulting services and information and developing Tenant Guidelines and/or green lease agreements that require or strongly support GHG reduction measures. For those**

components that will be the tenants' responsibility, the DEIR should identify specific strategies to encourage their adoption (e.g. design assistance, financial incentives, providing a list of approved fit-out material performance standards, etc.).

The Proponent will design and install all building systems in the residential units, hotel units and the parking garage. It is likely that retail tenants will install systems specific to their use. The Proponent will work with retail tenants to ensure installed systems are in keeping with the Projects GHG reduction goals.

MEPA.38 **The DEIR should confirm that the modeling of elements specifically delegated to the tenant fit-out process are consistent with those that will be mandated as minimum requirements in the proposed green tenant lease agreements/guidance.**

The Proponent will work with retail tenants to ensure installed systems are in keeping with the Projects GHG reduction goals, including modeling assumptions.

MEPA.39 **The GHG analysis should include an evaluation of potential GHG emissions associated with mobile emissions sources. The DEIR should follow the guidance provided in the GHG Policy for *Indirect Emissions from Transportation* and use data gathered as part of the traffic study to determine mobile emissions for Existing Conditions, Build Conditions, and Build with Mitigation Conditions.**

Please refer to Section 8.2 for a mobile source emissions analysis.

MEPA.40 **The Proponent should thoroughly explore means to reduce overall SOV trips.**

See Section 2.7, Travel Demand Management.

MEPA.41 **The Build with Mitigation model should incorporate any roadway improvements, improvements to transit and TDM measures implemented by the project and document the reductions in GHG emissions associated with the mitigation.**

As there is no planned traffic mitigation, there is no Build with Mitigation model.

MEPA.42 **The DEIR should provide an analysis and discussion of vulnerabilities of the site to the potential effects associated with climate change including increased frequency and intensity of precipitation events, and extreme heat events. To assist in this evaluation, the Proponent should review the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan and review data available through the Climate Change Clearinghouse for the Commonwealth.**

The 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan outlines the primary climate change risks for the Commonwealth as changes in precipitation, sea level rise, rising temperatures and extreme weather. The vulnerabilities for this project site and addressed by the Project include all of those except for sea level rise. The Project is not adjacent to Boston Harbor or its waterways and therefore would not be directly impacted by sea level rise.

Section 4.3 – Climate Change Resilience discusses the Project's climate change adaptation strategies and resiliency measures in detail.

MEPA.43 **The DEIR should evaluate incorporation of flood storage to accommodate the likelihood of extended flood periods, LID elements, further reduction in impervious surfaces, and increased freeboard of at least one foot above base flood levels.**

Sustainability Section 4.3.3 addresses the increased frequency of storm events and the ways in which the Project will mitigate them. Infrastructure Section 7.3.2 discusses the proposed stormwater management strategies, including the reduction of impervious area, and stormwater infiltration. The Project site is not located in the 100-year flood plain. and there will be a reduction of impervious paving in the courtyard through integration of planting areas in the landscape design.

MEPA.44 **In addition, the DEIR should evaluate the feasibility of: measures to minimize flood intrusion; ground floor use limitations; elevation of infrastructure; electrical equipment and outlet feeds; communication equipment; back-up communication equipment; use of water-resistant materials for structural elements below base flood elevation; emergency power sources; and essential personal safety measures.**

The Project is currently proposing to locate the emergency generator at the roof of the building. In addition, the design maximizes upon the existing site grading and slopes, and proposes a design that locates the critical infrastructure closer to the higher Tremont Street elevation, such that any rainfall flooding would flow downwards from west to east towards Washington Street, and away from critical components. The design intent is to deliver a water tight envelope in an effort to mitigate water infiltration.

The average grade of the Project is above the 100-year flood plain. The site is outside of the BPDA SLR-FHA Flood Zone at site elevation 29'.

MEPA.45 **The benefits of Passivehouse design to resiliency of the proposed office building should be analyzed and presented. The analysis provided in the DEIR should demonstrate that the project will not exacerbate flooding of adjacent uses and properties.**

The Proponent will continue to evaluate Passive House and will seek to incorporate Passive House principles into the Project such as building energy reduction measures. The Proponent will also evaluate the costs associated with Passive House as this is a project focused on Affordable Housing with subsidy Limits. The Project program does not include office space.

Sustainability Section 4.2 and GHG Chapter 8 describe in detail the ways in which the Project will strive for performance goals related to the building envelope and reduction of energy use and outlines the Passive House feasibility study completed.

The Project will increase pervious space onsite, and retain the first 1.25 inches of stormwater, reducing the rate and volume of stormwater leaving the site.

MEPA.46 **The DEIR should identify the anticipated build-out period of the project as a whole and describe potential project sequencing. It should provide a construction phasing figure and identify anticipated construction schedule and work hours.**

Section 3.11.2 includes information regarding the construction schedule and work hours.

MEPA.47 **The DEIR should include a draft Construction Management Plan (CMP) that identifies BMPs for erosion and sedimentation controls, construction staging areas, traffic management, and air/noise pollution.**

Section 3.11.1 includes a discussion of the CMP to be completed prior to filing of the building permit. Section 3.11.10 includes a discussion of erosion and sediment control measures, Section 3.11.3 addresses staging areas, and Sections 3.11.1 and 3.11.6 address traffic management. Section 3.11.7 and 3.11.8 address construction air quality and noise mitigation respectively.

MEPA.48 **Due to the extensive earth movement on-site to achieve final grades for development pads, the Proponent should outline measures to stabilize cleared areas and slopes throughout the site if construction in these individual building locations is not imminent subsequent to earth movement activities.**

A temporary lateral earth support system (such as a sheet pile wall or soldier pile and lagging wall) will be installed prior to excavation activities at the site.

MEPA.49 **The draft CMP should include appropriate erosion and sedimentation control BMPs.**

Please see Response to Comment MEPA.47 above.

MEPA.50 **Because the project is located close to several heavily travelled roadways, excessive dust may be a concern. The CMP should commit to specific mitigation measures to address this issue.**

Please see Section 3.11.7 for air quality mitigation measures including plans for controlling fugitive dust.

MEPA.51 **The Proponent should commit to avoid use of blasting materials that contain perchlorate to avoid impacts to water quality and wetlands.**

Blasting will not be conducted.

MEPA.52 **The DEIR should address noise and vibration impacts associated with blasting and identify appropriate mitigation measures.**

Blasting will not be conducted.

MEPA.53 **The DEIR should discuss specific BMPs to ensure that all drilling and/or blasting will be completed in accordance with local and State regulations.**

Blasting will not be conducted. If drilling is conducted for foundation installation, drilling will be conducted in accordance with local and State regulations.

MEPA.54 **The DEIR should identify and describe proposed construction truck traffic routes to and from the site and provide an estimate of the number of vehicle trips that will be generated during the construction period.**

Please see Section 3.11.6 for a discussion of construction truck routes and deliveries.

MEPA.55 **The DEIR should provide information on the emission controls that will be used for all on-site construction vehicles in an effort to minimize construction vehicle emissions.**

Please see Section 3.11.7 for information regarding construction air quality.

MEPA.56 **The DEIR should provide a discussion on using construction equipment with engines manufactured to Tier 4 federal emission standards or best available control technology (BACT).**

The Proponent will strive to use construction equipment with engines manufactured to Tier 4 federal emission standards or best available control technology.

MEPA.57 **I remind the Proponent that Ultra Low Sulfur Diesel (ULSD) fuel be used in all off-road construction equipment. The DEIR should confirm that the project will require its construction contractors to use ULSD fuel in off-road equipment and indicate whether it will incorporate additional measures to minimize construction-period emissions.**

Please see Section 3.11.7 regarding ULSD fuel.

MEPA.58 **The DEIR should also address how the project will ensure compliance with the Massachusetts Idling regulation at 310 CMR 7.11.**

Please see Section 3.11.6 and 3.11.7 regarding Idling regulations.

MEPA.59 **The DEIR should discuss the solid waste and air quality regulatory requirements and the project's generation, handling, recycling, and disposal of construction and demolition debris.**

Please see Section 3.11.11 for a discussion of construction waste.

MEPA.60 **The project must comply with MassDEP's Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. c.40, §54.**

The Proponent will comply with MassDEP's Solid Waste and Air pollution Control regulations.

MEPA.61 **The DEIR should include a section that summarizes proposed mitigation measures and provides draft Section 61 Findings for each Agency Action. It should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation.**

Chapter 10 summarizes proposed mitigation measures and provides draft Section 61 findings.

MEPA.62 **In order to ensure that all GHG emissions reduction measures adopted by the Proponent as the Preferred Alternative are actually constructed or performed by the Proponent, the Secretary requires proponents to provide a self-certification to the MEPA Office indicating that all of the required mitigation measures, or their equivalent, have been completed. The commitment to provide this self-certification in the manner outlined above should be incorporated into the draft Section 61 Findings included in the DEIR.**

Please refer to Section 8.3.2 for the Proponent's commitment to GHG reduction, including a commitment to self-certification.

MEPA.63 **The DEIR should contain a copy of this Certificate and a copy of each comment letter received.**

The Certificate is included in this Chapter, Chapter 11.

MEPA.64 **In order to ensure that the issues raised by commenters are addressed, the DEIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended, and shall not be construed, to enlarge the scope of the DEIR beyond what has been expressly identified in this certificate.**

This Chapter, Chapter 11 includes responses to the comment letters received on the ENF.

MEPA.65 **The Proponent should circulate the DEIR to those parties who commented on the ENF, to any State and municipal agencies from which the Proponent will seek permits or approvals, and too any parties specified in section 11.16 of the MEPA regulations.**

The Draft EIR/PNF will be distributed to as identified in Section 11.16 of the MEPA regulations. Attachment J includes a Distribution list.

MEPA.66 **The Proponent may circulate copies of the DEIR to commenters other than State Agencies in digital format (e.g., CD-ROM, USB drive) or port to an online website. However, the Proponent should make available a reasonable amount of hard copies to accommodate those without convenient access to a computer to be distributed upon request on a first come, first serve basis.**

The Proponent will make hard copies available if requested.

MEPA.67 **The Proponent should send a letter accompanying the digital copy or identifying the web address of the online version of the DEIR indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission comments.**

A letter will accompany any electronic versions stating that a hard copy is available upon request and will include comment deadlines and the address for submission of comments.

MEPA.68 **The DEIR submitted to the MEPA office should include a digital copy of the complete document.**

An electronic version of the complete document has been filed with MEPA.

MEPA.69 **A copy of the DEIR should be made available for review in Chinatown Branch of the Boston Public Library.**

A copy of the Draft EIR is available for review in the Chinatown branch of the Boston Public Library.

Boston Water and
Sewer Commission

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

August 6, 2019

Secretary Kathleen Theoharides
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
Erin Flaherty, EEA No. 16072
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Parcel P-12C, Boston
Environmental Notification Form

Dear Secretary Theoharides:

The Boston Water and Sewer Commission (Commission) has reviewed the Environmental Notification Form (ENF) for the proposed Parcel P-12C project in Boston Proper.

The proposed project is located on an approximately 0.67 acre site located in the South Cove Urban Renewal Area at 286-290 Tremont Street in Boston. The site currently contains a surface parking lot. The proponent, 288 Tremont Street Partners LLC, proposes to construct a mixed-use project including a hotel and residential tower and a garage extension connecting to the Tufts Shared Services, Inc. garage on the northwest of the site. The project will contain approximately 130,000 square feet of hotel use, 180,000 square feet of residential use, 2,500 square feet of retail use and up to 14,000 square feet of community/library space. There will be garage parking for approximately 374 vehicles. The site is bound by the Tufts Shared Services parking garage to the north, the Double Tree hotel to the south, Tremont Street to the west and an adjacent parking lot to the east.

According to the ENF, the proposed water demand is approximately 64,779 gallons per day (gpd). The Commission owns and maintains two (2) 12-inch water mains, a Southern Low DICL and a Southern High DICL, both installed in 1973 and a 16-inch HPFS main in Tremont Street.

According to the ENF, the proposed sewage generation is 58,890 gpd. For sewage and storm drainage service, the site is served by a 12-inch sanitary sewer and a 12-inch storm drain in Tremont Street.

The Commission has the following comments regarding the ENF:

General

1. Prior to the initial phase of the site plan development, 288 Tremont Street Partners LLC should meet with the Commission's Design and Engineering Customer Services to review water main, sewer and storm drainage system availability and potential upgrades that could impact the development. BWSC.1

2. All new or relocated water mains, sewers and storm drains must be designed and constructed at 288 Tremont Street Partners LLC's expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use regulations, and Requirements for Site Plans. The site plan should include the locations of new, relocated and existing water mains, sewers and drains which serve the site, proposed service connections, water meter locations, as well as back flow prevention devices in the facilities that will require inspection. A General Service Application must also be submitted to the Commission with the site plan. BWSC.2

3. The Department of Environmental Protection (DEP), in cooperation with the Massachusetts Water Resources Authority and its member communities, is implementing a coordinated approach to flow control in the MWRA regional wastewater system, particularly the removal of extraneous clean water (e.g., infiltration/inflow (I/I)) in the system. In April of 2014, the Massachusetts DEP promulgated new regulations regarding wastewater. The Commission has a National Pollutant Discharge Elimination System (NPDES) Permit for its combined sewer overflows and is subject to these new regulations [314 CMR 12.00, section 12.04(2)(d)]. This section requires all new sewer connections with design flows exceeding 15,000 gpd to mitigate the impacts of the development by removing four gallons of infiltration and inflow (I/I) for each new gallon of wastewater flow. In this regard, any new connection or expansion of an existing connection that exceeds 15,000 gallons per day of wastewater shall assist in the I/I reduction effort to ensure that the additional wastewater flows are offset by the removal of I/I. Currently, a minimum ratio of 4:1 for I/I removal to new wastewater flow added is used. The Commission supports the policy, and will require proponent to develop a consistent inflow reduction plan. The 4:1 requirement should be addressed at least 90 days prior to activation of water service and will be based on the estimated sewage generation provided on the project site plan. BWSC.3

4. The design of the project should comply with the City of Boston's Complete Streets Initiative, which requires incorporation of "green infrastructure" into street designs. Green infrastructure includes greenscapes, such as trees, shrubs, grasses and other landscape plantings, as well as rain gardens and vegetative swales, infiltration basins, and paving materials and permeable surfaces. The proponent must develop a maintenance plan for the proposed green infrastructure. For more information on the Complete Streets Initiative see the City's website at http://bostoncompletestreets.org/ BWSC.4

5. 288 Tremont Street Partners LLC should be aware that the US Environmental Protection Agency issued the Remediation General Permit (RGP) for Groundwater Remediation, Contaminated Construction Dewatering, and Miscellaneous Surface Water Discharges. If groundwater contaminated with petroleum products, for example, is encountered, 288 Tremont Street Partners LLC will be required to apply for a RGP to cover these discharges. BWSC.5

6. The project sites are located within Boston's Groundwater Conservation Overlay District (GCOD). The district is intended to promote the restoration of groundwater and reduce the impact of surface runoff. Projects constructed within the GCOD are required to include provisions for retaining stormwater and directing the stormwater to the groundwater table for recharge. BWSC.6

7. 288 Tremont Street Partners LLC is advised that the Commission will not allow buildings to be constructed over any of its water lines. Also, any plans to build over Commission sewer facilities are subject to review and approval by the Commission. The project must be designed so that access, including vehicular access, to the Commission's water and sewer lines for the purpose of operation and maintenance is not inhibited. BWSC.7

8. It is 288 Tremont Street Partners LLC's responsibility to evaluate the capacity of the water, sewer and storm drain systems serving the project site to determine if the systems are adequate to meet future project demands. With the site plan, 288 Tremont Street Partners LLC must include a detailed capacity analysis for the water, sewer and storm drain systems serving the project site, as well as an analysis of the impacts the proposed project will have on the Commission's water, sewer and storm drainage systems. BWSC.8

Water

1. 288 Tremont Street Partners LLC must provide separate estimates of peak and continuous maximum water demand for residential, commercial, industrial, irrigation of landscaped areas, and air-conditioning make-up water for the project with the site plan. Estimates should be based on full-site build-out of the proposed project. 288 Tremont Street Partners LLC should also provide the methodology used to estimate water demand for the proposed project. BWSC.9

2. 288 Tremont Street Partners LLC should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular, 288 Tremont Street Partners LLC should consider outdoor landscaping which requires minimal use of water to maintain. If 288 Tremont Street Partners LLC plans to install in-ground sprinkler systems, the Commission recommends that timers, soil moisture indicators and rainfall sensors be installed. The use of sensor-operated faucets and toilets in common areas of buildings should be considered. BWSC.10

3. 288 Tremont Street Partners LLC is required to obtain a Hydrant Permit for use of any hydrant during the construction phase of this project. The water used from the hydrant must be metered. 288 Tremont Street Partners LLC should contact the Commission's Meter Department for information on and to obtain a Hydrant Permit. BWSC.11

4. The Commission is utilizing a Fixed Radio Meter Reading System to obtain water meter readings. For new water meters, the Commission will provide a Meter Transmitter Unit (MTU) and connect the device to the meter. For information regarding the installation of MTUs, 288 Tremont Street Partners LLC should contact the Commission's Meter Department. BWSC.12

Sewage / Drainage

1. In conjunction with the Site Plan and the General Service Application 288 Tremont Street Partners LLC will be required to submit a Stormwater Pollution Prevention Plan. The plan must: BWSC.13

   - Identify specific best management measures for controlling erosion and preventing the discharge of sediment, contaminated stormwater or construction debris to the Commission's drainage system when construction is underway.

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

   - Specifically identify how the project will comply with the Department of Environmental Protection's Performance Standards for Stormwater Management both during construction and after construction is complete.

2. Developers of projects involving disturbances of land of one acre or more will be required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency and the Massachusetts Department of Environmental Protection. 288 Tremont Street Partners LLC is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required, it is required that a copy of the permit and any pollution prevention plan prepared pursuant to the permit be provided to the Commission's Engineering Services Department, prior to the commencement of construction. The pollution prevention plan submitted pursuant to a NPDES Permit may be submitted in place of the pollution prevention plan required by the Commission provided the Plan addresses the same components identified in item 1 above. BWSC.14

3. The Commission encourages 288 Tremont Street Partners LLC to explore additional opportunities for protecting stormwater quality on site by minimizing sanding and the use of deicing chemicals, pesticides, and fertilizers. BWSC.15

4. The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission. 288 Tremont Street Partners LLC is advised that the discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the dewatering drainage is contaminated with petroleum products, 288 Tremont Street Partners LLC will be required to obtain a Remediation General Permit from the Environmental Protection Agency (EPA) for the discharge. BWSC.16

5. 288 Tremont Street Partners LLC must fully investigate methods for retaining stormwater on-site before the Commission will consider a request to discharge stormwater to the Commission's system. The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining their stormwater discharge on-site. All projects at or above 100,000 square feet of floor area are to retain, on site, a volume of runoff equal to 1.25 inches of rainfall times the impervious area. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer. BWSC.17

6. The Massachusetts Department of Environmental Protection (MassDEP) established Stormwater Management Standards. The standards address water quality, water quantity and recharge. In addition to Commission standards, 288 Tremont Street Partners LLC will be required to meet MassDEP Stormwater Management Standards. BWSC.18

7. Sanitary sewage must be kept separate from stormwater and separate sanitary sewer and storm drain service connections must be provided. The Commission requires that existing stormwater and sanitary sewer service connections, which are to be re-used by the proposed project, be dye tested to confirm they are connected to the appropriate system. BWSC.19

8. The Commission requests that 288 Tremont Street Partners LLC install a permanent casting stating "Don't Dump: Drains to Boston Harbor" next to any catch basin created or modified as part of this project. 288 Tremont Street Partners LLC should contact the Commission's Operations Division for information regarding the purchase of the castings. BWSC.20

9. If a cafeteria or food service facility is built as part of this project, grease traps will be required in accordance with the Commission's Sewer Use Regulations. 288 Tremont Street Partners LLC is advised to consult with the Commission's Operations Department with regards to grease traps. BWSC.21

10. The enclosed floors of a parking garage must drain through oil separators into the sewer system in accordance with the Commission's Sewer Use Regulations. The BWSC.22

Commission's Requirements for Site Plans, available by contacting the Engineering Services Department, include requirements for separators.

Thank you for the opportunity to comment on this project.

Yours truly,

John P. Sullivan, P.E.
Chief Engineer

JPS/afh

cc: Joseph A. Larkin, 288 Tremont Street Partners LLC
K. Ronan, MWRA via e-mail
M. Zlody, BED via e-mail
P. Larocque, BWSC via e-mail

BOSTON WATER AND SEWER COMMISSION

BWSC.1 **Prior to the initial phase of the site plan development, 288 Tremont Street Partners LLC should meet with the Commission's Design and Engineering Customer Services to review water main, sewer and storm drainage system availability and potential upgrades that could impact the development.**

The Proponent will meet with BWSC to discuss the proposed Project prior to the start of development.

BWSC.2 **All new or relocated water mains, sewers and storm drains must be designed and constructed at 288 Tremont Street Partners LLC's expense. They must be designed and constructed in conformance with the Commission's design standards, Water Distribution System and Sewer Use regulations, and Requirements for Site Plans. The site plan should include the locations of new, relocated and existing water mains, sewers and drains which service the site, proposed service connections, water meter locations, as well as back flow prevention devices in the facilities that will require inspection. A General Service Application must also be submitted to the Commission with the site plan.**

The Project will comply with this comment.

BWSC.3 **The Department of Environmental Protection (DEP), in cooperation with the Massachusetts Water Resources Authority and its member communities, is implementing a coordinated approach to flow control in the MWRA regional wastewater system, particularly the removal of extraneous clean water (e.g., infiltration/inflow (I/I)) in the system. In April of 2014, the Massachusetts DEP promulgated new regulations regarding wastewater. The Commission has a National Pollutant Discharge Elimination System (NPDES) Permit for its combined sewer overflows and is subject to these new regulations [314 CMR 12.00, section 12.04(2)(d)]. This section requires all new sewer connections with design flows exceeding 15,000 gpd to mitigate the impacts of the development by removing four gallons of infiltration and inflow (I/I) for each new gallon of wastewater flow. In this regard, any new connection or expansion of an existing connection that exceeds 15,000 gallons per day of wastewater shall assist in the I/I reduction effort to ensure that the additional wastewater flows are offset by the removal of I/I. Currently, a minimum ratio of 4:1 for I/I removal to new wastewater flow added is used. The Commission supports the policy, and will require proponent to develop a consistent inflow reduction plan. The 4:1 requirement should be addressed at least 90 days prior to activation of water service and will be based on the estimated sewage generation provided on the project site plan.**

The Project will comply with the BWSC 4:1 I/I program.

BWSC.4 **The design of the project should comply with the City of Boston's Complete Streets Initiative, which requires incorporation of "green infrastructure" into street designs. Green infrastructure includes greenscapes, such as trees, shrubs, grasses and other landscape plantings, as well as rain gardens and vegetative swales, infiltration basins, and paving materials and permeable surfaces. The proponent must develop a maintenance plan for the proposed green infrastructure. For more information on the Complete Streets Initiative, see the City's website at http://bostoncompletestreets.org/.**

The Project will comply with the City of Boston's Complete Streets Initiative. Along Tremont Street, generous concrete walkways will be flanked on the street side by a furnishing zone with permeable paving, street trees and bicycle racks, and on the other side by a frontage zone with specialty paving adjacent to the building facades. The entry to the courtyard under the building will be paved with ADA/MAAB-compliant paving surfaces. The permeable paving will be maintained by the Proponent.

BWSC.5 **288 Tremont Street Partners LLC should be aware that the US Environmental Protection Agency issued the Remediation General Permit (RGP) for Groundwater Remediation, Contaminated Construction Dewatering, and Miscellaneous Surface Water Discharges. If groundwater contaminated with petroleum products, for example, is encountered, 288 Tremont Street Partners LLC will be required to apply for a RGP to cover these discharges.**

The Project will comply with this comment.

BWSC.6 **The project sites are located within Boston's Groundwater Conservation Overlay District (GCOD). The district is intended to promote the restoration and reduce the impact of surface runoff. Projects constructed within the GCOD are required to include provisions for retaining stormwater and directing the stormwater to the groundwater table for recharge.**

The Project will comply with the Article 32 requirements for the Groundwater Conservation Overlay District.

BWSC.7 **288 Tremont Street Partners LLC is advised that the Commission will not allow buildings to be constructed over any of its water lines. Also, any plans to build over the Commission sewer facilities are subject to review and approval by the Commission. The project must be designed so that access, including vehicular access, to the Commission's water and sewer lines for the purpose of operation and maintenance is not inhibited.**

The Project will comply with this comment.

BWSC.8 **It is 288 Tremont Street Partners LLC's responsibility to evaluate the capacity of the water, sewer and storm drain systems serving the project site to determine if the systems are adequate to meet future project demands. With the site plan, 288 Tremont Street Partners LLC must include a detailed capacity analysis for the water, sewer and storm drain systems serving the project site, as well as an analysis of the impacts the proposed project will have on the Commission's water, sewer and storm drainage systems.**

The Project will comply with this comment to the maximum extent practicable. As described in Chapter 7, no water capacity problems are anticipated within the BWSC system as a result of the Project, no capacity problems are expected within either the Tremont Street or Washington Street sewer systems.

BWSC.9 **288 Tremont Street Partners LLC must provide separate estimates of peak and continuous maximum water demand for residential, commercial, industrial, irrigation of landscaped areas, and air-conditioning make-up water for the project with the site plan. Estimates should be based on full-site build-out of the proposed project. 288 Tremont Street Partners LLC should also provide the methodology used to estimate water demand for the proposed project.**

The Project will comply with this comment. Estimates of peak water demand will be addressed during the site plan approval process. The plumbing engineer will calculate the peak instantaneous flow when the design progresses.

BWSC.10 **288 Tremont Street Partners LLC should explore opportunities for implementing water conservation measures in addition to those required by the State Plumbing Code. In particular, 288 Tremont Street Partners LLC should consider outdoor landscaping which requires minimal use of water to maintain. If 288 Tremont Street Partners LLC plans to install in-ground sprinkler systems, the Commission recommends that timers, soil moisture indicators and rainfall sensors be installed. The use of sensor-operated faucets and toilets in common areas of buildings should be considered.**

The Project will comply with this comment. Section 7.1.4 includes information regarding water conservation. Plant species will be selected to be urban tolerant, low-maintenance and low water use. An efficient irrigation system will be installed employing timer and moisture sensors that will substantially reduce water use from a typical baseline condition.

BWSC.11 **288 Tremont Street Partners LLC is required to obtain a Hydrant Permit for use of any hydrant during the construction phase of this project. The water used from the hydrant must be metered. 288 Tremont Street Partners LLC should contact the Commission's Meter Department for information on and to obtain a Hydrant Permit.**

The Project will comply with this comment.

BWSC.12 **The Commission is utilizing a Fixed Radio Meter Reading System to obtain water meter readings. For new water meters, the Commission will provide a Meter Transmitter Unit (MTU) and connect the device to the meter. For information regarding the installation of MTUs, 288 Tremont Street Partners LLC should contact the Commission's Meter Department.**

Comment noted.

BWSC.13 **In conjunction with the Site Plan and the General Service Application 288 Tremont Street Partners LLC will be required to submit a Stormwater Pollution Prevention Plan. The plan must:**

- **Identify specific best management measures for controlling erosion and preventing the discharge of sediment, contaminated stormwater or construction debris to the Commission's drainage system when construction is underway.**
- **Include a site map which shows, at a minimum, existing drainage patters and areas used for storage or treatment of contaminated soils, groundwater or stormwater, and the location of major control structures or treatment structures to be utilized during the construction.**
- **Specifically identify how the project will comply with the Department of Environmental Protection's Performance Standards for Stormwater Management both during construction and after construction is complete.**

The Project will comply with this comment.

BWSC.14 **Developers of projects involving disturbances of land of one acre or more will be required to obtain an NPDES General Permit for Construction from the Environmental Protection Agency and the Massachusetts Department of Environmental Protection. 288 Tremont Street Partners LLC is responsible for determining if such a permit is required and for obtaining the permit. If such a permit is required, it is required that a copy of the permit and any pollution prevention plan prepared pursuant to the permit be provided to the Commission's Engineering Services Department, prior to the commencement of construction. The pollution prevention plan submitted pursuant to a NPDES Permit may be submitted in place of the pollution prevention plan required by the Commission provided the Plan addresses the same components identified in item 1 above.**

The Project will comply with this comment.

BWSC.15 **The Commission encourages 288 Tremont Street Partners LLC to explore additional opportunities for protecting stormwater quality on site by minimizing sanding and the use of deicing chemicals, pesticides, and fertilizers.**

The Project will explore reducing the use of these items.

BWSC.16 **The discharge of dewatering drainage to a sanitary sewer is prohibited by the Commission. 288 Tremont Street Partners LLC is advised that the discharge of any dewatering drainage to the storm drainage system requires a Drainage Discharge Permit from the Commission. If the dewatering drainage is contaminated with petroleum products, 288 Tremont Street Partners LLC will be required to obtain a Remediation General Permit from the Environmental Protection Agency (EPA) for the discharge.**

The Project will comply with this comment.

BWSC.17 **288 Tremont Street Partners LLC must fully investigate methods for retaining stormwater on-site before the Commission will consider a request to discharge stormwater to the Commission's system. The site plan should indicate how storm drainage from roof drains will be handled and the feasibility of retaining their stormwater discharge on-site. All projects at or above 100,000 square feet of floor area are to retain, on site, a volume of runoff equal to 1.25 inches of rainfall times the impervious area. Under no circumstances will stormwater be allowed to discharge to a sanitary sewer.**

The Project will comply with this comment. See Section 7.3.2 for information regarding stormwater.

BWSC.18 **The Massachusetts Department of Environmental Protection (MassDEP) established Stormwater Management Standards. The standards address water quality, water quantity and recharge. In addition to Commission standards, 288 Tremont Street Partners LLC will be required to meet MassDEP Stormwater Management Standards.**

The Project will comply with this comment. Section 7.3.3 includes a discussion of compliance with MassDEP Stormwater Management Standards.

BWSC.19 **Sanitary sewage must be kept separate from stormwater and separate sanitary sewer and storm drain service connections must be provided. The Commission requires that existing stormwater and sanitary sewer service connections, which are to be re-used by the proposed project, be dye tested to confirm they are connected to the appropriate system.**

The Project will comply with this comment.

BWSC.20 **The Commission requests that 288 Tremont Street Partners LLC install a permanent casting stating "Don't Dump, Drains to Boston Harbor" next to any catch basin created or modified as part of this project. 288 Tremont Street Partners LLC should contact the Commission's Operations Division for information regarding the purchase of the castings.**

The Project will install "Don't Dump, Drains to Boston Harbor as required.

BWSC.21 **If a cafeteria or food service facility is built as part of this project, grease traps will be required in accordance with the Commission's Sewer Use Regulations. 288 Tremont Street Partners LLC is advised to consult with the Commission's Operations Department with regard to grease traps.**

The Project will comply with this comment.

BWSC.22 **The enclosed floors of a parking garage must drain through oil separators into the sewer system in accordance with the Commission's Sewer Use Regulations. The Commission's Requirements for Site Plans, available by contacting the Engineering Services Department, include requirements for separators.**

The Project will comply with this comment. An oil/gas separator will be installed in new garages to treat runoff from vehicles.

MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Frederick A. Laskey
Executive Director

Telephone: (617) 242-6000
Fax: (617) 788-4899
TTY: (617) 788-4971

August 13, 2019

Kathleen A. Theoharides, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge St, Suite 900
Attn: MEPA Office, Erin Flaherty
Boston, MA 02114

Subject: EOEEA #16072 – Environmental Notification Form
Parcel P-12C, Boston, MA

Dear Secretary Theoharides,

The Massachusetts Water Resources Authority (MWRA) appreciates the opportunity to comment on the Environmental Notification Form (ENF) submitted by 288 Tremont Street Partners LLC (the "Proponent") for Parcel P-12C (the "Project") in Boston, Massachusetts. The 0.67-area Project site is located in the South Cove Urban Renewal Area at 286-290 Tremont Street and is currently a surface parking lot. The Project consists of the construction of a mixed used development including a hotel and residential tower as well as a garage extension connecting to an existing parking garage. The ground floor of the project will include a residential lobby, hotel lobby, café or retail space, pedestrian walkway, courtyard and community space.

MWRA's comments relate to stormwater, wastewater issues emphasizing the need for Infiltration/Inflow (I/I) Removal, and Discharge Permitting from the Toxic Reduction and Control (TRAC) Department.

<u>Stormwater</u>

According to the Boston Water and Sewer Commission ("BWSC") storm drain and sewer maps, the Project site is served by local BWSC separated sanitary sewers and storm drains. Like the sanitary sewers, the storm drains serving the site eventually connect to BWSC combined sewers and MWRA's sewer system. The ENF reports that the Project will slightly decrease impervious areas onsite, which will improve stormwater quality and flow rates off the site. The proposed infrastructure system will also promote groundwater recharge and decrease stormwater load on the BWSC storm drainage system. The Project lies within the City of Boston's Groundwater Conservation Overlay District (GCOD). As a result, the Project is required to provide groundwater recharge for the first inch of runoff from the Project's impervious surfaces. MWRA.1

Wastewater

The ENF estimates that the Project will generate approximately 58,890 gallons per day (gpd) of new wastewater flows. BWSC sewers serving the Project site convey wastewater flows to BWSC's West Side Interceptor (WSI) at the intersection of Boylston and Hereford Streets, which conveys flows to MWRA's Ward Street Headworks in Roxbury and ultimately to the Deer Island treatment plant. The WSI serves large areas of Boston, including Beacon Hill and Back Bay, which are served by combined sewer systems. In large storms, larger volumes of combined sanitary and storm flow can overwhelm the WSI, which can overflow to MWRA's Boston Marginal Conduit (BMC). The BMC conveys overflows to MWRA's Prison Point CSO treatment facility, which discharges treated CSOs to Boston Inner Harbor at the Charles River Dam. In larger storms, the BMC can overflow at untreated CSO outfalls to the Charles River Basin.

To ensure that the Project's wastewater flow does not increase system surcharging or overflows in large storms, the Proponent and BWSC should ensure a 4:1 offset of the Project's wastewater flow by removing stormwater and/or infiltration and inflow (I/I) from a hydraulically related system(s). Four gallons of extraneous flow should be removed for every gallon of new wastewater flow, in compliance with Massachusetts Department of Environmental Protection regulation and BWSC I/I mitigation policy. Increasing wastewater flow to the BWSC and MWRA sewer systems without effective offset can compromise the sewer system benefits and the Charles River and Boston Harbor water quality benefits of MWRA's recently completed $910 million region-wide combined sewer overflow (CSO) control plan. MWRA.2

TRAC Discharge Permitting

Pursuant to 360 C.M.R. 10.091-10.094, an MWRA Temporary Construction Site Dewatering Discharge Permit may be required during the construction phase of the Project. For assistance in obtaining this permit, representatives from the Project should contact Lisa Chapman, Industrial Coordinator in the TRAC Department at 1 (617) 305-5622. Construction Site Dewatering Discharge Permits from both MWRA and Boston Water Sewer Commission are required prior to the discharge of groundwater into the sanitary sewer system. MWRA.3

A Sewer Use Discharge Permit is required prior to discharging laundry effluent from any hotel associated with the Project into the MWRA sanitary sewer system. For assistance in obtaining this permit, representatives from the proposed hotel should contact Lisa Chapman, Industrial Coordinator in the TRAC Department at 1 (617) 305-5622. MWRA.4

Any gas/oil separators in parking garages associated with the Project must comply with 360 C.M.R. 10.016 and State Plumbing Code. Installation of the proposed gas/oil separator(s) may not be back filled until inspected and approved by the MWRA and the Local Plumbing Inspector. For assistance in obtaining an inspection, the Proponent should contact John Feeney, Source Coordinator, in the TRAC Department at 1 (617) 305-5631. MWRA.5

On behalf of the MWRA, thank you for the opportunity to provide comments on this Project. Please do not hesitate to contact me at 1 (617) 788-4958 with any questions or concerns.

Sincerely,

Bethany Card
Director
Environmental and Regulatory Affairs

cc: Gary Moran, DEP
Kate Kerigan, DEP
John Viola, DEP
Adam Horst, BWSC

MASSACHUSETTS WATER RESOURCES AUTHORITY

MWRA.1 **The Project lies within the City of Boston's Groundwater Conservation Overlay District (GCOD). As a result, the Project is required to provide groundwater recharge for the first inch of runoff from the Project's impervious surfaces.**

Please refer to the response to BWSC.6.

MWRA.2 **To ensure that the Project's wastewater flow does not increase system surcharging or overflows in large storms, the Proponent and BWSC should ensure a 4:1 offset of the Project's related system(s). Four gallons of extraneous flow should be removed for every gallon of new wastewater flow, in compliance with Massachusetts Department of Environmental Protection regulation and BWSC I/I mitigation policy.**

Refer to the response to BWSC.3.

MWRA.3 **Pursuant to 360 C.M.R 10.091-10.094, an MWRA Temporary Construction Site Dewatering Discharge Permit may be required during the construction phase of the Project. For assistance in obtaining this permit, representatives from the Project should contact Lisa Chapman, Industrial Coordinator in the TRAC Department at 1 (617) 305-5622. Construction Site Dewatering Discharge Permits from both MWRA and Boston Water Sewer Commission are required prior to the discharge of groundwater into the sanitary sewer system.**

The Project will comply with this comment.

MWRA.4 **A Sewer Use Discharge Permit is required prior to discharging laundry effluent from any hotel associated with the Project into the MWRA sanitary sewer system. For assistance in obtaining this permit, representatives from the Project should contact Lisa Chapman, Industrial Coordinator in the TRAC Department at 1 (617) 305-5622.**

The Project will comply with this comment.

MWRA.5 **Any gas/oil separators in parking garages associated with the Project must comply with 360 C.M.R. 10.016 and State Plumbing Code. Installation of the proposed gas/oil separator(s) may not be filled until inspected and approved by the MWRA and the Local Plumbing Inspector. For assistance in obtaining an inspection, the Proponent should contact John Feeney, Source Coordinator, in the TRAC Department at 1 (617) 305-5631.**

The Project will comply with this comment.

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation

August 13, 2019

Kathleen Theoharides, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114-2150

RE: Boston: Parcel P-12C – ENF
(EEA # 16072)

ATTN: MEPA Unit
Erin Flaherty

Dear Secretary Theoharides:

On behalf of the Massachusetts Department of Transportation, I am submitting comments regarding the Parcel P-12C project in Boston, as prepared by the Office of Transportation Planning. If you have any questions regarding these comments, please contact J. Lionel Lucien, P.E., Manager of the Public/Private Development Unit, at (857) 368-8862.

Sincerely,

David J. Mohler
Executive Director
Office of Transportation Planning

DJM/jll

Ten Park Plaza, Suite 4150, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
www.mass.gov/massdot

cc: Jonathan Gulliver, Administrator, Highway Division
Patricia Leavenworth, P.E., Chief Engineer, Highway Division
Neil Boudreau, Assistant Administrator of Traffic and Safety Engineering
John McInerney, P.E., District 6 Highway Director
Metropolitan Area Planning Council
Massachusetts Bay Transportation Authority
Boston Planning and Development Authority, City of Boston
Boston Transportation Department
A Better City Transportation Management Association
PPDU Files

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant. Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation

MEMORANDUM

TO: David Mohler, Executive Director
Office of Transportation Planning

FROM: J. Lionel Lucien, P.E, Manager
Public/Private Development Unit

DATE: August 13, 2019

RE: Boston: Parcel P-12C – ENF
(EEA #16072)

The Public/Private Development Unit (PPDU) has reviewed the Environmental Notification Form (ENF) for the proposed Parcel P-12C project in Boston. The approximately 0.67-acre site, located at 286-290 Tremont Street, is comprised of a surface parking lot. The project proposes to construct approximately 416,500 square feet of mixed-use development consisting of a 200-key hotel, 171 affordable housing units at between 30 and 90 percent of the area median income, and approximately 2,500 square feet of retail/café space. An expansion of an existing parking garage owned by Tufts Shared Services to the north of the project site is proposed as part of the project which, combined with the elimination of the surface parking lot, would result in 274 additional parking spaces on the project site. Full-Build, the project will include provision for 374 parking spaces. The project site is bounded to the north by the existing parking garage, to the south by a hotel, to the east by a parking lot, and to the west by Tremont Street.

Based on the information presented in the ENF, the Full-Build project is expected to generate 5,110 unadjusted vehicle trips on a typical weekday, of which 4,510 trips will be generated by the proposed project. The project exceeds the Massachusetts Environmental Policy Act (MEPA) threshold for trip generation (3,000 new trips) and thus is categorically included for preparation of a Draft Environmental Impact Report (EIR). Access to the site is proposed via the existing parking garage to the north of the project site as well as a new site driveway along Tremont Street, which is proposed to be restricted to service vehicles only.

According to information in the ENF, the project is expected to generate 1,956 net new vehicle trips when adjusted for mode share; therefore, the impacts on the transportation network will be limited. As part of the DEIR, we request the Proponent provide further information on the following subjects:

- The DEIR should detail the status of any transportation mitigation proposed in coordination with the Boston Planning & Development Agency (BPDA) and Boston DOT.1

Transportation Department (BTD), particularly in instances where bicycle, pedestrian, and transit infrastructure is affected.

- The DEIR should explain the derivation of the proposed parking supply for the project, notably by detailing the relationship between the proposed parking expansion, usage of the existing garage, anticipated usage by the hotel and residential users, and anticipated usage of the neighborhood at-large. The number of proposed spaces should be compared to the amount required based on information contained in ITE's *Parking Generation* (4th edition) as well as the requirements of local zoning codes. DOT.2

- A Transportation Demand Management (TDM) program that fully explores all feasible measures aimed at reducing site trip generation should be provided in the DEIR. The program should clearly identify such measures and demonstrate their effectiveness in accomplishing this objective. The program should be based on the specific measures that have been successful in reducing trip generation for similar development projects and further investigate measures that would maximize usage of existing pedestrian, bicycle, and transit facilities, such as subsidizing transit passes, promoting ridesharing and vanpooling, and limiting the available parking supply. The Proponent is invited to consult with A Better City Transportation Management Association (TMA) and/or MassDOT to help implement the TDM program. DOT.3

The Proponent should continue consultation with appropriate MassDOT units regarding the preparation of the DEIR. If you have any questions regarding these comments, please contact me at (857) 368-8862 or Michael Clark at (857) 368-8867. DOT.4

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

DOT.1 **The DEIR should detail to status of any transportation mitigation proposed in coordination with the Boston Planning & Development Agency (BPDA) and Boston Transportation Department (BTD), particularly in instances where bicycles, pedestrian, and transit infrastructure is affected.**

See Section 2.8, Transportation Mitigation Measures.

DOT.2 **The DEIR should explain the derivation of the proposed parking supply for the project, notably by detailing the relationship between the proposed parking expansion, usage of the existing garage, anticipated usage by the hotel and residential users, and anticipated users of the neighborhood at-large. The number of proposed spaces should be compared to the amount required based on information contained in ITE's *Parking Generation* (4th edition) as well as the requirements of local zoning codes.**

See Section 2.4.2, Project Parking.

DOT.3 **A Transportation Demand Management (TDM) program that fully explores all feasible measures aimed at reducing site trip generation should be provided in the DEIR. The program should clearly identify such measures and demonstrate their effectiveness in accomplishing this objective. The program should be based on the specific measures that have been successful in reducing trip generation for similar development projects and further investigate measures that would maximize usage of existing pedestrian, bicycle, and transit facilities, such as subsidizing transit passes, promoting ridesharing and vanpooling, and limiting the available parking supply. The Proponent is invited to consult with A Better City Transportation Management Association (TMA) and/or MassDOT to help implement the TDM program.**

See Section 2.7, Travel Demand Management.

DOT.4 **The Proponent should continue consultation with appropriate MassDOT units regarding the preparation of the DEIR. If you have any questions regarding these comments, please contact me at (857) 368-8862 or Michael Clark at (857) 368-8867.**

The Proponent has had discussions with MassDOT after filing the ENF.

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

RECEIVED

AUG 14 2019

MEPA

August 12, 2019

Secretary Katherine Theoharides
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

ATTN: Erin Flaherty, MEPA Office

RE: Parcel P-12C, 286-290 Tremont Street, Boston (Downtown), MA; MHC# RC.66727; EEA #16072

Dear Secretary Theoharides:

Staff of the Massachusetts Historical Commission (MHC) have reviewed the Environmental Notification Form (ENF) submitted for the above referenced project and have the following comments.

The proposed project consists of the construction of a mixed-use tower that will include a hotel on floors two through 11 and affordable residential units on floors 12 through 30. The ground floor uses include the residential lobby, a hotel lobby, and café or retail space, an accessible pedestrian walkway leading to a proposed courtyard, and a community space that the Proponent anticipates will include a Chinatown branch of the Boston Public Library. The total height of the proposed tower from the average site grade is approximately 350 feet, including the mechanical penthouse. A garage extension is also proposed at the rear of the parcel. The height of the proposed garage extension is approximately up to 122 feet.

The project is in close proximity to the Wang Theater (BOS.2315), Wilbur Theater (BOS.2314), Shubert Theater (BOS.2317), and Charles River Playhouse (BOS.2319), all of which are listed in the State and National Registers of Historic Places. The project site is also in close proximity to the Bay Village Historic District (BOS.BQ), which is listed in the State Register of Historic Places.

MHC requests that the proponent conduct shadow studies in order to assist in determining the effects of shadows on the historic properties and districts noted above. MHC.1

These comments are offered to assist in compliance with M.G.L. Chapter 9, sections 26-27C (950 CMR 71.00) and MEPA (301 CMR 11). Please do not hesitate to contact Elizabeth Sherva of my staff if you have any questions.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc: 288 Tremont Street Partners LLC
Katherine Ronan, MWRA
Corinne Snowdon, Epsilon Associates

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

MASSACHUSETTS HISTORICAL COMMISSION

MHC.1 **The project is in close proximity to the Wang Theater (BOS.2315), Wilbur Theater (BOS.2314), Shubert Theater (BOS.2317), and Charles River Playhouse (BOS.2319), all of which are listed in the State and National Registers of Historic Places. The project site is also in close proximity to the Bay Village Historic District (BOS.BQ), which is listed in the State Register of Historic Places. MHC requests that the proponent conduct shadow studies in order to assist in determining the effect of shadows on the historic properties and districts noted above.**

See Section 6.4.3 Shadow Impacts to Historic Resources; Figures 6.2 – 6.15.

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF
ENERGY AND ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENERGY RESOURCES
100 CAMBRIDGE ST., SUITE 1020
BOSTON, MA 02114
Telephone: 617-626-7300
Facsimile: 617-727-0030

Charles D. Baker
Governor

Karyn E. Polito
Lt. Governor

Kathleen A. Theoharides
Secretary

Judith F. Judson
Commissioner

16 August 2019

Kathleen Theoharides, Secretary
Executive Office of Energy & Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02114
Attn: MEPA Unit

RE: Parcel P-12C, Boston, Massachusetts, EEA #16072

Cc: Maggie McCarey, Director of Efficiency Programs, Department of Energy Resources
Judith Judson, Commissioner, Department of Energy Resources

Dear Secretary Theoharides:

We've reviewed the Environmental Notification Form (ENF) for the above project. The proposed project will include a 350' tower consisting of 180,000-sf low-income residential, 130,000-sf hotel, and 16,500-sf of library and retail space. There will also be approximately 90,000-sf of parking space. For this project, we expect key mitigation measures to include: DOER.1

- Electrification of space and water heating with heat pump/VRF systems;
- Passivehouse (PHI or PHIUS method);
- Maintain envelope integrity with framed, insulated walls with continuous insulation above code minimum levels;
- Avoid glass curtain wall assemblies and excessive windows;
- Energy recovery ventilation and waste-water systems;
- LED lighting and integrated lighting controls;

Emissions associated with regulated end uses can be largely eliminated (typically: 50 to 80% less emissions than code-built construction) with the above strategies. Significant incentives are available, as well.

We commend the proponent for their active commitment to pursue several GHG mitigation strategies within this project, including increased envelope insulation, reduction of fossil fuel consumption, and Passivehouse analysis.

Electrification of Space and Water Heating

Electrification of space and water heating is a key mitigation strategy with significant short- and long-term implications on GHG emissions. Massachusetts grid emissions rates continue to decline with the implementation of clean energy policies that increase renewable electricity sources. The implication is that efficient electric space and water heating with cold climate air source heat pump and VRF equipment has dramatically lower emissions profiles than fossil-fuel based heating options, including best-in-class condensing natural gas equipment. Currently, efficient electric heating has approximately **45% lower emissions** than condensing natural gas heating and, by 2050, efficient electric heating is expected to have approximately **85% lower emissions**.

Efficient electrification of space and water heating entails use of:

- Cold-climate air source heat pumps, and/or VRF for space heating;
- Air source heat pumps for water heating. (In-unit or centrally located)

Heat pumps and/or VRFs used for space heating can qualify for significant incentives, including Alternative Energy Credits (AECs). Additionally, electrifying space and water heating could eliminate the need for gas service from some or all the project, potentially eliminating costs associated with gas utility distribution.

Passivehouse

We recommend that Passivehouse be thoroughly investigated for the project. Two Passivehouse standards exist: Passive House Institute United States (PHIUS) and Passive House Institute (PHI), both are recognized by Massachusetts building code. DOER.2

Passivehouse is an effective GHG emission reduction strategy and will also provide many attractive benefits in-line with the project's goals of resiliency, unit affordability, and improved air quality for the future occupants, including:

- Greater affordability for the apartment residents (significant reduction in utility costs and maintenance costs);
- Greater resiliency (units can stay warm (or cool, in the summer) for extended periods of time);
- Noise reduction;
- Indoor air quality improvements;
- Comfort improvements;

- Greater building durability (reduced air leakage and attention to envelope detailing)
- Higher quality doors and windows.

Passivehouse multifamily may or may not cost more to build than minimally Code-compliant multifamily housing. For example, construction cost data taken from 194 projects by the Pennsylvania Housing Financing Agency (PHFA)[1] show that low- and mid-rise Passivehouse buildings cost $9.3/sf more than Code in 2015, then $2.7/sf more than Code in 2016, then **$6.2/sf less** than Code in 2018.

In Massachusetts, a building achieving Passivehouse could also qualify for credits and incentives which would offset part of a potential premium. For this project, the potential value of these is as follows:

- Alternative Energy Credits[2]
- MassSave© performance-based utility incentives[3]
- MassSave Passivehouse Incentives. MassSave recently announced a Passivehouse incentive worth up ~$3,250 per multifamily unit. See link in footnote for details.[4]

Integrity of Building Envelope

High-performing envelope is essential to successful GHG mitigation. Key strategies for maintaining integrity of envelope are:

- The use of continuous insulation
- Limiting or eliminating use of glass "curtain wall" and spandrel assemblies;
- Maximizing framed, insulated walls sections;
- Maintaining window/wall ratios to code levels.

The thermal performance of windows, curtain walls, and spandrels is about **70 to 80% less** than the thermal performance of the framed, insulated wall assemblies. Accordingly, buildings which use extensive curtain wall, spandrel, and windows have compromised envelope performance, compared to a code modelled baseline building, which increases energy consumption and operating costs as well as greenhouse gas and local air pollutant emissions.

Rooftop Solar PV or Solar Thermal

---

[1] Pennsylvania Housing and Finance Association. *Passivehouse Cost Comparison Data set 2015, 2016, 2018* [Data Set]

[2] https://www.mass.gov/service-details/alternative-portfolio-standard-rulemaking;

[3] https://www.masssave.com/-/media/Files/PDFs/Save/Residential/Pay-for-Savings.pdf?la=en&hash=67420BCA38A8BC3BBDB8B9DE41949DE58D22C964

[4] http://ma-eeac.org/wordpress/wp-content/uploads/Mass-Save-PH-offer-EEAC-meeting-7.24.2019-Final-002.pdf

Rooftop PV or solar thermal collectors can provide significant GHG benefits as well as significant financial benefits. We recommend preliminary solar access evaluations be performed for the project. DOER.3

We recognize that the urban location and extreme height of this building and the limited roof space may not lend itself to rooftop PV, however anticipating significant hot water needs for the intended uses and the greater energy collection of solar thermal collectors per square foot, opportunities for on-site solar thermal collectors and or solar PV should be considered. DOER.4

Recommendations for subsequent Submissions

Recommendations are as follows:

- Emissions and utility cost reduction should be estimated for heat pumps/VRF for all buildings for both space heating and water heating. DOER.5

- Emissions and utility cost reduction should be estimated using Passivehouse design criteria for multifamily. Passivehouse analysis should include: DOER.6

    a. Estimate of Alternative Energy Credits, including bonus multipliers for Passivehouse-level performance;

    b. Estimates of MassSave® incentives, based on meeting with utility. Note that new Passivehouse incentive offerings are included in the 2019-2021 statewide energy efficiency plan.

- Evaluate solar PV for all buildings. DOER.7

    a. Map out maximum area available for solar thermal or PV.

    b. Estimate GHG reduction as a result of solar thermal for pre-heating hot water or solar PV.

- Above-code envelope should be used throughout. In summary: DOER.8

    a. Above Code-threshold envelope is recommended (vertical walls, windows, roofs and exposed floors). Priority should be given to increasing **continuous insulation**. Distinguish between R value of batt and R value of continuous insulation. Indicate planned wall assembly U value and wall construction type (mass, wood, metal stud, etc). Confirm that the relationship between R-value and assembly U-factor conform to Appendix A of the Code.

    b. Window to wall ratios should be maintained at or below the values shown in Table G3.1.1-1 of ASHRAE 90.1-2013.

c. Glass curtain wall/spandrel systems should be avoided.

- Report the following for each building: DOER.9

Vertical Envelope	Reference Building		Proposed Building	
	Percent of Vertical Area	U value	Percent of Vertical Area	U value
Framed, insulated Wall	%	value	%	value
Opaque glass, curtain wall, shadowbox, spandrel	%	value	%	value
Vision glass	%	value	%	value
	100%	*Aggregate U*	*100%*	*Aggregate U*
		Aggregate R		*Aggregate R*

Aggregate U is calculated as: $(U_1\%_1 + U_2\%_2 + U_3\%_3)$ where U is the respective thermal transmittance values and $\%_1$ is the percent area of framed insulated wall; $\%_2$ is the percent area of opaque glass, curtain, or shadowbox; and $\%_3$ is the percent area of vision glass. Only areas adjacent to conditioned space are counted, areas adjacent to unconditioned spaces (e.g. parking garages, mechanical penthouses) are not counted. Aggregate R is the inverse of aggregate U.

- For all buildings, the proposed aggregate R calculated above should be larger than the reference building; otherwise envelope performance is being traded-off for other improvements, reversing mitigation gains. Tradeoffs should be avoided. DOER.10

- Investigate external shading. DOER.11

- Submit project modeling files to the DOER on a flash drive. DOER.12

- Compare model results total and individual end uses with representative, prototype buildings developed by Pacific Northwest National Labs/Department of Energy found at the link below. Provide a summary explaining potential differences. DOER.13

  - https://www.energycodes.gov/sites/default/files/documents/BECP_901_2013_Progress_Indicator_0_0.pdf
  - http://www.energycodes.gov/sites/default/files/documents/2013EndUseTables.zip
  - https://www.energycodes.gov/commercial-energy-cost-savings-analysis

- Include a table similar to the example below. For "code value" ensure that the value incorporates any improved efficiency per requirements of Section C406.1 of the Massachusetts' amendments. DOER.14

Measure/Area	Base Code	Proposed	% Change	Comment

AC Efficiency (EER)				
Bldg 1	*code value*	*design value*	**%**	
Bldg 2	*code value*	*design value*	**%**	
ERV Effectiveness (%)				
Bldg 1	*code value*	*design value*	**%**	
Bldg 2	*code value*	*design value*	**%**	
Boiler (% efficiency)				
Bldg 1	*code value*	*design value*	**%**	
Bldg 2	*code value*	*design value*	**%**	
LPD (Watts/sq ft)				
Bldg 1	*code value*	*design value*	**%**	
Bldg 2	*code value*	*design value*	**%**	
(continue to include service water, equipment, etc)				

Sincerely,

Paul F. Ormond, P.E.
Energy Efficiency Engineer
Massachusetts Department of Energy Resources

Brendan Place
Clean Energy Engineer
Massachusetts Department of Energy Resources

DEPARTMENT OF ENERGY RESOURCES

DOER.1 **For this project, we expect key mitigation measures to include:**

- **Electrification of space and water heating with heat pump/VRF systems;**
- **Passivehouse (PHI or PHIUS method);**
- **Maintain envelope integrity with framed, insulated walls with continuous insulation above code minimum levels;**
- **Avoid glass curtain wall assemblies and excessive windows;**
- **Energy recovery ventilation and waste-water systems;**
- **LED Lighting and integrated lighting controls.**

All of the above measures are discussed in Chapter 8.

DOER.2 **We recommend that Passivehouse be thoroughly investigated for the project. Two Passivehouse standards exist: Passive House Institute United States (PHIUS) and Passive House Institute (PHI), both are recognized by Massachusetts building code.**

Please refer to Section 8.1.7 for a Passive House analysis.

DOER.3 **Rooftop PV or solar thermal collectors can provide significant GHG benefits as well as significant financial benefits. We recommend preliminary solar access evaluations be performed for the project.**

Please refer to Section 8.1.11 for a rooftop solar analysis.

DOER.4 **We recognize that the urban location and extreme height of this building and the limited roof space may not lend itself to rooftop PV, however anticipated significant hot water needs for the intended uses and the greater energy collection of solar thermal collectors per square foot, opportunities for on-site solar thermal collectors and or solar PV should be considered.**

Please refer to Section 8.1.11 for a solar analysis.

DOER.5 **Emissions and utility cost reduction should be estimated for heat pumps/VRF for all buildings for both space heating and water heating.**

Please refer to Section 8.1.6 for a discussion of electric systems including utility cost reductions.

DOER.6 **Emissions and utility cost reduction should be estimated using Passivehouse design criteria for multifamily. Passivehouse analysis should include:**

a) **Estimate of Alternative Energy Credits, including bonus multipliers for Passivehouse-level performance;**

b) **Estimates of MassSave® incentives, based on meeting with utility. Note that new Passivehouse incentive offerings are included in the 2019-2021 statewide energy efficiency plan.**

Please refer to Section 8.1.7 for a Passive House analysis that includes emission and utility cost reductions, and estimate of available AECs, and MassSave Passive House incentives.

DOER.7 **Evaluate solar PV for all buildings.**

a) **Map out maximum area available for solar thermal or PV.**

b) **Estimate GHG reduction as a result of solar thermal for pre-heating hot water or solar PV.**

Please refer to Section 8.1.11 for a rooftop solar analysis, including available garage-top space and GHG reduction potential.

DOER.8 **Above-code envelope should be used throughout. In summary:**

a) **Above Code-threshold envelope is recommended (vertical walls, windows, roofs and exposed floors). Priority should be given to increasing continuous insulation. Distinguish between R value of batt and R value of continuous insulation. Indicate planned wall assembly U value and wall construction type (mass, wood, metal stud, etc.). Confirm that the relationship between R-value and assembly U-factor conform to Appendix A of the Code.**

b) **Window to wall ratios should be maintained at or below the values shown in Table G3.1.1-1 of ASHRAE 90.1-2013.**

c) **Glass curtain wall/spandrel systems should be provided.**

An above-code envelope is proposed. The window to wall ratio will be less than 24%. Curtain wall has been limited to ground level retail storefronts.

DOER.9 Report the following for each building:

Vertical Envelope	Reference Building Percent of Vertical Area	Reference Building U value	Proposed Building Percent of Vertical Area	Proposed Building U value
Framed, insulated wall	%	Value	%	Value
Opaque glass, curtain wall, shadowbox, spandrel	%	Value	%	Value
Vision glass	%	Value	%	Value
	100%	*Aggregate U*	*100%*	*Aggregate U*
		Aggregate R		*Aggregate R*

Please refer to Table 8-2.

DOER.10 For all buildings, the proposed aggregate R calculated above should be larger than the reference building; otherwise envelope performance is being traded-off for other improvements, reversing mitigation gains. Tradeoffs should be avoided.

The proposed aggregate R value exceeds the reference building.

DOER.11 Investigate internal shading.

External shading will be studied as design progresses.

DOER.12 Submit project modeling files to the DOER on a flash drive.

Modeling files will be provided.

DOER.13 Compare model results total and individual end uses with representative prototype buildings developed by Pacific Northwest National Labs/Department of Energy found at the links [provided]. Provide a summary explaining potential differences.

Table 8-3 includes EUI comparisons to PNNL prototypes.

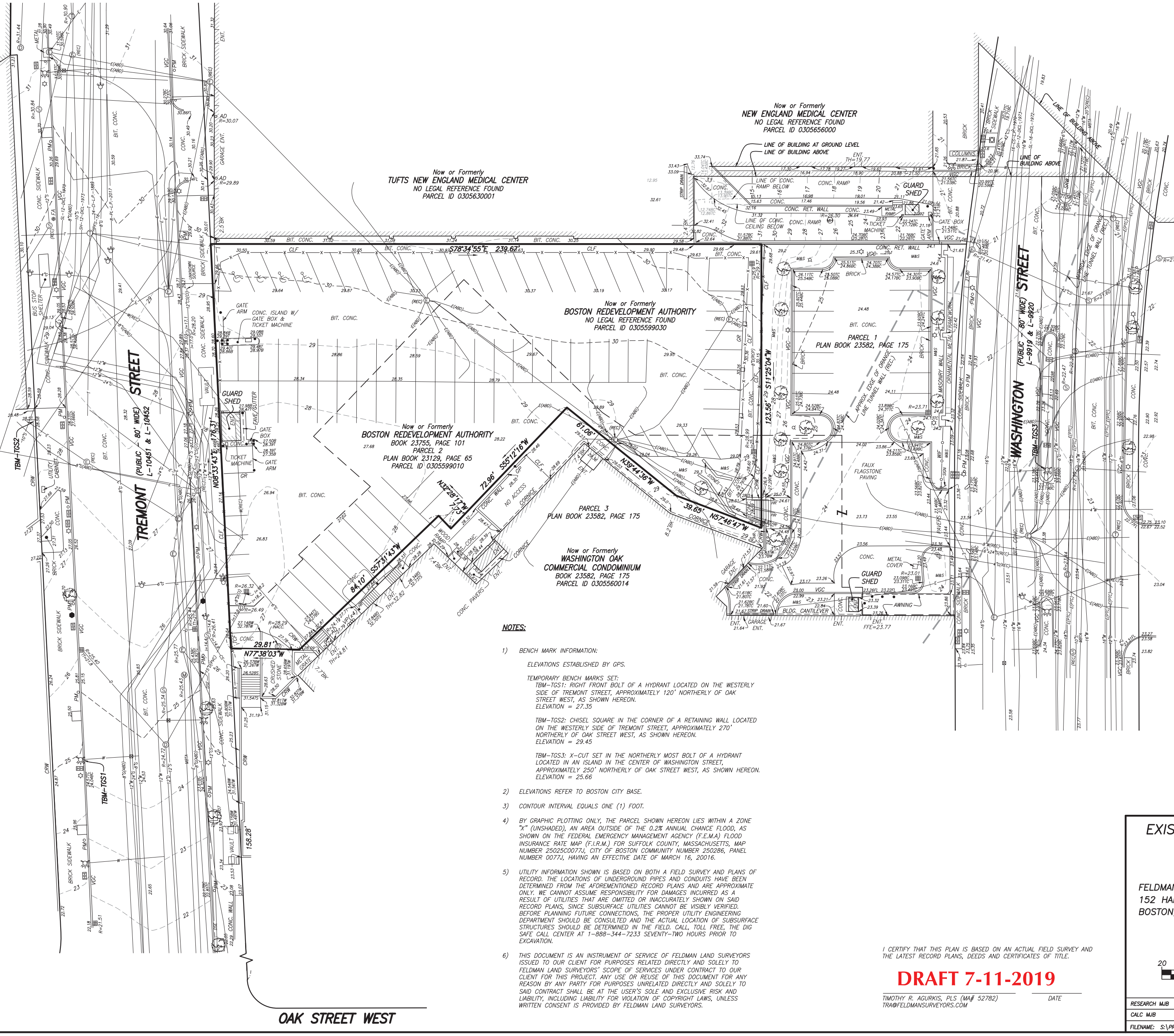
DOER.14 **Include a table similar to the example below. For "code value" ensure that the value incorporates any improved efficiency per requirements of Section C406.1 of the Massachusetts' amendments.**

Measure/Area	Base Code	Proposed	% Change	Comment
AC Efficiency (EER)				
Bldg 1	Code value	Design value		
Bldg 2	Code value	Design value		
ERV Efficiency (%)				
Bldg 1	Code value	Design value		
Bldg 2	Code value	Design value		
Boiler (%)				
Bldg 1	Code value	Design value		
Bldg 2	Code value	Design value		
LPD (Watts/sq ft)				
Bldg 1	Code value	Design value		
Bldg 2	Code value	Design value		
(Continue to include service water, equipment, etc.)				

Please refer to Attachment G for a table of modeling inputs.

Attachment A

Site Survey



LEGEND

- SEWER MANHOLE
- DRAIN MANHOLE
- ELECTRIC MANHOLE
- TELEPHONE MANHOLE
- MBTA MANHOLE
- MANHOLE
- HYDRANT
- WATER SHUT OFF/WATER GATE
- GAS SHUT OFF/GAS GATE
- BOSTON WATER VALVE
- CATCH BASIN
- TRAFFIC SIGNAL
- LIGHT POLE
- ELECTRIC HANDHOLE
- BOLLARD
- SIGN
- AD .... AREA DRAIN
- PM .... PARKING METER
- VP .... VENT PIPE
- FA .... FIRE ALARM
- SECURITY CAMERA
- DECIDUOUS TREE
- HANDICAP RAMP
- GP .... GATE POST
- B .... BOTTOM
- Z .... INDICATES COMMON OWNERSHIP
- BC .... BOTTOM OF CURB
- BIT .... BITUMINOUS
- BK .... BACK
- BS .... BOTTOM OF STEPS
- BW .... BOTTOM OF WALL
- CLF .... CHAIN LINK FENCE
- CONC .... CONCRETE
- CRW .... CONCRETE RETAINING WALL
- DWS .... DETECTIBLE WARNING SYSTEM
- ENT .... ENTRANCE
- FL .... FLUSH
- HR .... HANDRAIL
- I= .... INVERT ELEVATION
- INACC. .... INACCESSIBLE
- M&S .... MULCH & SHRUBS
- R= .... RADIUS OR RIM ELEVATION
- (REC) .... RECORD
- SQ. FT. .... SQUARE FEET
- T .... TOP
- TBM .... TEMPORARY BENCH MARK
- TC .... TOP OF CURB
- TCF .... TEMPORARY CONSTRUCTION FENCE
- TH .... THRESHOLD
- TS .... TOP OF STEPS
- TW .... TOP OF WALL
- VGC .... VERTICAL GRANITE CURB
- —C— CABLE TELEVISION
- —CS— COMBINED SEWER
- —D— DRAIN
- —E— ELECTRIC
- —E(PTC)— ELECTRIC–PIPE TYPE CABLE
- —G— GAS
- —L— STREET LIGHTING
- —M— MBTA
- —S— SEWER
- —T— TELEPHONE
- —W— WATER
- —(ABD)— ABANDONED
- —(CI)— CAST IRON
- —(PVC)— POLYVINYL CHLORIDE
- —x—x—x— METAL FENCE
- —DSE— DIGSAFE ELECTRIC

NOTES:

1) BENCH MARK INFORMATION:

ELEVATIONS ESTABLISHED BY GPS.

TEMPORARY BENCH MARKS SET:

TBM–TGS1: RIGHT FRONT BOLT OF A HYDRANT LOCATED ON THE WESTERLY SIDE OF TREMONT STREET, APPROXIMATELY 120' NORTHERLY OF OAK STREET WEST, AS SHOWN HEREON.
ELEVATION = 27.35

TBM–TGS2: CHISEL SQUARE IN THE CORNER OF A RETAINING WALL LOCATED ON THE WESTERLY SIDE OF TREMONT STREET, APPROXIMATELY 270' NORTHERLY OF OAK STREET WEST, AS SHOWN HEREON.
ELEVATION = 29.45

TBM–TGS3: X–CUT SET IN THE NORTHERLY MOST BOLT OF A HYDRANT LOCATED IN AN ISLAND IN THE CENTER OF WASHINGTON STREET, APPROXIMATELY 250' NORTHERLY OF OAK STREET WEST, AS SHOWN HEREON.
ELEVATION = 25.66

2) ELEVATIONS REFER TO BOSTON CITY BASE.

3) CONTOUR INTERVAL EQUALS ONE (1) FOOT.

4) BY GRAPHIC PLOTTING ONLY, THE PARCEL SHOWN HEREON LIES WITHIN A ZONE "X" (UNSHADED), AN AREA OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD, AS SHOWN ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY (F.E.M.A) FLOOD INSURANCE RATE MAP (F.I.R.M.) FOR SUFFOLK COUNTY, MASSACHUSETTS, MAP NUMBER 25025C0077J, CITY OF BOSTON COMMUNITY NUMBER 250286, PANEL NUMBER 0077J, HAVING AN EFFECTIVE DATE OF MARCH 16, 20016.

5) UTILITY INFORMATION SHOWN IS BASED ON BOTH A FIELD SURVEY AND PLANS OF RECORD. THE LOCATIONS OF UNDERGROUND PIPES AND CONDUITS HAVE BEEN DETERMINED FROM THE AFOREMENTIONED RECORD PLANS AND ARE APPROXIMATE ONLY. WE CANNOT ASSUME RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES THAT ARE OMITTED OR INACCURATELY SHOWN ON SAID RECORD PLANS, SINCE SUBSURFACE UTILITIES CANNOT BE VISIBLY VERIFIED. BEFORE PLANNING FUTURE CONNECTIONS, THE PROPER UTILITY ENGINEERING DEPARTMENT SHOULD BE CONSULTED AND THE ACTUAL LOCATION OF SUBSURFACE STRUCTURES SHOULD BE DETERMINED IN THE FIELD. CALL, TOLL FREE, THE DIG SAFE CALL CENTER AT 1–888–344–7233 SEVENTY–TWO HOURS PRIOR TO EXCAVATION.

6) THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF FELDMAN LAND SURVEYORS ISSUED TO OUR CLIENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO FELDMAN LAND SURVEYORS' SCOPE OF SERVICES UNDER CONTRACT TO OUR CLIENT FOR THIS PROJECT. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN CONSENT IS PROVIDED BY FELDMAN LAND SURVEYORS.

I CERTIFY THAT THIS PLAN IS BASED ON AN ACTUAL FIELD SURVEY AND THE LATEST RECORD PLANS, DEEDS AND CERTIFICATES OF TITLE.

DRAFT 7-11-2019

TIMOTHY R. AGURKIS, PLS (MA# 52782) — DATE
TRA@FELDMANSURVEYORS.COM

EXISTING CONDITIONS PLAN OF LAND
290 TREMONT STREET
BOSTON, MASS.

FELDMAN LAND SURVEYORS
152 HAMPDEN STREET
BOSTON, MASS. 02119
PHONE: (617)357–9740
www.feldmansurveyors.com

JUNE 25, 2019

FELDMAN LAND SURVEYORS

20 0 10 20 40 60

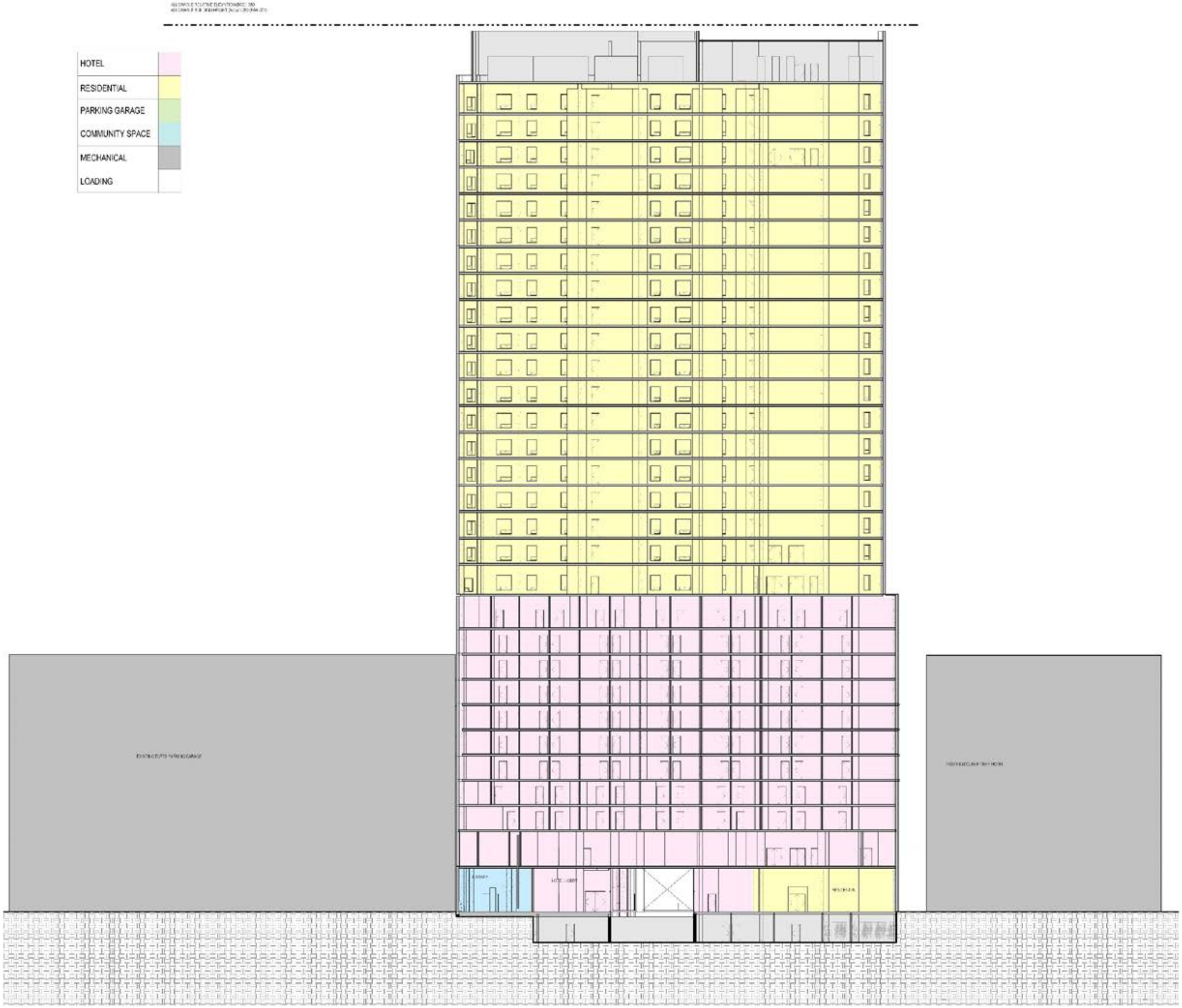
SCALE: 1"=20'

RESEARCH MJB	FIELD CHIEF TS	PROJ MGR TRA	APPROVED	SHEET NO. 1 OF 1
CALC MJB	CADD MJB	FIELD CHECKED	CRD FILE 16799	JOB NO. 16799

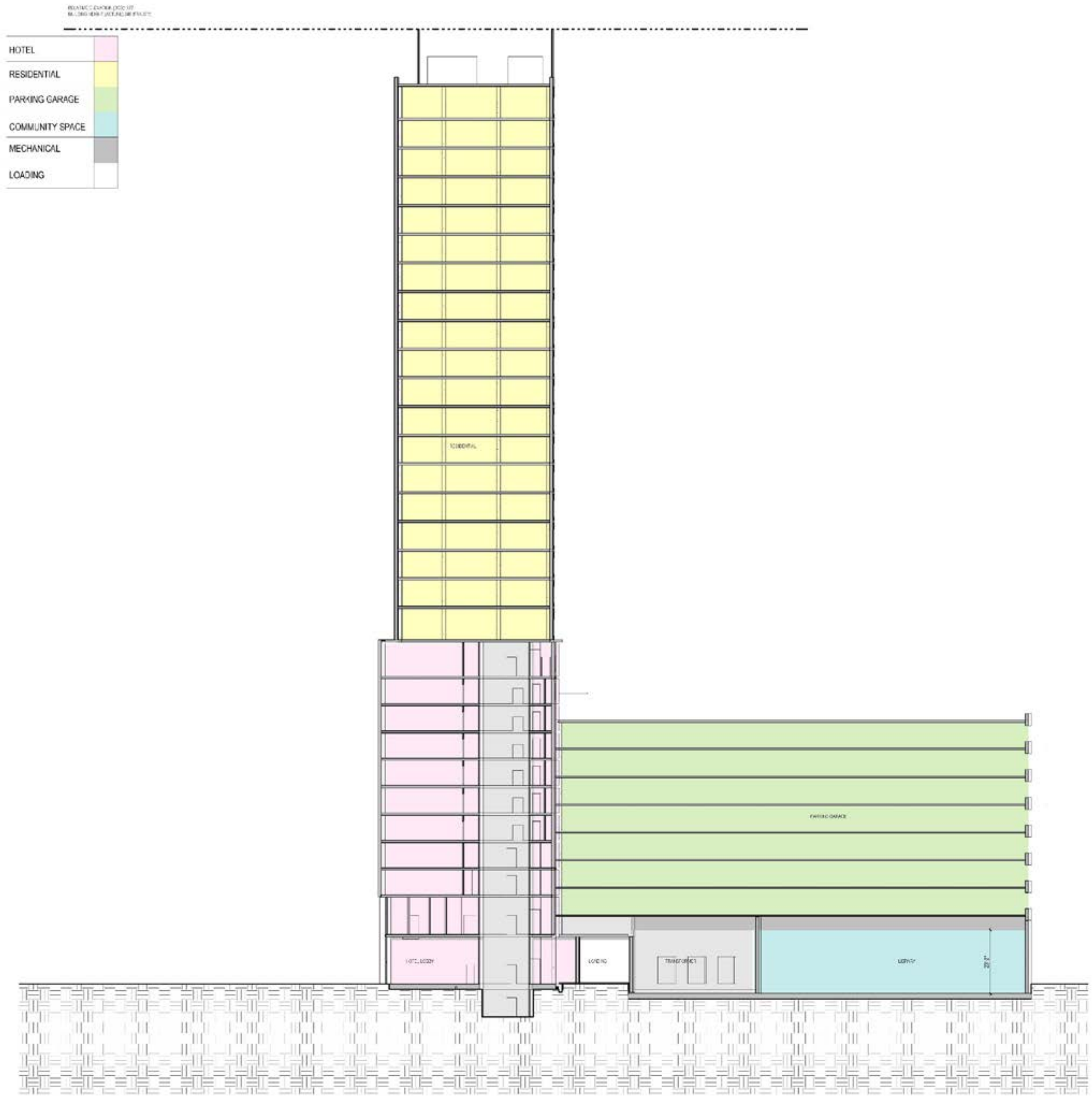
FILENAME: S:\PROJECTS\16700s\16799\DWG\16799–EC.dwg

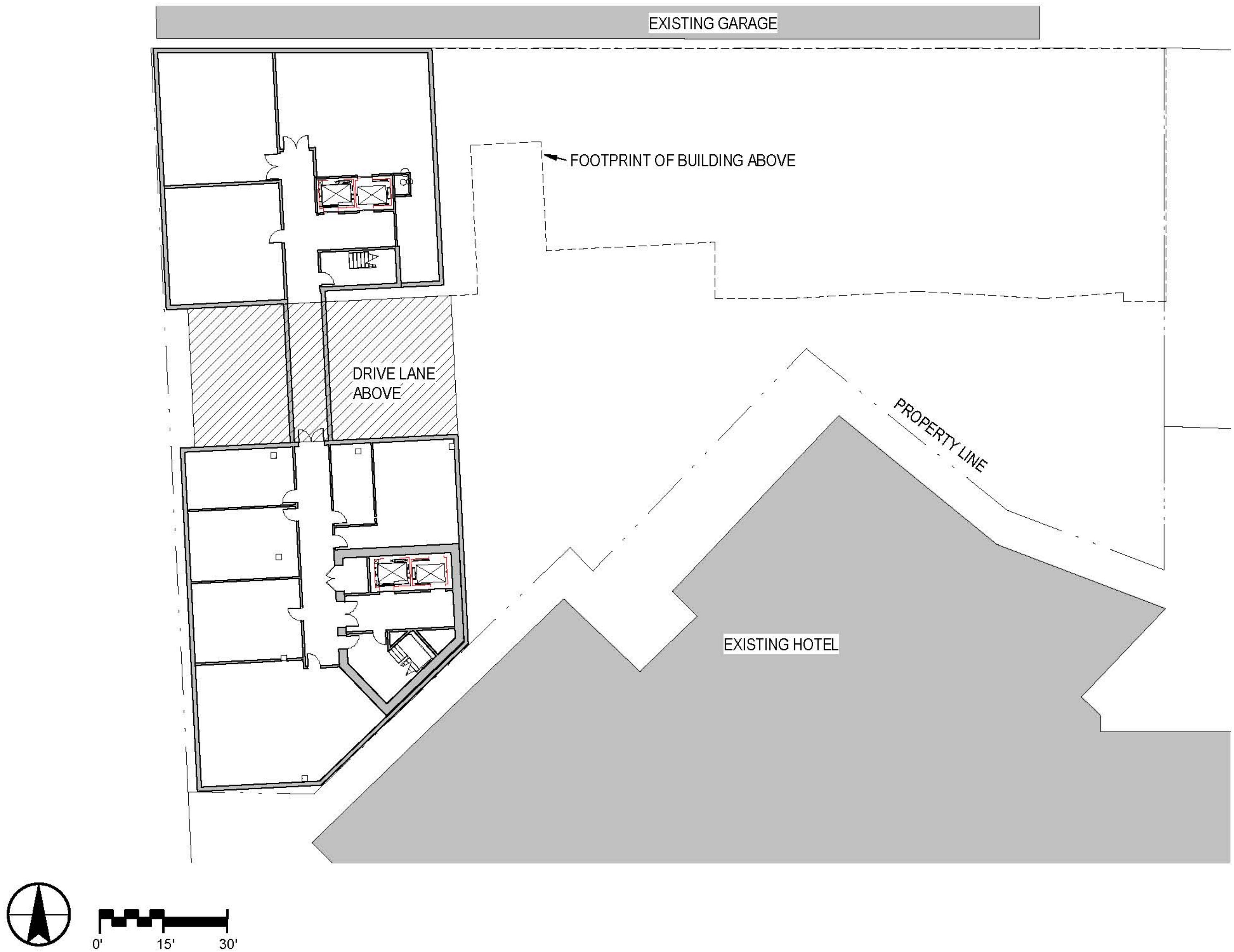
Attachment B

Floor Plans

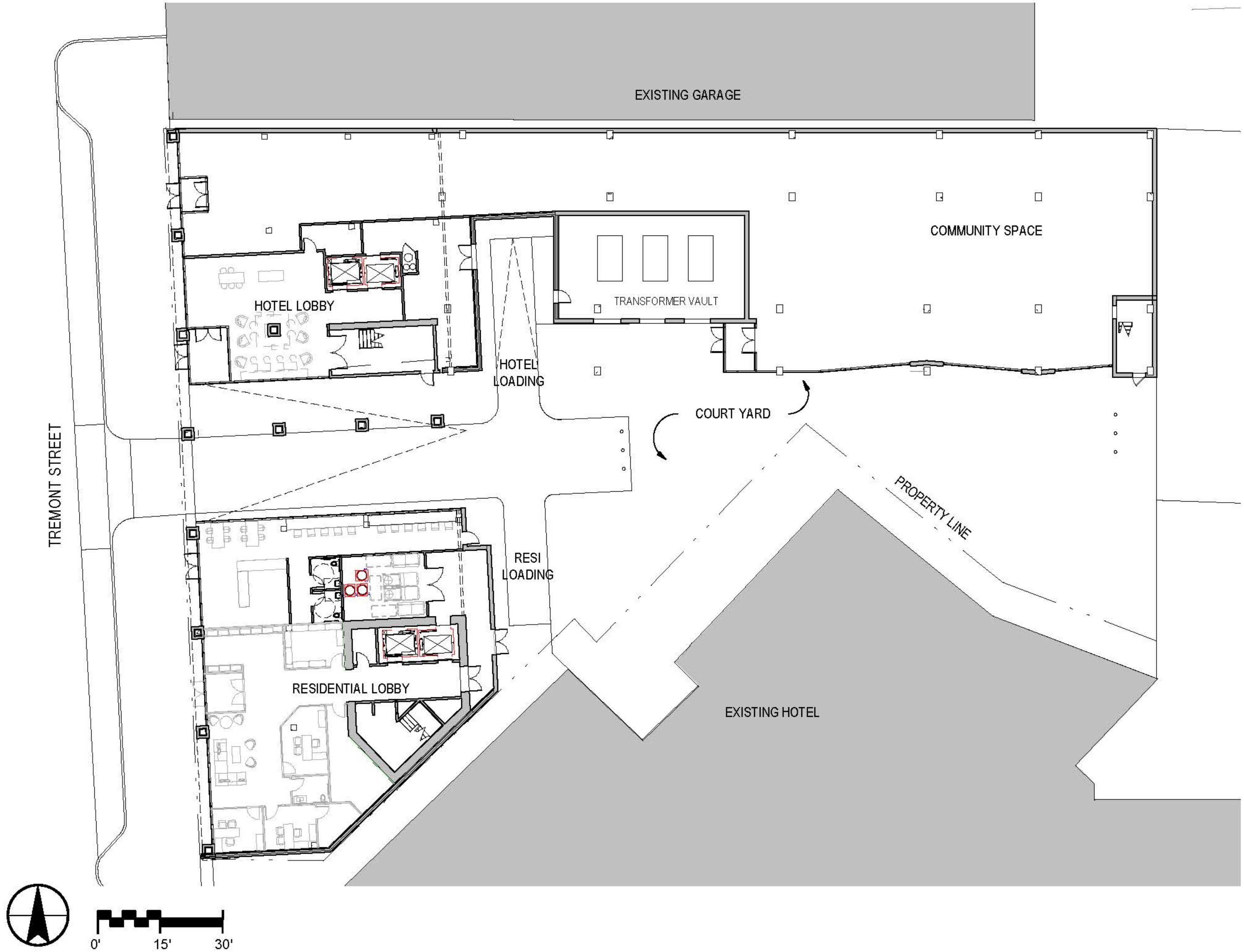


Parcel P-12C Boston, Massachusetts


HOTEL
RESIDENTIAL
PARKING GARAGE
COMMUNITY SPACE
MECHANICAL
LOADING



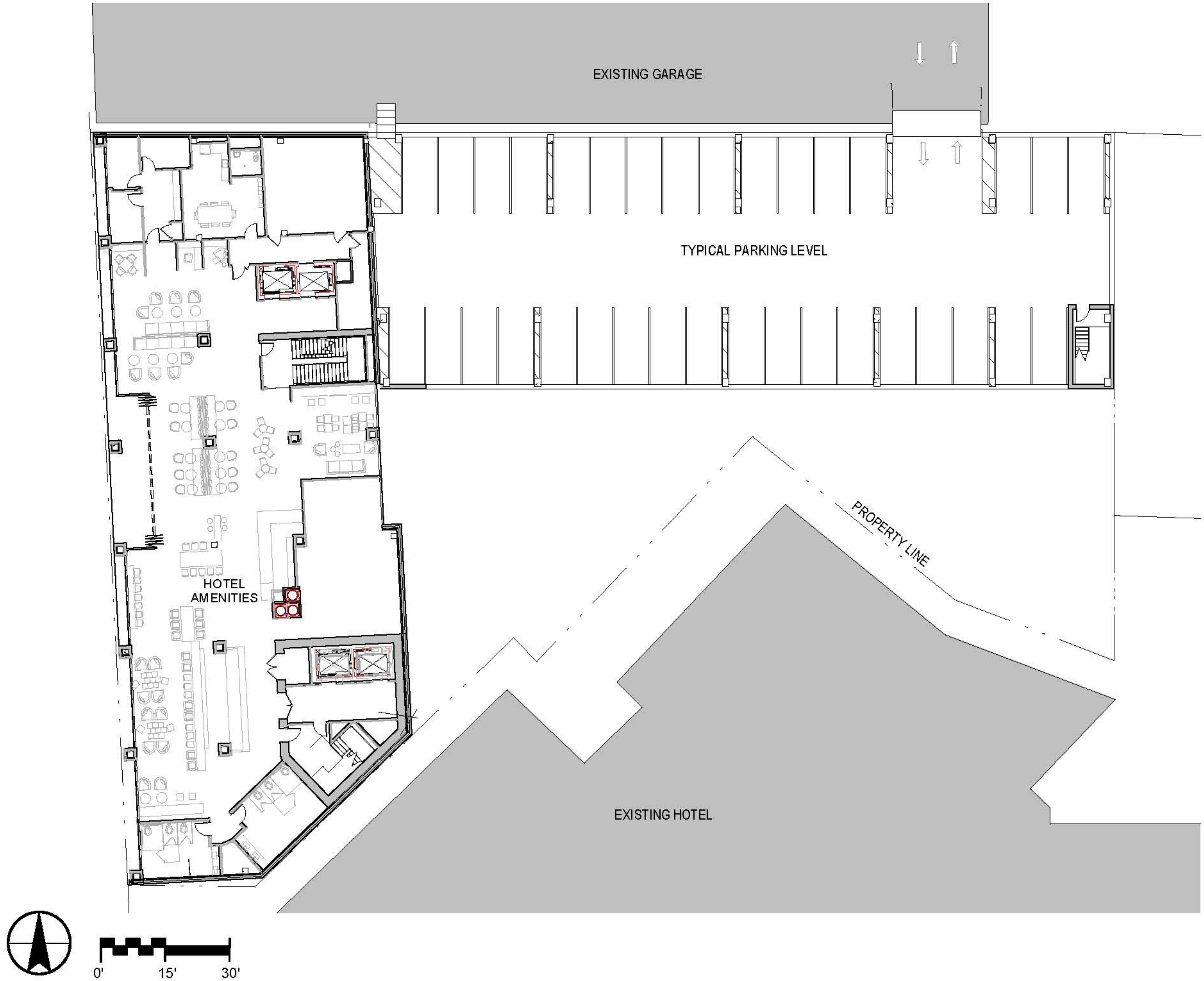
Parcel P-12C **Boston, Massachusetts**



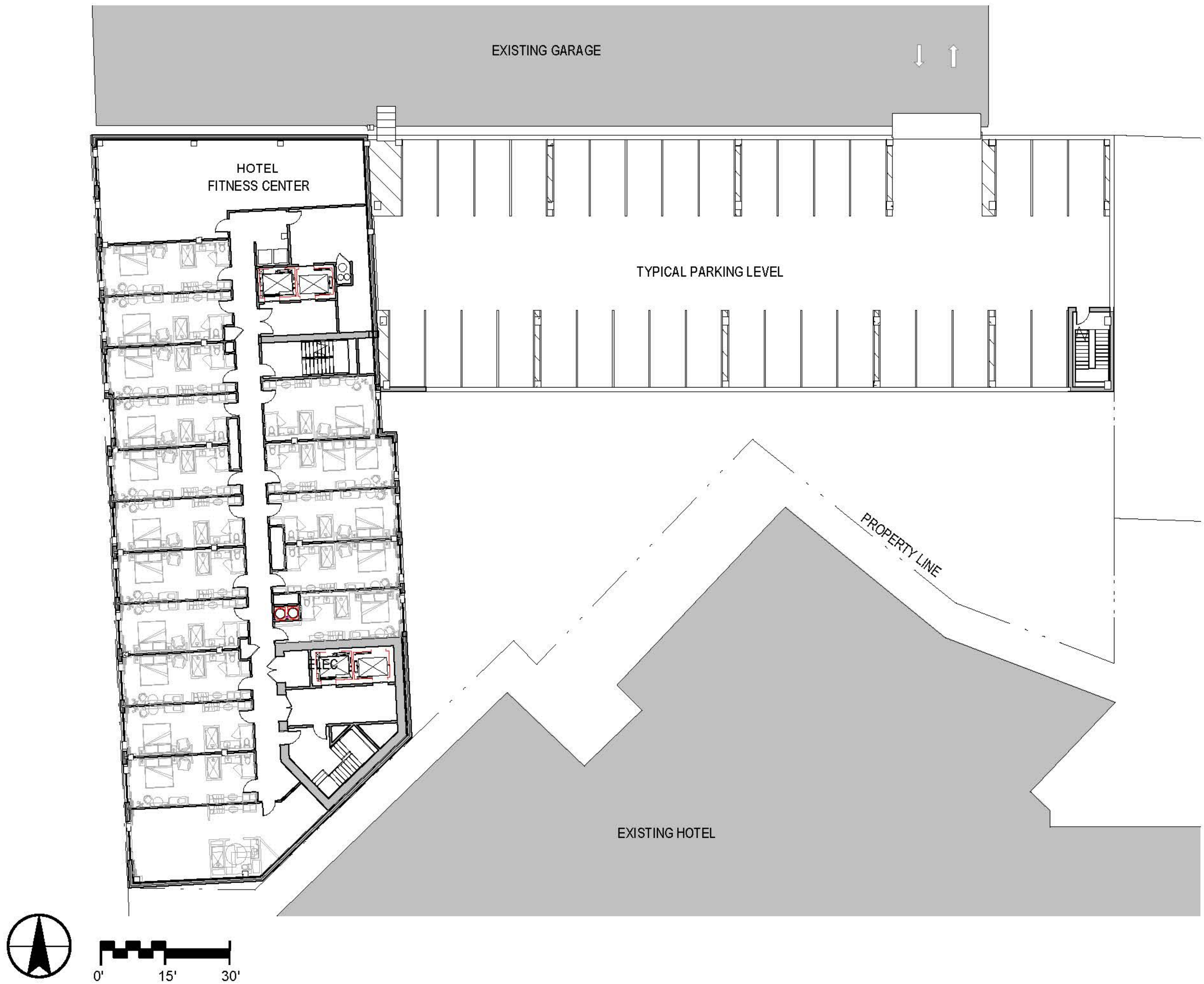
Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

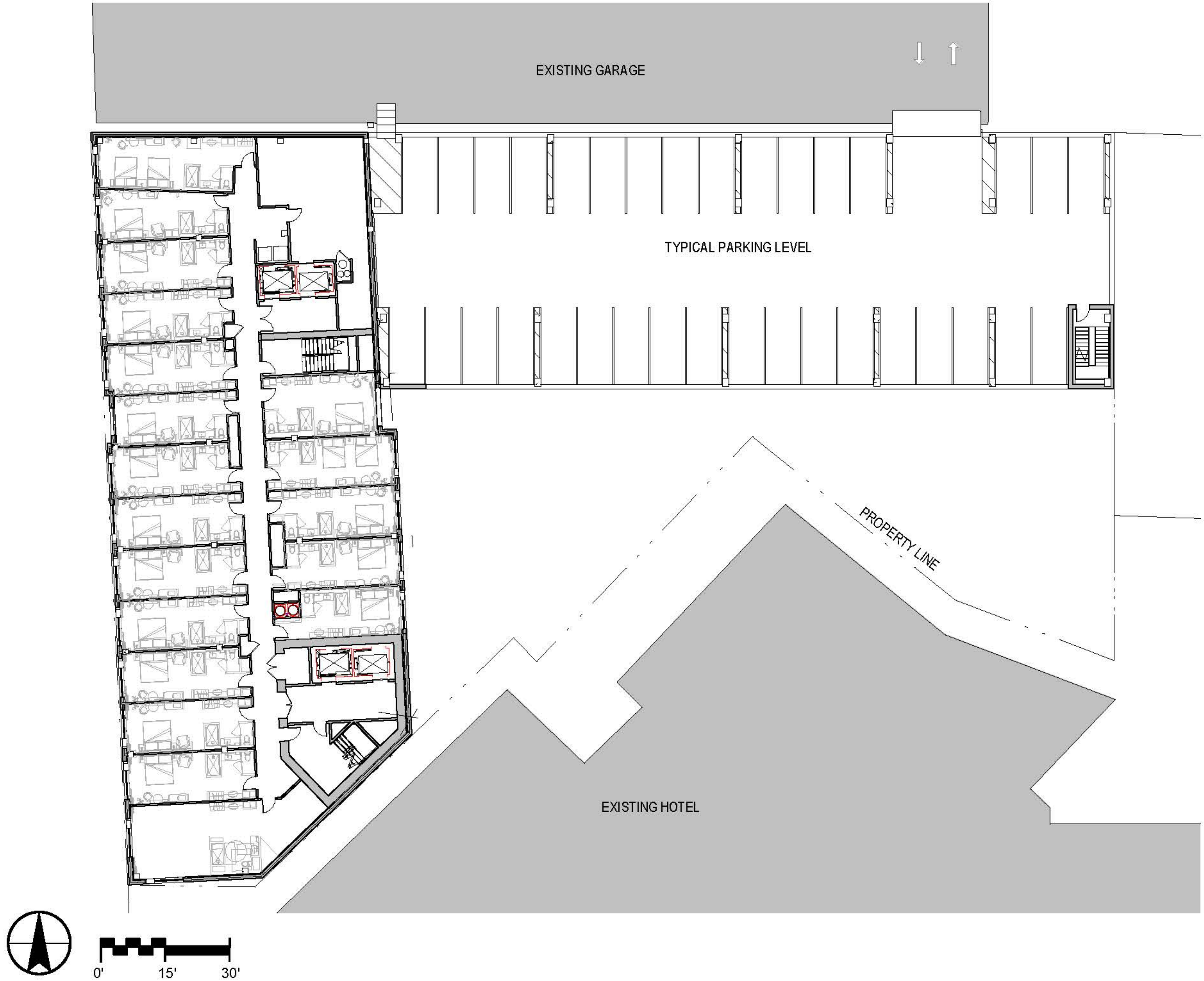
Ground Floor Plan



Parcel P-12C Boston, Massachusetts



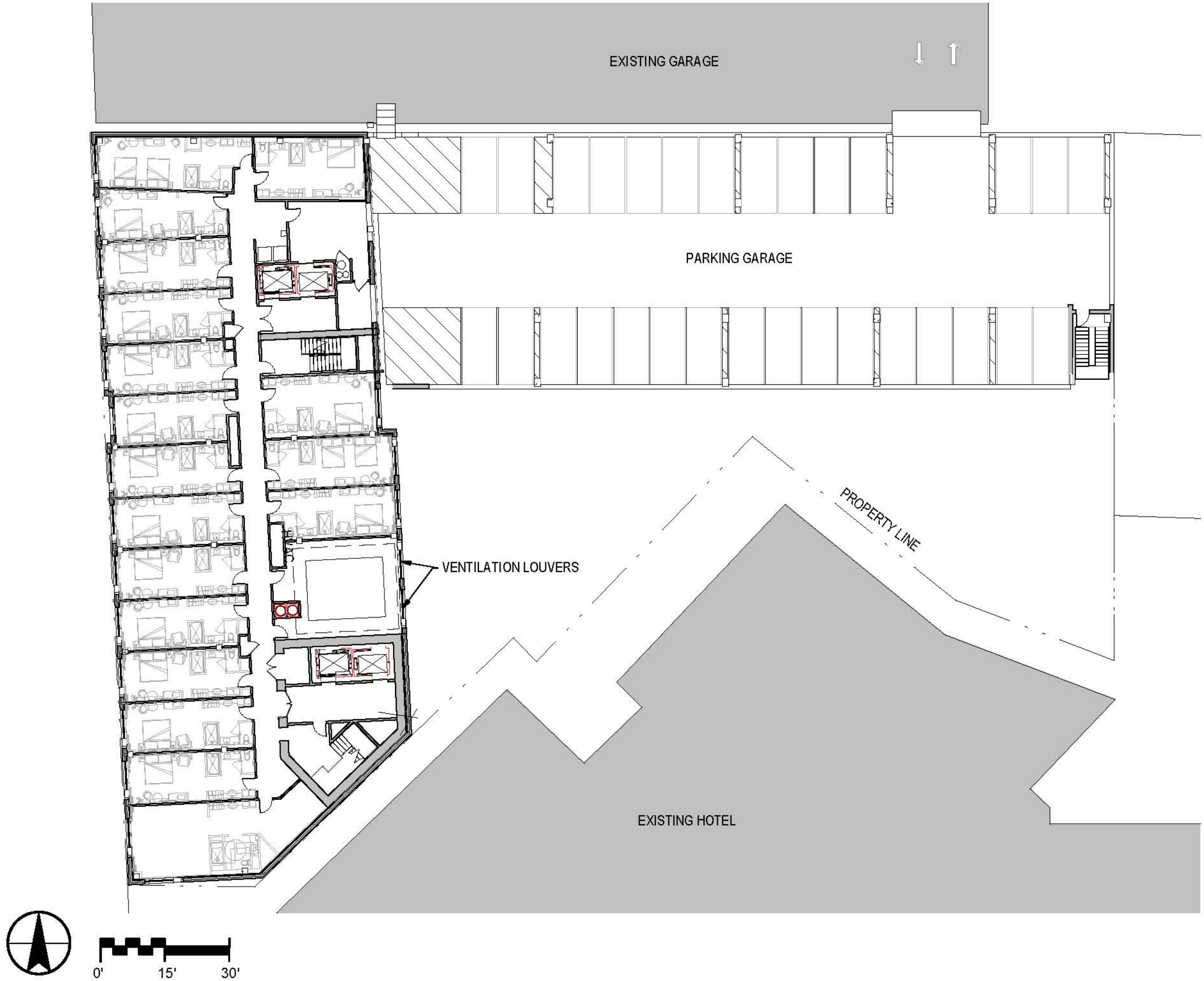
Parcel P-12C Boston, Massachusetts



Parcel P-12C **Boston, Massachusetts**

Stantec D/R/E/A/M COLLABORATIVE
ARCHITECTURE | REAL ESTATE DEVELOPMENT

Levels 4-10 – Typical Hotel Floor



Parcel P-12C **Boston, Massachusetts**

Parcel P-12C **Boston, Massachusetts**

Parcel P-12C **Boston, Massachusetts**

Attachment C

Transportation

Attachment C - Transportation

Peak Hour Vehicle, Pedestrian, and Bicycle Counts

Seasonal Adjustment Factors

Trip Generation - Proposed Program

Synchro Intersection Level of Service Reports

- Existing (2019) Condition
- No-Build (2026) Condition
- Build (2026) Condition

Transit Analysis

Additional 11-Hour Vehicle, Pedestrian, and Bicycle Counts

Peak Hour Vehicle, Pedestrian, and Bicycle Counts

Client: Melissa Restrepo
Project #: Location 2
BTD #: 373_C28_HSH
Location: Boston, MA
Street 1: Stuart St
Street 2: Tremont St
Count Date: 5/1/2019
Day of Week: Wednesday
Weather: Clear, 50 F

TOTAL (CARS & TRUCKS)

	Tremont St Northbound				Tremont St Southbound				Stuart St Eastbound				Stuart St Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	0	0	0	16	38	30	0	0	61	28	0	27	103	0
7:15 AM	0	0	0	0	0	14	56	42	0	0	68	35	0	21	112	0
7:30 AM	0	0	0	0	0	20	41	26	0	0	78	32	0	17	116	0
7:45 AM	0	0	0	0	0	19	63	29	0	0	93	44	0	26	130	0
8:00 AM	0	0	0	0	0	23	52	38	0	0	111	38	0	28	107	0
8:15 AM	0	0	0	0	0	25	55	41	0	0	78	40	0	12	70	0
8:30 AM	0	0	0	0	0	10	73	27	0	0	105	45	0	46	114	0
8:45 AM	0	0	0	0	0	19	73	27	0	0	100	41	0	35	105	0

	Tremont St Northbound				Tremont St Southbound				Stuart St Eastbound				Stuart St Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
4:00 PM	0	0	0	0	0	38	109	31	0	0	125	49	0	22	110	0
4:15 PM	0	0	0	0	0	52	89	36	0	0	138	38	0	21	89	0
4:30 PM	0	0	0	0	0	28	97	23	0	0	135	44	0	27	100	0
4:45 PM	0	0	0	0	0	27	118	32	0	0	138	35	0	23	74	0
5:00 PM	0	0	0	0	0	35	110	31	0	0	124	54	0	26	70	0
5:15 PM	0	0	0	0	0	34	105	23	0	0	159	44	0	22	100	0
5:30 PM	0	0	0	0	0	41	110	30	0	0	143	36	0	25	92	0
5:45 PM	0	0	0	0	0	38	114	27	0	0	146	36	0	21	100	0

AM PEAK HOUR 7:45 AM to 8:45 AM	Tremont St Northbound				Tremont St Southbound				Stuart St Eastbound				Stuart St Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**77**	**243**	**135**	**0**	**0**	**387**	**167**	**0**	**112**	**421**	**0**
PHF	**0.00**				**0.94**				**0.92**				**0.83**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**18.2%**	**12.3%**	**14.1%**	**0.0%**	**0.0%**	**7.2%**	**6.0%**	**0.0%**	**4.5%**	**8.6%**	**0.0%**

PM PEAK HOUR 5:00 PM to 6:00 PM	Tremont St Northbound				Tremont St Southbound				Stuart St Eastbound				Stuart St Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**148**	**439**	**111**	**0**	**0**	**572**	**170**	**0**	**94**	**362**	**0**
PHF	**0.00**				**0.96**				**0.91**				**0.93**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**10.1%**	**2.3%**	**7.2%**	**0.0%**	**0.0%**	**3.5%**	**3.5%**	**0.0%**	**3.2%**	**1.1%**	**0.0%**

Client:	Melissa Restrepo
Project #:	Location 2
BTD #:	373_C28_HSH
Location:	Boston, MA
Street 1:	Stuart St
Street 2:	Tremont St
Count Date:	5/1/2019
Day of Week:	Wednesday
Weather:	Clear, 50 F

TRUCKS

	Tremont St Northbound				Tremont St Southbound				Stuart St Eastbound				Stuart St Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	0	0	0	5	4	5	0	0	5	0	0	0	13	0
7:15 AM	0	0	0	0	0	6	7	6	0	0	3	2	0	0	8	0
7:30 AM	0	0	0	0	0	3	5	2	0	0	5	0	0	0	18	0
7:45 AM	0	0	0	0	0	3	11	5	0	0	7	4	0	1	12	0
8:00 AM	0	0	0	0	0	5	6	3	0	0	6	1	0	3	7	0
8:15 AM	0	0	0	0	0	5	5	8	0	0	9	1	0	0	7	0
8:30 AM	0	0	0	0	0	1	8	3	0	0	6	4	0	1	10	0
8:45 AM	0	0	0	0	0	4	6	1	0	0	10	1	0	1	10	0

	Tremont St Northbound				Tremont St Southbound				Stuart St Eastbound				Stuart St Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
4:00 PM	0	0	0	0	0	4	3	1	0	0	3	1	0	1	5	0
4:15 PM	0	0	0	0	0	5	3	2	0	0	4	2	0	3	0	0
4:30 PM	0	0	0	0	0	5	8	2	0	0	3	2	0	1	4	0
4:45 PM	0	0	0	0	0	2	7	1	0	0	5	1	0	4	4	0
5:00 PM	0	0	0	0	0	5	2	1	0	0	6	4	0	0	1	0
5:15 PM	0	0	0	0	0	2	3	3	0	0	5	1	0	2	1	0
5:30 PM	0	0	0	0	0	3	2	1	0	0	5	1	0	1	1	0
5:45 PM	0	0	0	0	0	5	3	3	0	0	4	0	0	0	1	0

AM PEAK HOUR 7:30 AM to 8:30 AM	Tremont St Northbound				Tremont St Southbound				Stuart St Eastbound				Stuart St Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**16**	**27**	**18**	**0**	**0**	**27**	**6**	**0**	**4**	**44**	**0**
PHF	**0.00**				**0.80**				**0.75**				**0.67**			

PM PEAK HOUR 4:15 PM to 5:15 PM	Tremont St Northbound				Tremont St Southbound				Stuart St Eastbound				Stuart St Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**17**	**20**	**6**	**0**	**0**	**18**	**9**	**0**	**8**	**9**	**0**
PHF	**0.00**				**0.72**				**0.68**				**0.53**			

Client: Melissa Restrepo
Project #: Location 2
BTD #: 373_C28_HSH
Location: Boston, MA
Street 1: Stuart St
Street 2: Tremont St
Count Date: 5/1/2019
Day of Week: Wednesday
Weather: Clear, 50 F

PEDESTRIANS & BICYCLES

	Tremont St Northbound					Tremont St Southbound					Stuart St Eastbound					Stuart St Westbound				
Start Time	Left	Thru	Right	PED		Left	Thru	Right	PED		Left	Thru	Right	PED		Left	Thru	Right	PED	
7:00 AM	0	0	0	0	0	0	0	1	30	0	0	2	0	27	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	19	0	0	6	1	35	0	0	1	0	0	0
7:30 AM	0	0	0	0	0	0	1	0	19	0	0	5	0	55	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	1	0	1	32	0	0	8	2	50	0	0	3	0	1	0
8:00 AM	0	0	0	0	0	2	0	1	43	0	0	13	0	62	0	0	1	0	0	0
8:15 AM	0	0	0	0	0	0	2	1	52	0	0	9	0	84	0	0	1	0	0	0
8:30 AM	0	0	0	0	0	1	0	1	61	0	0	13	0	57	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	1	0	0	44	0	0	13	0	75	0	0	0	0	0	0

	Tremont St Northbound					Tremont St Southbound					Stuart St Eastbound					Stuart St Westbound				
Start Time	Left	Thru	Right	PED		Left	Thru	Right	PED		Left	Thru	Right	PED		Left	Thru	Right	PED	
4:00 PM	0	0	0	0	0	0	2	3	63	0	0	1	0	51	0	0	1	0	0	0
4:15 PM	0	0	0	0	0	0	2	1	44	0	0	0	1	53	0	0	2	0	0	0
4:30 PM	0	0	0	0	0	0	3	0	27	0	0	1	1	40	0	0	0	1	0	0
4:45 PM	0	0	0	0	0	1	3	3	35	0	0	4	1	79	0	0	1	1	0	0
5:00 PM	0	0	0	0	0	0	3	3	51	0	0	4	0	132	0	0	0	1	0	0
5:15 PM	0	0	0	0	0	1	1	7	77	0	0	4	0	165	0	0	2	1	0	0
5:30 PM	0	0	0	0	0	0	0	5	55	0	0	2	0	102	0	0	1	0	0	0
5:45 PM	0	0	0	0	0	0	5	4	42	0	0	1	0	140	0	0	0	0	0	0

AM PEAK HOUR[1] 7:45 AM to 8:45 AM	Tremont St Northbound					Tremont St Southbound					Stuart St Eastbound					Stuart St Westbound				
	Left	Thru	Right	PED		Left	Thru	Right	PED		Left	Thru	Right	PED		Left	Thru	Right	PED	
	0	0	0	0		4	2	4	188		0	43	2	253		0	5	0	1	

PM PEAK HOUR[1] 5:00 PM to 6:00 PM	Tremont St Northbound					Tremont St Southbound					Stuart St Eastbound					Stuart St Westbound				
	Left	Thru	Right	PED		Left	Thru	Right	PED		Left	Thru	Right	PED		Left	Thru	Right	PED	
	0	0	0	0		1	9	19	225		0	11	0	539		0	3	2	0	

[1] Peak hours corresponds to vehicular peak hours.

Client: Melissa Restrepo
Project #: Location 5
BTD #: 373_C28_HSH
Location: Boston, MA
Street 1: Tremont St/Shawmut Ave
Street 2: Tremont St/Oak St W
Count Date: 5/1/2019
Day of Week: Wednesday
Weather: Clear, 50 F

TOTAL (CARS & TRUCKS)

	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	0	0	0	6	43	20	0	0	11	8	0	4	7	0
7:15 AM	0	0	0	0	0	10	50	29	0	0	8	1	0	8	5	0
7:30 AM	0	0	0	0	0	15	61	21	0	0	8	4	0	5	16	0
7:45 AM	0	0	0	0	0	15	63	32	0	0	7	13	0	2	14	0
8:00 AM	0	0	0	0	0	17	57	34	0	0	28	14	0	5	21	0
8:15 AM	0	0	0	0	0	10	43	24	0	0	17	2	0	6	20	0
8:30 AM	0	0	0	0	0	16	70	46	0	0	21	3	0	5	12	0
8:45 AM	0	0	0	0	0	19	64	31	0	0	20	6	0	11	14	0

	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
4:00 PM	0	0	0	0	0	37	108	55	0	0	27	5	0	10	20	0
4:15 PM	0	0	0	0	0	28	106	61	0	0	32	6	0	9	8	0
4:30 PM	0	0	0	0	0	33	109	50	0	0	28	6	0	6	16	0
4:45 PM	0	0	0	0	0	42	107	64	0	0	46	3	0	0	19	0
5:00 PM	0	0	0	0	0	38	116	56	0	0	40	4	0	3	11	0
5:15 PM	0	0	0	0	0	32	88	62	0	0	66	13	0	8	13	0
5:30 PM	0	0	0	0	0	34	96	62	0	0	53	5	0	3	14	0
5:45 PM	0	0	0	0	0	28	91	60	0	0	69	5	0	2	10	0

AM PEAK HOUR 8:00 AM to 9:00 AM	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**62**	**234**	**135**	**0**	**0**	**86**	**25**	**0**	**27**	**67**	**0**
PHF	**0.00**				**0.82**				**0.66**				**0.90**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.6%**	**7.3%**	**10.4%**	**0.0%**	**0.0%**	**7.0%**	**20.0%**	**0.0%**	**0.0%**	**9.0%**	**0.0%**

PM PEAK HOUR 4:45 PM to 5:45 PM	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**146**	**407**	**244**	**0**	**0**	**205**	**25**	**0**	**14**	**57**	**0**
PHF	**0.00**				**0.94**				**0.73**				**0.85**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**2.1%**	**3.4%**	**2.0%**	**0.0%**	**0.0%**	**0.0%**	**4.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Client: Melissa Restrepo
Project #: Location 5
BTD #: 373_C28_HSH
Location: Boston, MA
Street 1: Tremont St/Shawmut Ave
Street 2: Tremont St/Oak St W
Count Date: 5/1/2019
Day of Week: Wednesday
Weather: Clear, 50 F

TRUCKS

	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	0	0	0	0	2	1	0	0	0	4	0	0	1	0
7:15 AM	0	0	0	0	0	0	4	3	0	0	0	0	0	1	0	0
7:30 AM	0	0	0	0	0	2	4	0	0	0	0	1	0	0	0	0
7:45 AM	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	5	5	0	0	1	3	0	0	2	0
8:15 AM	0	0	0	0	0	0	2	2	0	0	1	1	0	0	3	0
8:30 AM	0	0	0	0	0	0	8	6	0	0	0	1	0	0	1	0
8:45 AM	0	0	0	0	0	1	2	1	0	0	4	0	0	0	0	0

	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
4:00 PM	0	0	0	0	0	1	5	0	0	0	2	2	0	0	0	0
4:15 PM	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	3	3	3	0	0	2	0	0	0	1	0
4:45 PM	0	0	0	0	0	0	8	1	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	2	3	2	0	0	0	1	0	0	0	0
5:15 PM	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0

AM PEAK HOUR 8:00 AM to 9:00 AM	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**1**	**17**	**14**	**0**	**0**	**6**	**5**	**0**	**0**	**6**	**0**
PHF	**0.00**				**0.57**				**0.69**				**0.50**			

PM PEAK HOUR 4:00 PM to 5:00 PM	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**5**	**17**	**5**	**0**	**0**	**4**	**2**	**0**	**0**	**1**	**0**
PHF	**0.00**				**0.75**				**0.38**				**0.25**			

Client: Melissa Restrepo
Project #: Location 5
BTD #: 373_C28_HSH
Location: Boston, MA
Street 1: Tremont St/Shawmut Ave
Street 2: Tremont St/Oak St W
Count Date: 5/1/2019
Day of Week: Wednesday
Weather: Clear, 50 F

PEDESTRIANS & BICYCLES

	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	0	0	7	0	0	0	22	0	0	0	4	0	0	0	17
7:15 AM	0	0	0	17	0	0	0	10	0	0	0	8	0	0	0	17
7:30 AM	0	0	0	20	0	0	0	22	0	0	0	6	0	0	0	19
7:45 AM	0	0	0	17	0	0	0	32	0	0	0	6	0	0	0	35
8:00 AM	0	0	0	14	0	0	0	24	0	0	0	17	0	1	0	36
8:15 AM	0	0	0	14	0	0	0	35	0	0	0	7	0	0	0	18
8:30 AM	0	0	0	34	0	0	0	28	0	0	0	8	0	0	0	31
8:45 AM	0	0	0	24	0	0	0	37	0	0	0	7	0	0	0	20

	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
4:00 PM	0	0	0	27	0	1	0	32	0	0	0	11	0	0	0	35
4:15 PM	0	0	0	32	0	0	1	30	0	0	0	15	0	1	0	37
4:30 PM	0	0	0	15	0	1	0	23	0	0	0	4	0	1	0	25
4:45 PM	0	0	0	34	0	0	0	21	0	0	0	9	0	1	0	19
5:00 PM	0	0	0	20	0	0	0	30	0	0	0	11	0	1	1	25
5:15 PM	0	0	0	19	0	0	0	30	0	0	0	15	0	0	0	28
5:30 PM	0	0	0	24	0	0	0	19	0	0	0	6	0	1	0	14
5:45 PM	0	0	0	31	0	1	0	17	0	0	0	18	0	1	0	27

AM PEAK HOUR[1]	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
8:00 AM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
9:00 AM	0	0	0	86	0	0	0	124	0	0	0	39	0	1	0	105

PM PEAK HOUR[1]	Shawmut Ave Northbound				Tremont St Southbound				Tremont St Eastbound				Oak St W Westbound			
4:45 PM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
5:45 PM	0	0	0	97	0	0	0	100	0	0	0	41	0	3	1	86

[1] *Peak hours corresponds to vehicular peak hours.*

Pedestrian Volume

Job 407_C37_HSH_TMC 7A
Area Boston, MA
Location Tremont Street, between Stuart Street & Oak Street

BOSTON
TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Wednesday, June 19, 2019

Time	Tremont St Crosswalk Eastbound		Tremont St Crosswalk Westbound		Jaywalking Eastbound		Jaywalking Westbound	
7:00 AM	10		1		11		1	
7:15 AM	7		1		4		0	
7:30 AM	8		5		2		1	
7:45 AM	2	27	4	11	3	20	1	3
8:00 AM	6		2		5		2	
8:15 AM	3		2		2		2	
8:30 AM	8		7		4		1	
8:45 AM	4	21	6	17	1	12	2	7
9:00 AM	7		10		3		4	
9:15 AM	5		5		2		1	
9:30 AM	4		3		0		2	
9:45 AM	6	22	3	21	1	6	0	7
10:00 AM	8		7		4		4	
10:15 AM	5		5		2		1	
10:30 AM	6		4		1		0	
10:45 AM	5	24	3	19	0	7	0	5
11:00 AM	7		2		1		1	
11:15 AM	6		5		1		1	
11:30 AM	2		8		0		0	
11:45 AM	4	19	7	22	2	4	2	4
12:00 PM	11		8		4		3	
12:15 PM	5		5		3		1	
12:30 PM	7		3		5		3	
12:45 PM	5	28	3	19	2	14	0	7
1:00 PM	4		4		2		1	
1:15 PM	6		2		1		0	
1:30 PM	10		1		0		1	
1:45 PM	6	26	3	10	0	3	0	2
2:00 PM	6		5		1		1	
2:15 PM	7		4		0		1	
2:30 PM	8		6		1		0	
2:45 PM	7	28	5	20	1	3	1	3
3:00 PM	11		8		0		0	
3:15 PM	8		7		1		0	
3:30 PM	7		5		2		0	
3:45 PM	5	31	8	28	0	3	1	1
4:00 PM	2		10		1		2	
4:15 PM	3		7		1		1	
4:30 PM	4		6		2		2	
4:45 PM	5	14	9	32	0	4	1	6
5:00 PM	6		14		1		4	
5:15 PM	7		12		0		2	
5:30 PM	11		10		1		3	
5:45 PM	12	36	11	47	1	3	1	10

Seasonal Adjustment Factors

Massachusetts Highway Department
Statewide Traffic Data Collection
2017 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.30	1.23	1.21	1.04	0.98	0.92	0.86	0.81	0.95	0.99	1.03	1.10	0.80
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.05	1.01	1.04	0.99	0.94	0.93	0.91	0.92	0.96	0.94	1.01	1.03	0.97
R4-R7	1.10	1.07	1.09	1.00	0.95	0.89	0.88	0.87	0.92	0.95	1.04	1.09	0.93
U1-Boston	1.01	1.04	0.99	0.94	0.93	0.92	0.96	0.93	0.94	0.93	0.95	0.98	0.95
U1-Essex	1.04	1.05	1.00	0.96	0.93	0.89	0.90	0.90	0.93	0.93	0.98	1.03	0.90
U1-Southeast	1.07	1.05	1.02	0.97	0.95	0.90	0.89	0.88	0.92	0.94	0.98	1.01	0.97
U1-West	1.00	0.96	0.94	0.92	0.93	0.92	0.95	0.93	0.92	0.92	0.97	0.97	0.89
U1-Worcester	1.10	1.10	1.04	0.97	0.95	0.94	0.93	0.91	0.95	0.96	0.98	1.04	0.89
U2	1.01	1.03	0.98	0.95	0.93	0.91	0.94	0.92	0.95	0.95	0.95	0.97	0.98
U3	1.03	1.05	1.01	0.95	0.92	0.90	0.94	0.93	0.93	0.92	0.96	0.99	0.96
U4-U7	1.06	1.05	1.02	0.96	0.92	0.89	0.95	0.95	0.92	0.92	0.98	1.03	0.98
Rec - East	1.18	1.17	1.08	1.03	0.95	0.87	0.83	0.83	0.97	0.98	1.19	1.19	0.98
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.95

Round off:
0-999 = 10
>1000 = 100

U = Urban
R = Rural

1 - Interstate
2 - Freeway and Expressway
3 - Other Principal Arterial
4 - Minor Arterial
5 - Major Collector
6 - Minor Collector
7 - Local Road and Street

Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha s Vineyard and Nantucket.

Recreational - West Group - Continuous Stations 2 and 189 including stations 1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

Trip Generation - Proposed Program

Parcel P-12C/288 Tremont Street

Trip Generation Assessment

HOWARD STEIN HUDSON

12-Sep-2019

xx HARD CODED TO BALANCE (Manually change formatting)

Land Use	Size	Category	Directional Split	Average Trip Rate	Unadjusted Vehicle Trips	Assumed National Vehicle Occupancy Rate[1]	Unadjusted Person-Trips	Primary Person-Trips	Transit Share[2]	Transit Person-Trips	Walk/Bike/ Other Share[2]	Walk/ Bike/ Other Trips	Auto Share[2]	Auto Person-Trips	% Taxi/ TNC[3]	Taxi/TNC Person-Trips	Assumed Local Auto Occupancy Rate for Taxis[4]	Private Auto Person-Trips	Primary Auto-Person Trips	Assumed Local Auto Occupancy Rate[5]	Taxi/TNC Auto Trips	Primary AutoTrips	Total Auto Trips (Private + Taxi)
Daily Peak Hour																							
Multifamily Housing (Mid Rise)[5]	171	Total		5.440	930	1.18	**1,098**	**1,098**	12%	**132**	67%	**736**	21%	**230**	5%	12	1.18	218	218	1.18	**20**	**184**	**204**
	units	In	50%	2.720	465	1.18	**549**	**549**	12%	**66**	67%	**368**	21%	**115**	5%	6	1.18	109	109	1.18	**10**	**92**	**102**
		Out	50%	2.720	465	1.18	**549**	**549**	12%	**66**	67%	**368**	21%	**115**	5%	6	1.18	109	109	1.18	**10**	**92**	**102**
Hotel[6]	200	Total		8.360	1,672	1.82	**3,044**	**3,044**	30%	**914**	39%	**1,188**	31%	**942**	3%	28	1.82	914	914	1.82	**32**	**502**	**534**
	rooms	In	50%	4.180	836	1.82	**1,522**	**1,522**	30%	**457**	39%	**594**	31%	**471**	3%	14	1.82	457	457	1.82	**16**	**251**	**267**
		Out	50%	4.180	836	1.82	**1,522**	**1,522**	30%	**457**	39%	**594**	31%	**471**	3%	14	1.82	457	457	1.82	**16**	**251**	**267**
Library[7]	14	Total		72.050	1,008	1.82	**1,834**	**1,834**	30%	**550**	39%	**716**	31%	**568**	3%	18	1.82	550	550	1.82	**20**	**302**	**322**
	KSF	In	50%	36.025	504	1.82	**917**	**917**	30%	**275**	39%	**358**	31%	**284**	3%	9	1.82	275	275	1.82	**10**	**151**	**161**
		Out	50%	36.025	504	1.82	**917**	**917**	30%	**275**	39%	**358**	31%	**284**	3%	9	1.82	275	275	1.82	**10**	**151**	**161**
Parking Garage[8]	274	Total			1,096	1.18	**1,294**	**1,294**	0%	**0**	0%	**0**	100%	**1,294**	0%	0	1.18	1,294	1294	1.18	**0**	**1,096**	**1,096**
	Spaces	In		2.000	548	1.18	**647**	**647**	0%	**0**	0%	**0**	100%	**647**	0%	0	1.18	647	647	1.18	**0**	**548**	**548**
		Out		2.000	548	1.18	**647**	**647**	0%	**0**	0%	**0**	100%	**647**	0%	0	1.18	647	647	1.18	**0**	**548**	**548**
Total		Total			**4,706**		**7,270**	**7,270**		**1,596**		**2,640**		**3,034**							**72**	**2,084**	**2,156**
		In			**2,353**		**3,635**	**3,635**		**798**		**1,320**		**1,517**							**36**	**1,042**	**1,078**
		Out			**2,353**		**3,635**	**3,635**		**798**		**1,320**		**1,517**							**36**	**1,042**	**1,078**
AM Peak Hour																							
Multifamily Housing (Mid Rise)[5]	171	Total		0.360	62	1.18	**73**	**73**		**8**		**49**		**16**	5%	1	1.18	15	15	1.18	**2**	**12**	**14**
	units	In	26%	0.094	16	1.18	**19**	**19**	12%	**2**	67%	**13**	21%	**4**	5%	0	1.18	4	4	1.18	**1**	**3**	**4**
		Out	74%	0.266	46	1.18	**54**	**54**	12%	**6**	67%	**36**	21%	**12**	5%	1	1.18	11	11	1.18	**1**	**9**	**10**
Hotel[6]	200	Total		0.47	94	1.82	**171**	**171**		**47**		**76**		**48**	3%	1	1.82	47	47	1.82	**2**	**26**	**28**
	rooms	In	59%	0.277	55	1.82	**100**	**100**	39%	**39**	27%	**27**	34%	**34**	3%	1	1.82	33	33	1.82	**1**	**18**	**19**
		Out	41%	0.193	39	1.82	**71**	**71**	11%	**8**	69%	**49**	20%	**14**	3%	0	1.82	14	14	1.82	**1**	**8**	**9**
Library[7]	14	Total		1.00	14	1.82	**25**	**25**		**8**		**10**		**7**	3%	0	1.82	7	7	1.82	**0**	**4**	**4**
	KSF	In	71%	0.710	10	1.82	**18**	**18**	39%	**7**	27%	**5**	34%	**6**	3%	0	1.82	6	6	1.82	**0**	**3**	**3**
		Out	29%	0.290	4	1.82	**7**	**7**	11%	**1**	69%	**5**	20%	**1**	3%	0	1.82	1	1	1.82	**0**	**1**	**1**
Parking Garage[8]	274	Total		0.000											0%	0	0.00	0	0			**43**	**43**
	Spaces	In							0%		0%		100%									**33**	**33**
		Out							0%		0%		100%									**10**	**10**
Total		Total			**170**		**269**	**269**		**63**		**135**		**71**							**4**	**85**	**89**
		In			**81**		**137**	**137**		**48**		**45**		**44**							**2**	**57**	**59**
		Out			**89**		**132**	**132**		**15**		**90**		**27**							**2**	**28**	**30**
PM Peak Hour																							
Multifamily Housing (Mid Rise)[5]	171	Total		0.440	75	1.18	**88**	**88**		**10**		**59**		**19**	5%	1	1.18	18	18	1.18	**2**	**15**	**17**
	units	In	61%	0.268	46	1.18	**54**	**54**	12%	**6**	67%	**36**	21%	**12**	5%	1	1.18	11	11	1.18	**1**	**9**	**10**
		Out	39%	0.172	29	1.18	**34**	**34**	12%	**4**	67%	**23**	21%	**7**	5%	0	1.18	7	7	1.18	**1**	**6**	**7**
Hotel[6]	200	Total		0.60	120	1.82	**218**	**218**		**54**		**106**		**58**	3%	2	1.82	56	56	1.82	**4**	**31**	**35**
	rooms	In	51%	0.306	61	1.82	**111**	**111**	11%	**12**	69%	**77**	20%	**22**	3%	1	1.82	21	21	1.82	**2**	**12**	**14**
		Out	49%	0.294	59	1.82	**107**	**107**	39%	**42**	27%	**29**	34%	**36**	3%	1	1.82	35	35	1.82	**2**	**19**	**21**
Library[7]	14	Total		8.16	114	1.82	**207**	**207**		**53**		**98**		**56**	3%	2	1.82	54	54	1.82	**4**	**29**	**33**
	KSF	In	48%	3.917	55	1.82	**100**	**100**	11%	**11**	69%	**69**	20%	**20**	3%	1	1.82	19	19	1.82	**2**	**10**	**12**
		Out	52%	4.243	59	1.82	**107**	**107**	39%	**42**	27%	**29**	34%	**36**	3%	1	1.82	35	35	1.82	**2**	**19**	**21**
Parking Garage[8]	274	Total													0%	0	0.00	0	0			**56**	**56**
	Spaces	In							0%		0%		100%									**12**	**12**
		Out							0%		0%		100%									**44**	**44**
Total		Total			**309**		**513**	**513**		**117**		**263**		**133**							**10**	**131**	**141**
		In			**162**		**265**	**265**		**29**		**182**		**54**							**5**	**43**	**48**
		Out			**147**		**248**	**248**		**88**		**81**		**79**							**5**	**88**	**93**

1. 2017 National vehicle occupancy rates - 1.18:home to work; 1.82: family/personal business; 1.82: shopping; 2.1 social/recreational
2. Mode shares for residential based on U.S. Census Bureau, 2013-2017 American Community Survey and Hotel/Library based on peak-hour BTD Data for Area 3
3. Assumed Taxi/TNC percentage
4. Local vehicle occupancy rates based on 2017 National vehicle occupancy rates
5. ITE Trip Generation Manual, 10th Edition, LUC 221 (Multifamily Housing Mid-Rise (3-10 floors)), average rate
6. ITE Trip Generation Manual, 10th Edition, LUC 310 (Hotel), average rate
7. ITE Trip Generation Manual, 10th Edition, LUC 590 (Library), average rate

Synchro Intersection Level of Service Reports

- Existing (2019) Condition

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	412	167	112	421	0	0	0	0	84	247	135	
Future Volume (vph)	0	412	167	112	421	0	0	0	0	84	247	135	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		140	130		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	1		1	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	
Ped Bike Factor													
Frt			0.850									0.850	
Flt Protected				0.950						0.950			
Satd. Flow (prot)	0	3374	1524	1736	3312	0	0	0	0	1530	3223	1417	
Flt Permitted				0.426						0.950			
Satd. Flow (perm)	0	3374	1524	778	3312	0	0	0	0	1530	3223	1417	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			182									144	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		514			525			502			316		
Travel Time (s)		11.7			11.9			11.4			7.2		
Confl. Bikes (#/hr)												4	
Peak Hour Factor	0.92	0.92	0.92	0.83	0.83	0.83	0.25	0.25	0.25	0.94	0.94	0.94	
Heavy Vehicles (%)	0%	7%	6%	4%	9%	0%	0%	0%	0%	18%	12%	14%	
Adj. Flow (vph)	0	448	182	135	507	0	0	0	0	89	263	144	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	448	182	135	507	0	0	0	0	89	263	144	
Turn Type		NA	custom	D.P+P	NA					Split	NA	Prot	
Protected Phases		1	1	6	1 6					5	5	5	2
Permitted Phases			1	1									
Detector Phase		1	1	6	1 6					5	5	5	
Switch Phase													
Minimum Initial (s)		8.0	8.0	8.0						8.0	8.0	8.0	1.0
Minimum Split (s)		21.5	21.5	14.0						17.0	17.0	17.0	29.0
Total Split (s)		34.0	34.0	14.0						33.0	33.0	33.0	29.0
Total Split (%)		30.9%	30.9%	12.7%						30.0%	30.0%	30.0%	26%
Maximum Green (s)		28.5	28.5	9.0						24.0	24.0	24.0	23.0
Yellow Time (s)		3.0	3.0	3.0						3.5	3.5	3.5	2.0
All-Red Time (s)		2.5	2.5	2.0						5.5	5.5	5.5	4.0
Lost Time Adjust (s)		0.0	0.0	0.0						0.0	0.0	0.0	
Total Lost Time (s)		5.5	5.5	5.0						9.0	9.0	9.0	
Lead/Lag		Lead	Lead	Lag						Lead	Lead	Lead	Lag
Lead-Lag Optimize?		Yes	Yes	Yes						Yes	Yes	Yes	Yes
Vehicle Extension (s)		2.0	2.0	2.0						2.0	2.0	2.0	0.2
Recall Mode		C-Max	C-Max	None						None	None	None	None
Walk Time (s)		7.0	7.0	4.0									5.0
Flash Dont Walk (s)		9.0	9.0	5.0									18.0
Pedestrian Calls (#/hr)		253	253	253									442
Act Effct Green (s)		38.8	38.8	48.3	52.8					13.7	13.7	13.7	
Actuated g/C Ratio		0.35	0.35	0.44	0.48					0.12	0.12	0.12	
v/c Ratio		0.38	0.28	0.32	0.32					0.47	0.66	0.48	
Control Delay		28.4	5.3	13.2	12.3					52.0	53.4	12.4	
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0	
Total Delay		28.4	5.3	13.2	12.3					52.0	53.4	12.4	
LOS		C	A	B	B					D	D	B	
Approach Delay		21.7			12.5						41.2		
Approach LOS		C			B						D		
Queue Length 50th (ft)		122	0	23	46					59	94	0	
Queue Length 95th (ft)		179	50	m42	81					106	132	55	
Internal Link Dist (ft)		434			445			422			236		
Turn Bay Length (ft)			140	130									
Base Capacity (vph)		1189	655	420	1589					333	703	421	
Starvation Cap Reductn		0	0	0	0					0	0	0	
Spillback Cap Reductn		0	0	0	0					0	0	0	
Storage Cap Reductn		0	0	0	0					0	0	0	
Reduced v/c Ratio		0.38	0.28	0.32	0.32					0.27	0.37	0.34	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 8 (7%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 23.8 Intersection LOS: C
Intersection Capacity Utilization 41.1% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Tremont Street & Stuart Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	86	25	39	67	0	0	0	0	62	234	135	
Future Volume (vph)	0	86	25	39	67	0	0	0	0	62	234	135	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	0.91	
Ped Bike Factor		0.97			0.96								
Frt		0.969									0.953		
Flt Protected					0.982						0.993		
Satd. Flow (prot)	0	1622	0	0	1765	0	0	0	0	0	4578	0	
Flt Permitted					0.820						0.993		
Satd. Flow (perm)	0	1622	0	0	1422	0	0	0	0	0	4578	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		16									118		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		295			385			253			268		
Travel Time (s)		6.7			8.8			5.8			6.1		
Confl. Peds. (#/hr)			86	86									
Peak Hour Factor	0.66	0.66	0.66	0.90	0.90	0.90	0.25	0.25	0.25	0.82	0.82	0.82	
Heavy Vehicles (%)	0%	7%	20%	0%	9%	0%	0%	0%	0%	2%	7%	10%	
Adj. Flow (vph)	0	130	38	43	74	0	0	0	0	76	285	165	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	168	0	0	117	0	0	0	0	0	526	0	
Turn Type		NA		Perm	NA					Split	NA		
Protected Phases		5			5					1	1		2
Permitted Phases				5									
Detector Phase		5		5	5					1	1		
Switch Phase													
Minimum Initial (s)		10.0		10.0	10.0					10.0	10.0		1.0
Minimum Split (s)		24.0		24.0	24.0					14.5	14.5		25.0
Total Split (s)		39.0		39.0	39.0					34.0	34.0		27.0
Total Split (%)		39.0%		39.0%	39.0%					34.0%	34.0%		27%
Maximum Green (s)		35.0		35.0	35.0					30.0	30.0		25.0
Yellow Time (s)		3.0		3.0	3.0					3.0	3.0		2.0
All-Red Time (s)		1.0		1.0	1.0					1.0	1.0		0.0
Lost Time Adjust (s)		0.0			0.0						0.0		
Total Lost Time (s)		4.0			4.0						4.0		
Lead/Lag										Lead	Lead		Lag
Lead-Lag Optimize?										Yes	Yes		Yes
Vehicle Extension (s)		2.0		2.0	2.0					2.0	2.0		0.2
Recall Mode		Min		Min	Min					C-Max	C-Max		None
Walk Time (s)		8.0		8.0	8.0								7.0
Flash Dont Walk (s)		12.0		12.0	12.0								16.0
Pedestrian Calls (#/hr)		144		144	144								359
Act Effct Green (s)		20.0			20.0						47.0		
Actuated g/C Ratio		0.20			0.20						0.47		
v/c Ratio		0.50			0.41						0.24		
Control Delay		27.5			27.2						12.3		
Queue Delay		0.1			0.0						0.0		
Total Delay		27.5			27.2						12.3		
LOS		C			C						B		
Approach Delay		27.5			27.2						12.3		
Approach LOS		C			C						B		
Queue Length 50th (ft)		91			66						53		
Queue Length 95th (ft)		100			122						67		
Internal Link Dist (ft)		215			305			173			188		
Turn Bay Length (ft)													
Base Capacity (vph)		578			497						2214		
Starvation Cap Reductn		34			0						0		
Spillback Cap Reductn		0			0						0		
Storage Cap Reductn		0			0						0		
Reduced v/c Ratio		0.31			0.24						0.24		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 56 (56%), Referenced to phase 1:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.50
Intersection Signal Delay: 17.6 Intersection LOS: B
Intersection Capacity Utilization 31.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Shawmut Avenue & Tremont Street & Oak Street W

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations		↑↑	↱	↰	↑↑					↰	↑↑	↱	
Traffic Volume (vph)	0	617	170	94	362	0	0	0	0	193	439	111	
Future Volume (vph)	0	617	170	94	362	0	0	0	0	193	439	111	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		140	130		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	1		1	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	
Ped Bike Factor			0.99										
Frt			0.850									0.850	
Flt Protected				0.950						0.950			
Satd. Flow (prot)	0	3471	1553	1752	3574	0	0	0	0	1641	3539	1509	
Flt Permitted				0.257						0.950			
Satd. Flow (perm)	0	3471	1532	474	3574	0	0	0	0	1641	3539	1509	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			155									134	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		514			525			502			316		
Travel Time (s)		11.7			11.9			11.4			7.2		
Confl. Bikes (#/hr)			2			2						19	
Peak Hour Factor	0.91	0.91	0.91	0.93	0.93	0.93	0.25	0.25	0.25	0.96	0.96	0.96	
Heavy Vehicles (%)	0%	4%	4%	3%	1%	0%	0%	0%	0%	10%	2%	7%	
Adj. Flow (vph)	0	678	187	101	389	0	0	0	0	201	457	116	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	678	187	101	389	0	0	0	0	201	457	116	
Turn Type		NA	custom	D.P+P	NA					Split	NA	Prot	
Protected Phases		1	1	6	1 6					5	5	5	2
Permitted Phases			1	1									
Detector Phase		1	1	6	1 6					5	5	5	
Switch Phase													
Minimum Initial (s)		8.0	8.0	6.0						8.0	8.0	8.0	1.0
Minimum Split (s)		21.5	21.5	14.0						13.0	13.0	13.0	29.0
Total Split (s)		35.0	35.0	14.0						32.0	32.0	32.0	29.0
Total Split (%)		31.8%	31.8%	12.7%						29.1%	29.1%	29.1%	26%
Maximum Green (s)		29.5	29.5	9.0						27.0	27.0	27.0	23.0
Yellow Time (s)		3.0	3.0	3.0						3.5	3.5	3.5	2.0
All-Red Time (s)		2.5	2.5	2.0						1.5	1.5	1.5	4.0
Lost Time Adjust (s)		0.0	0.0	0.0						0.0	0.0	0.0	
Total Lost Time (s)		5.5	5.5	5.0						5.0	5.0	5.0	
Lead/Lag		Lead	Lead	Lag						Lead	Lead	Lead	Lag
Lead-Lag Optimize?		Yes	Yes	Yes						Yes	Yes	Yes	Yes
Vehicle Extension (s)		2.0	2.0	2.0						2.0	2.0	2.0	0.2
Recall Mode		C-Max	C-Max	None						None	None	None	None
Walk Time (s)		7.0	7.0	4.0									5.0
Flash Dont Walk (s)		9.0	9.0	5.0									18.0
Pedestrian Calls (#/hr)		500	500	500									500
Act Effct Green (s)		36.5	36.5	46.0	50.5					20.0	20.0	20.0	
Actuated g/C Ratio		0.33	0.33	0.42	0.46					0.18	0.18	0.18	
v/c Ratio		0.59	0.30	0.33	0.24					0.67	0.71	0.30	
Control Delay		34.1	8.8	16.8	14.5					52.8	48.2	6.3	
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0	
Total Delay		34.1	8.8	16.8	14.5					52.8	48.2	6.3	
LOS		C	A	B	B					D	D	A	
Approach Delay		28.6			15.0						43.1		
Approach LOS		C			B						D		
Queue Length 50th (ft)		206	15	25	50					135	162	0	
Queue Length 95th (ft)		297	74	m42	80					197	200	34	
Internal Link Dist (ft)		434			445			422			236		
Turn Bay Length (ft)			140	130									
Base Capacity (vph)		1151	618	302	1640					402	868	471	
Starvation Cap Reductn		0	0	0	0					0	0	0	
Spillback Cap Reductn		0	0	0	0					0	0	0	
Storage Cap Reductn		0	0	0	0					0	0	0	
Reduced v/c Ratio		0.59	0.30	0.33	0.24					0.50	0.53	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 8 (7%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 30.8 Intersection LOS: C
Intersection Capacity Utilization 47.3% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Tremont Street & Stuart Street

Ø1 (R)	Ø2	Ø5	Ø6
35 s	29 s	32 s	14 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	233	25	14	57	0	0	0	0	146	437	244	
Future Volume (vph)	0	233	25	14	57	0	0	0	0	146	437	244	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	0.91	
Ped Bike Factor		0.99			0.99								
Frt		0.987									0.956		
Flt Protected					0.990						0.991		
Satd. Flow (prot)	0	1840	0	0	1881	0	0	0	0	0	4793	0	
Flt Permitted					0.742						0.991		
Satd. Flow (perm)	0	1840	0	0	1394	0	0	0	0	0	4793	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		5									120		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		295			385			253			268		
Travel Time (s)		6.7			8.8			5.8			6.1		
Confl. Peds. (#/hr)			97	97									
Peak Hour Factor	0.73	0.73	0.73	0.85	0.85	0.85	0.25	0.25	0.25	0.94	0.94	0.94	
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	0%	0%	0%	2%	3%	2%	
Adj. Flow (vph)	0	319	34	16	67	0	0	0	0	155	465	260	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	353	0	0	83	0	0	0	0	0	880	0	
Turn Type		NA		Perm	NA					Split	NA		
Protected Phases		5			5					1	1		2
Permitted Phases				5									
Detector Phase		5		5	5					1	1		
Switch Phase													
Minimum Initial (s)		10.0		10.0	10.0					10.0	10.0		1.0
Minimum Split (s)		24.0		24.0	24.0					14.5	14.5		25.0
Total Split (s)		32.0		32.0	32.0					41.0	41.0		27.0
Total Split (%)		32.0%		32.0%	32.0%					41.0%	41.0%		27%
Maximum Green (s)		28.0		28.0	28.0					37.0	37.0		25.0
Yellow Time (s)		3.0		3.0	3.0					3.0	3.0		2.0
All-Red Time (s)		1.0		1.0	1.0					1.0	1.0		0.0
Lost Time Adjust (s)		0.0			0.0						0.0		
Total Lost Time (s)		4.0			4.0						4.0		
Lead/Lag										Lead	Lead		Lag
Lead-Lag Optimize?										Yes	Yes		Yes
Vehicle Extension (s)		2.0		2.0	2.0					2.0	2.0		0.2
Recall Mode		Min		Min	Min					C-Max	C-Max		None
Walk Time (s)		8.0		8.0	8.0								7.0
Flash Dont Walk (s)		12.0		12.0	12.0								16.0
Pedestrian Calls (#/hr)		127		127	127								324
Act Effct Green (s)		23.5			23.5						43.5		
Actuated g/C Ratio		0.24			0.24						0.44		
v/c Ratio		0.81			0.25						0.41		
Control Delay		40.5			32.1						17.7		
Queue Delay		20.1			0.0						0.0		
Total Delay		60.6			32.1						17.7		
LOS		E			C						B		
Approach Delay		60.6			32.1						17.7		
Approach LOS		E			C						B		
Queue Length 50th (ft)		236			43						116		
Queue Length 95th (ft)		m252			75						165		
Internal Link Dist (ft)		215			305			173			188		
Turn Bay Length (ft)													
Base Capacity (vph)		518			390						2151		
Starvation Cap Reductn		159			0						0		
Spillback Cap Reductn		0			0						0		
Storage Cap Reductn		0			0						0		
Reduced v/c Ratio		0.98			0.21						0.41		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 20 (20%), Referenced to phase 1:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 30.1 — Intersection LOS: C
Intersection Capacity Utilization 40.1% — ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Shawmut Avenue & Tremont Street & Oak Street W

Ø1 (R)	Ø2	Ø5
41 s	27 s	32 s

- No-Build (2026) Condition

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations		↑↑	↱	↰	↑↑					↰	↑↑	↱	
Traffic Volume (vph)	0	456	173	116	451	0	0	0	0	81	256	140	
Future Volume (vph)	0	456	173	116	451	0	0	0	0	81	256	140	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		140	130		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	1		1	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	
Ped Bike Factor													
Frt			0.850									0.850	
Flt Protected				0.950						0.950			
Satd. Flow (prot)	0	3374	1524	1736	3312	0	0	0	0	1530	3223	1417	
Flt Permitted				0.389						0.950			
Satd. Flow (perm)	0	3374	1524	711	3312	0	0	0	0	1530	3223	1417	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			188									149	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		514			525			502			316		
Travel Time (s)		11.7			11.9			11.4			7.2		
Confl. Bikes (#/hr)												4	
Peak Hour Factor	0.92	0.92	0.92	0.83	0.83	0.83	0.25	0.25	0.25	0.94	0.94	0.94	
Heavy Vehicles (%)	0%	7%	6%	4%	9%	0%	0%	0%	0%	18%	12%	14%	
Adj. Flow (vph)	0	496	188	140	543	0	0	0	0	86	272	149	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	496	188	140	543	0	0	0	0	86	272	149	
Turn Type		NA	custom	D.P+P	NA					Split	NA	Prot	
Protected Phases		1	1	6	1 6					5	5	5	2
Permitted Phases			1	1									
Detector Phase		1	1	6	1 6					5	5	5	
Switch Phase													
Minimum Initial (s)		8.0	8.0	8.0						8.0	8.0	8.0	1.0
Minimum Split (s)		21.5	21.5	14.0						17.0	17.0	17.0	29.0
Total Split (s)		34.0	34.0	14.0						33.0	33.0	33.0	29.0
Total Split (%)		30.9%	30.9%	12.7%						30.0%	30.0%	30.0%	26%
Maximum Green (s)		28.5	28.5	9.0						24.0	24.0	24.0	23.0
Yellow Time (s)		3.0	3.0	3.0						3.5	3.5	3.5	2.0
All-Red Time (s)		2.5	2.5	2.0						5.5	5.5	5.5	4.0
Lost Time Adjust (s)		0.0	0.0	0.0						0.0	0.0	0.0	
Total Lost Time (s)		5.5	5.5	5.0						9.0	9.0	9.0	
Lead/Lag		Lead	Lead	Lag						Lead	Lead	Lead	Lag
Lead-Lag Optimize?		Yes	Yes	Yes						Yes	Yes	Yes	Yes
Vehicle Extension (s)		2.0	2.0	2.0						2.0	2.0	2.0	0.2
Recall Mode		C-Max	C-Max	None						None	None	None	None
Walk Time (s)		7.0	7.0	4.0									5.0
Flash Dont Walk (s)		9.0	9.0	5.0									18.0
Pedestrian Calls (#/hr)		253	253	253									442
Act Effct Green (s)		38.5	38.5	48.0	52.5					14.0	14.0	14.0	
Actuated g/C Ratio		0.35	0.35	0.44	0.48					0.13	0.13	0.13	
v/c Ratio		0.42	0.29	0.36	0.34					0.44	0.66	0.48	
Control Delay		29.3	5.3	14.2	13.2					50.7	53.4	12.2	
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0	
Total Delay		29.3	5.3	14.2	13.2					50.7	53.4	12.2	
LOS		C	A	B	B					D	D	B	
Approach Delay		22.7			13.4						40.9		
Approach LOS		C			B						D		
Queue Length 50th (ft)		138	0	26	55					57	97	0	
Queue Length 95th (ft)		200	50	m40	m81					103	136	56	
Internal Link Dist (ft)		434			445			422			236		
Turn Bay Length (ft)			140	130									
Base Capacity (vph)		1180	655	394	1580					333	703	425	
Starvation Cap Reductn		0	0	0	0					0	0	0	
Spillback Cap Reductn		0	0	0	0					0	0	0	
Storage Cap Reductn		0	0	0	0					0	0	0	
Reduced v/c Ratio		0.42	0.29	0.36	0.34					0.26	0.39	0.35	

Intersection Summary	
Area Type: Other	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 8 (7%), Referenced to phase 1:EBWB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 24.2	Intersection LOS: C
Intersection Capacity Utilization 42.6%	ICU Level of Service A
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: Tremont Street & Stuart Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	89	24	40	69	0	0	0	0	64	242	140	
Future Volume (vph)	0	89	24	40	69	0	0	0	0	64	242	140	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	
Ped Bike Factor		0.97			0.97								
Frt		0.972									0.953		
Flt Protected					0.982						0.993		
Satd. Flow (prot)	0	1634	0	0	1765	0	0	0	0	0	3186	0	
Flt Permitted					0.808						0.993		
Satd. Flow (perm)	0	1634	0	0	1402	0	0	0	0	0	3186	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		15									76		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		295			385			253			268		
Travel Time (s)		6.7			8.8			5.8			6.1		
Confl. Peds. (#/hr)			86	86									
Peak Hour Factor	0.66	0.66	0.66	0.90	0.90	0.90	0.25	0.25	0.25	0.82	0.82	0.82	
Heavy Vehicles (%)	0%	7%	20%	0%	9%	0%	0%	0%	0%	2%	7%	10%	
Adj. Flow (vph)	0	135	36	44	77	0	0	0	0	78	295	171	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	171	0	0	121	0	0	0	0	0	544	0	
Turn Type		NA		Perm	NA					Split	NA		
Protected Phases		5			5					1	1		2
Permitted Phases				5									
Detector Phase		5		5	5					1	1		
Switch Phase													
Minimum Initial (s)		10.0		10.0	10.0					10.0	10.0		1.0
Minimum Split (s)		24.0		24.0	24.0					14.5	14.5		25.0
Total Split (s)		39.0		39.0	39.0					34.0	34.0		27.0
Total Split (%)		39.0%		39.0%	39.0%					34.0%	34.0%		27%
Maximum Green (s)		35.0		35.0	35.0					30.0	30.0		25.0
Yellow Time (s)		3.0		3.0	3.0					3.0	3.0		2.0
All-Red Time (s)		1.0		1.0	1.0					1.0	1.0		0.0
Lost Time Adjust (s)		0.0			0.0						0.0		
Total Lost Time (s)		4.0			4.0						4.0		
Lead/Lag										Lead	Lead		Lag
Lead-Lag Optimize?										Yes	Yes		Yes
Vehicle Extension (s)		2.0		2.0	2.0					2.0	2.0		0.2
Recall Mode		Min		Min	Min					C-Max	C-Max		None
Walk Time (s)		8.0		8.0	8.0								7.0
Flash Dont Walk (s)		12.0		12.0	12.0								16.0
Pedestrian Calls (#/hr)		144		144	144								359
Act Effct Green (s)		20.0			20.0						47.0		
Actuated g/C Ratio		0.20			0.20						0.47		
v/c Ratio		0.51			0.43						0.35		
Control Delay		27.4			27.9						15.1		
Queue Delay		0.1			0.0						0.0		
Total Delay		27.4			27.9						15.1		
LOS		C			C						B		
Approach Delay		27.4			27.9						15.1		
Approach LOS		C			C						B		
Queue Length 50th (ft)		94			69						94		
Queue Length 95th (ft)		102			126						117		
Internal Link Dist (ft)		215			305			173			188		
Turn Bay Length (ft)													
Base Capacity (vph)		581			490						1537		
Starvation Cap Reductn		38			0						0		
Spillback Cap Reductn		0			0						0		
Storage Cap Reductn		0			0						0		
Reduced v/c Ratio		0.31			0.25						0.35		

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 56 (56%), Referenced to phase 1:SBTL, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay: 19.4	Intersection LOS: B
Intersection Capacity Utilization 35.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Shawmut Avenue & Tremont Street & Oak Street W

Ø1 (R)	Ø2	Ø5
34 s	27 s	39 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations		↑↑	↱	↰	↑↑					↰	↑↑	↱	
Traffic Volume (vph)	0	669	176	97	396	0	0	0	0	200	455	115	
Future Volume (vph)	0	669	176	97	396	0	0	0	0	200	455	115	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		140	130		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	1		1	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	
Ped Bike Factor			0.99										
Frt			0.850									0.850	
Flt Protected				0.950						0.950			
Satd. Flow (prot)	0	3471	1553	1752	3574	0	0	0	0	1641	3539	1509	
Flt Permitted				0.219						0.950			
Satd. Flow (perm)	0	3471	1532	404	3574	0	0	0	0	1641	3539	1509	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			147									134	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		514			525			502			316		
Travel Time (s)		11.7			11.9			11.4			7.2		
Confl. Bikes (#/hr)			2			2						19	
Peak Hour Factor	0.91	0.91	0.91	0.93	0.93	0.93	0.25	0.25	0.25	0.96	0.96	0.96	
Heavy Vehicles (%)	0%	4%	4%	3%	1%	0%	0%	0%	0%	10%	2%	7%	
Adj. Flow (vph)	0	735	193	104	426	0	0	0	0	208	474	120	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	735	193	104	426	0	0	0	0	208	474	120	
Turn Type		NA	custom	D.P+P	NA					Split	NA	Prot	
Protected Phases		1	1	6	1 6					5	5	5	2
Permitted Phases			1	1									
Detector Phase		1	1	6	1 6					5	5	5	
Switch Phase													
Minimum Initial (s)		8.0	8.0	6.0						8.0	8.0	8.0	1.0
Minimum Split (s)		21.5	21.5	14.0						13.0	13.0	13.0	29.0
Total Split (s)		35.0	35.0	14.0						32.0	32.0	32.0	29.0
Total Split (%)		31.8%	31.8%	12.7%						29.1%	29.1%	29.1%	26%
Maximum Green (s)		29.5	29.5	9.0						27.0	27.0	27.0	23.0
Yellow Time (s)		3.0	3.0	3.0						3.5	3.5	3.5	2.0
All-Red Time (s)		2.5	2.5	2.0						1.5	1.5	1.5	4.0
Lost Time Adjust (s)		0.0	0.0	0.0						0.0	0.0	0.0	
Total Lost Time (s)		5.5	5.5	5.0						5.0	5.0	5.0	
Lead/Lag		Lead	Lead	Lag						Lead	Lead	Lead	Lag
Lead-Lag Optimize?		Yes	Yes	Yes						Yes	Yes	Yes	Yes
Vehicle Extension (s)		2.0	2.0	2.0						2.0	2.0	2.0	0.2
Recall Mode		C-Max	C-Max	None						None	None	None	None
Walk Time (s)		7.0	7.0	4.0									5.0
Flash Dont Walk (s)		9.0	9.0	5.0									18.0
Pedestrian Calls (#/hr)		500	500	500									500
Act Effct Green (s)		35.9	35.9	45.4	49.9					20.6	20.6	20.6	
Actuated g/C Ratio		0.33	0.33	0.41	0.45					0.19	0.19	0.19	
v/c Ratio		0.65	0.32	0.38	0.26					0.68	0.72	0.31	
Control Delay		35.8	10.3	18.9	15.9					52.5	47.9	6.8	
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0	
Total Delay		35.8	10.3	18.9	15.9					52.5	47.9	6.8	
LOS		D	B	B	B					D	D	A	
Approach Delay		30.5			16.5						43.0		
Approach LOS		C			B						D		
Queue Length 50th (ft)		232	23	25	54					138	166	0	
Queue Length 95th (ft)		326	85	m45	97					204	207	38	
Internal Link Dist (ft)		434			445			422			236		
Turn Bay Length (ft)			140	130									
Base Capacity (vph)		1133	606	277	1622					402	868	471	
Starvation Cap Reductn		0	0	0	0					0	0	0	
Spillback Cap Reductn		0	0	0	0					0	0	0	
Storage Cap Reductn		0	0	0	0					0	0	0	
Reduced v/c Ratio		0.65	0.32	0.38	0.26					0.52	0.55	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 8 (7%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 31.6 Intersection LOS: C
Intersection Capacity Utilization 49.4% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Tremont Street & Stuart Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	241	26	14	59	0	0	0	0	151	453	253	
Future Volume (vph)	0	241	26	14	59	0	0	0	0	151	453	253	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	
Ped Bike Factor		0.98			0.99								
Frt		0.987									0.956		
Flt Protected					0.991						0.991		
Satd. Flow (prot)	0	1840	0	0	1883	0	0	0	0	0	3336	0	
Flt Permitted					0.727						0.991		
Satd. Flow (perm)	0	1840	0	0	1367	0	0	0	0	0	3336	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		5									73		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		295			385			253			268		
Travel Time (s)		6.7			8.8			5.8			6.1		
Confl. Peds. (#/hr)			97	97									
Peak Hour Factor	0.73	0.73	0.73	0.85	0.85	0.85	0.25	0.25	0.25	0.94	0.94	0.94	
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	0%	0%	0%	2%	3%	2%	
Adj. Flow (vph)	0	330	36	16	69	0	0	0	0	161	482	269	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	366	0	0	85	0	0	0	0	0	912	0	
Turn Type		NA		Perm	NA					Split	NA		
Protected Phases		5			5					1	1		2
Permitted Phases				5									
Detector Phase		5		5	5					1	1		
Switch Phase													
Minimum Initial (s)		10.0		10.0	10.0					10.0	10.0		1.0
Minimum Split (s)		24.0		24.0	24.0					14.5	14.5		25.0
Total Split (s)		32.0		32.0	32.0					41.0	41.0		27.0
Total Split (%)		32.0%		32.0%	32.0%					41.0%	41.0%		27%
Maximum Green (s)		28.0		28.0	28.0					37.0	37.0		25.0
Yellow Time (s)		3.0		3.0	3.0					3.0	3.0		2.0
All-Red Time (s)		1.0		1.0	1.0					1.0	1.0		0.0
Lost Time Adjust (s)		0.0			0.0						0.0		
Total Lost Time (s)		4.0			4.0						4.0		
Lead/Lag										Lead	Lead		Lag
Lead-Lag Optimize?										Yes	Yes		Yes
Vehicle Extension (s)		2.0		2.0	2.0					2.0	2.0		0.2
Recall Mode		Min		Min	Min					C-Max	C-Max		None
Walk Time (s)		8.0		8.0	8.0								7.0
Flash Dont Walk (s)		12.0		12.0	12.0								16.0
Pedestrian Calls (#/hr)		127		127	127								324
Act Effct Green (s)		23.9			23.9						43.1		
Actuated g/C Ratio		0.24			0.24						0.43		
v/c Ratio		0.82			0.26						0.62		
Control Delay		40.8			32.0						23.0		
Queue Delay		35.7			0.0						0.0		
Total Delay		76.5			32.0						23.0		
LOS		E			C						C		
Approach Delay		76.5			32.0						23.0		
Approach LOS		E			C						C		
Queue Length 50th (ft)		245			44						213		
Queue Length 95th (ft)		m253			77						300		
Internal Link Dist (ft)		215			305			173			188		
Turn Bay Length (ft)													
Base Capacity (vph)		518			382						1478		
Starvation Cap Reductn		167			0						0		
Spillback Cap Reductn		0			0						0		
Storage Cap Reductn		0			0						0		
Reduced v/c Ratio		1.04			0.22						0.62		

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 20 (20%), Referenced to phase 1:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 37.9	Intersection LOS: D
Intersection Capacity Utilization 48.3%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 2: Shawmut Avenue & Tremont Street & Oak Street W

- Build (2026) Condition

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	456	195	139	451	0	0	0	0	87	272	140	
Future Volume (vph)	0	456	195	139	451	0	0	0	0	87	272	140	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		140	130		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	1		1	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	
Ped Bike Factor													
Frt			0.850									0.850	
Flt Protected				0.950						0.950			
Satd. Flow (prot)	0	3374	1524	1736	3312	0	0	0	0	1530	3223	1417	
Flt Permitted				0.386						0.950			
Satd. Flow (perm)	0	3374	1524	705	3312	0	0	0	0	1530	3223	1417	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			212									149	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		514			525			502			316		
Travel Time (s)		11.7			11.9			11.4			7.2		
Confl. Bikes (#/hr)												4	
Peak Hour Factor	0.92	0.92	0.92	0.83	0.83	0.83	0.25	0.25	0.25	0.94	0.94	0.94	
Heavy Vehicles (%)	0%	7%	6%	4%	9%	0%	0%	0%	0%	18%	12%	14%	
Adj. Flow (vph)	0	496	212	167	543	0	0	0	0	93	289	149	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	496	212	167	543	0	0	0	0	93	289	149	
Turn Type		NA	custom	D.P+P	NA					Split	NA	Prot	
Protected Phases		1	1	6	1 6					5	5	5	2
Permitted Phases			1	1									
Detector Phase		1	1	6	1 6					5	5	5	
Switch Phase													
Minimum Initial (s)		8.0	8.0	8.0						8.0	8.0	8.0	1.0
Minimum Split (s)		21.5	21.5	14.0						17.0	17.0	17.0	29.0
Total Split (s)		34.0	34.0	14.0						33.0	33.0	33.0	29.0
Total Split (%)		30.9%	30.9%	12.7%						30.0%	30.0%	30.0%	26%
Maximum Green (s)		28.5	28.5	9.0						24.0	24.0	24.0	23.0
Yellow Time (s)		3.0	3.0	3.0						3.5	3.5	3.5	2.0
All-Red Time (s)		2.5	2.5	2.0						5.5	5.5	5.5	4.0
Lost Time Adjust (s)		0.0	0.0	0.0						0.0	0.0	0.0	
Total Lost Time (s)		5.5	5.5	5.0						9.0	9.0	9.0	
Lead/Lag		Lead	Lead	Lag						Lead	Lead	Lead	Lag
Lead-Lag Optimize?		Yes	Yes	Yes						Yes	Yes	Yes	Yes
Vehicle Extension (s)		2.0	2.0	2.0						2.0	2.0	2.0	0.2
Recall Mode		C-Max	C-Max	None						None	None	None	None
Walk Time (s)		7.0	7.0	4.0									5.0
Flash Dont Walk (s)		9.0	9.0	5.0									18.0
Pedestrian Calls (#/hr)		253	253	253									442
Act Effct Green (s)		37.8	37.8	47.3	51.8					14.7	14.7	14.7	
Actuated g/C Ratio		0.34	0.34	0.43	0.47					0.13	0.13	0.13	
v/c Ratio		0.43	0.32	0.43	0.35					0.46	0.67	0.47	
Control Delay		30.0	5.4	15.6	13.7					50.1	52.7	11.7	
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0	
Total Delay		30.0	5.4	15.6	13.7					50.1	52.7	11.7	
LOS		C	A	B	B					D	D	B	
Approach Delay		22.6			14.1						40.7		
Approach LOS		C			B						D		
Queue Length 50th (ft)		139	0	32	58					62	104	0	
Queue Length 95th (ft)		205	54	m49	m83					108	141	55	
Internal Link Dist (ft)		434			445			422			236		
Turn Bay Length (ft)			140	130									
Base Capacity (vph)		1158	662	387	1558					333	703	425	
Starvation Cap Reductn		0	0	0	0					0	0	0	
Spillback Cap Reductn		0	0	0	0					0	0	0	
Storage Cap Reductn		0	0	0	0					0	0	0	
Reduced v/c Ratio		0.43	0.32	0.43	0.35					0.28	0.41	0.35	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 8 (7%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 24.5 Intersection LOS: C
Intersection Capacity Utilization 44.1% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Tremont Street & Stuart Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	89	26	40	69	0	0	0	0	67	253	159	
Future Volume (vph)	0	89	26	40	69	0	0	0	0	67	253	159	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	
Ped Bike Factor		0.97			0.97								
Frt		0.970									0.950		
Flt Protected					0.982						0.993		
Satd. Flow (prot)	0	1625	0	0	1765	0	0	0	0	0	3174	0	
Flt Permitted					0.803						0.993		
Satd. Flow (perm)	0	1625	0	0	1394	0	0	0	0	0	3174	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		16									88		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		295			385			253			268		
Travel Time (s)		6.7			8.8			5.8			6.1		
Confl. Peds. (#/hr)			86	86									
Peak Hour Factor	0.66	0.66	0.66	0.90	0.90	0.90	0.25	0.25	0.25	0.82	0.82	0.82	
Heavy Vehicles (%)	0%	7%	20%	0%	9%	0%	0%	0%	0%	2%	7%	10%	
Adj. Flow (vph)	0	135	39	44	77	0	0	0	0	82	309	194	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	174	0	0	121	0	0	0	0	0	585	0	
Turn Type		NA		Perm	NA					Split	NA		
Protected Phases		5			5					1	1		2
Permitted Phases				5									
Detector Phase		5		5	5					1	1		
Switch Phase													
Minimum Initial (s)		10.0		10.0	10.0					10.0	10.0		1.0
Minimum Split (s)		24.0		24.0	24.0					14.5	14.5		25.0
Total Split (s)		39.0		39.0	39.0					34.0	34.0		27.0
Total Split (%)		39.0%		39.0%	39.0%					34.0%	34.0%		27%
Maximum Green (s)		35.0		35.0	35.0					30.0	30.0		25.0
Yellow Time (s)		3.0		3.0	3.0					3.0	3.0		2.0
All-Red Time (s)		1.0		1.0	1.0					1.0	1.0		0.0
Lost Time Adjust (s)		0.0			0.0						0.0		
Total Lost Time (s)		4.0			4.0						4.0		
Lead/Lag										Lead	Lead		Lag
Lead-Lag Optimize?										Yes	Yes		Yes
Vehicle Extension (s)		2.0		2.0	2.0					2.0	2.0		0.2
Recall Mode		Min		Min	Min					C-Max	C-Max		None
Walk Time (s)		8.0		8.0	8.0								7.0
Flash Dont Walk (s)		12.0		12.0	12.0								16.0
Pedestrian Calls (#/hr)		144		144	144								359
Act Effct Green (s)		20.1			20.1						46.9		
Actuated g/C Ratio		0.20			0.20						0.47		
v/c Ratio		0.51			0.43						0.38		
Control Delay		27.7			27.9						15.2		
Queue Delay		0.1			0.0						0.0		
Total Delay		27.7			27.9						15.2		
LOS		C			C						B		
Approach Delay		27.7			27.9						15.2		
Approach LOS		C			C						B		
Queue Length 50th (ft)		95			69						102		
Queue Length 95th (ft)		103			126						126		
Internal Link Dist (ft)		215			305			173			188		
Turn Bay Length (ft)													
Base Capacity (vph)		579			487						1536		
Starvation Cap Reductn		37			0						0		
Spillback Cap Reductn		0			0						0		
Storage Cap Reductn		0			0						0		
Reduced v/c Ratio		0.32			0.25						0.38		

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 56 (56%), Referenced to phase 1:SBTL, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay: 19.4	Intersection LOS: B
Intersection Capacity Utilization 36.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Shawmut Avenue & Tremont Street & Oak Street W

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations		↑↑	↱	↰	↑↑					↰	↑↑	↱	
Traffic Volume (vph)	0	669	195	117	396	0	0	0	0	200	469	115	
Future Volume (vph)	0	669	195	117	396	0	0	0	0	200	469	115	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		140	130		0	0		0	0		0	
Storage Lanes	0		1	1		0	0		0	1		1	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	
Ped Bike Factor			0.99										
Frt			0.850									0.850	
Flt Protected				0.950						0.950			
Satd. Flow (prot)	0	3471	1553	1752	3574	0	0	0	0	1641	3539	1509	
Flt Permitted				0.217						0.950			
Satd. Flow (perm)	0	3471	1532	400	3574	0	0	0	0	1641	3539	1509	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			163									134	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		514			525			502			316		
Travel Time (s)		11.7			11.9			11.4			7.2		
Confl. Bikes (#/hr)			2			2						19	
Peak Hour Factor	0.91	0.91	0.91	0.93	0.93	0.93	0.25	0.25	0.25	0.96	0.96	0.96	
Heavy Vehicles (%)	0%	4%	4%	3%	1%	0%	0%	0%	0%	10%	2%	7%	
Adj. Flow (vph)	0	735	214	126	426	0	0	0	0	208	489	120	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	735	214	126	426	0	0	0	0	208	489	120	
Turn Type		NA	custom	D.P+P	NA					Split	NA	Prot	
Protected Phases		1	1	6	1 6					5	5	5	2
Permitted Phases			1	1									
Detector Phase		1	1	6	1 6					5	5	5	
Switch Phase													
Minimum Initial (s)		8.0	8.0	6.0						8.0	8.0	8.0	1.0
Minimum Split (s)		21.5	21.5	14.0						13.0	13.0	13.0	29.0
Total Split (s)		35.0	35.0	14.0						32.0	32.0	32.0	29.0
Total Split (%)		31.8%	31.8%	12.7%						29.1%	29.1%	29.1%	26%
Maximum Green (s)		29.5	29.5	9.0						27.0	27.0	27.0	23.0
Yellow Time (s)		3.0	3.0	3.0						3.5	3.5	3.5	2.0
All-Red Time (s)		2.5	2.5	2.0						1.5	1.5	1.5	4.0
Lost Time Adjust (s)		0.0	0.0	0.0						0.0	0.0	0.0	
Total Lost Time (s)		5.5	5.5	5.0						5.0	5.0	5.0	
Lead/Lag		Lead	Lead	Lag						Lead	Lead	Lead	Lag
Lead-Lag Optimize?		Yes	Yes	Yes						Yes	Yes	Yes	Yes
Vehicle Extension (s)		2.0	2.0	2.0						2.0	2.0	2.0	0.2
Recall Mode		C-Max	C-Max	None						None	None	None	None
Walk Time (s)		7.0	7.0	4.0									5.0
Flash Dont Walk (s)		9.0	9.0	5.0									18.0
Pedestrian Calls (#/hr)		500	500	500									500
Act Effct Green (s)		35.6	35.6	45.1	49.6					20.9	20.9	20.9	
Actuated g/C Ratio		0.32	0.32	0.41	0.45					0.19	0.19	0.19	
v/c Ratio		0.65	0.35	0.46	0.26					0.67	0.73	0.30	
Control Delay		36.2	10.4	21.8	16.0					51.6	48.2	6.7	
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0	
Total Delay		36.2	10.4	21.8	16.0					51.6	48.2	6.7	
LOS		D	B	C	B					D	D	A	
Approach Delay		30.4			17.4						42.9		
Approach LOS		C			B						D		
Queue Length 50th (ft)		234	25	30	54					137	172	0	
Queue Length 95th (ft)		326	92	m55	97					204	214	38	
Internal Link Dist (ft)		434			445			422			236		
Turn Bay Length (ft)			140	130									
Base Capacity (vph)		1123	613	274	1612					402	868	471	
Starvation Cap Reductn		0	0	0	0					0	0	0	
Spillback Cap Reductn		0	0	0	0					0	0	0	
Storage Cap Reductn		0	0	0	0					0	0	0	
Reduced v/c Ratio		0.65	0.35	0.46	0.26					0.52	0.56	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 8 (7%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 31.7 Intersection LOS: C
Intersection Capacity Utilization 50.9% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Tremont Street & Stuart Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2
Lane Configurations													
Traffic Volume (vph)	0	241	26	14	59	0	0	0	0	160	485	309	
Future Volume (vph)	0	241	26	14	59	0	0	0	0	160	485	309	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	
Ped Bike Factor		0.98			0.99								
Frt		0.987									0.951		
Flt Protected					0.991						0.992		
Satd. Flow (prot)	0	1840	0	0	1883	0	0	0	0	0	3322	0	
Flt Permitted					0.727						0.992		
Satd. Flow (perm)	0	1840	0	0	1367	0	0	0	0	0	3322	0	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		5									92		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		295			385			253			268		
Travel Time (s)		6.7			8.8			5.8			6.1		
Confl. Peds. (#/hr)			97	97									
Peak Hour Factor	0.73	0.73	0.73	0.85	0.85	0.85	0.25	0.25	0.25	0.94	0.94	0.94	
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	0%	0%	0%	2%	3%	2%	
Adj. Flow (vph)	0	330	36	16	69	0	0	0	0	170	516	329	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	366	0	0	85	0	0	0	0	0	1015	0	
Turn Type		NA		Perm	NA					Split	NA		
Protected Phases		5			5					1	1		2
Permitted Phases				5									
Detector Phase		5		5	5					1	1		
Switch Phase													
Minimum Initial (s)		10.0		10.0	10.0					10.0	10.0		1.0
Minimum Split (s)		24.0		24.0	24.0					14.5	14.5		25.0
Total Split (s)		32.0		32.0	32.0					41.0	41.0		27.0
Total Split (%)		32.0%		32.0%	32.0%					41.0%	41.0%		27%
Maximum Green (s)		28.0		28.0	28.0					37.0	37.0		25.0
Yellow Time (s)		3.0		3.0	3.0					3.0	3.0		2.0
All-Red Time (s)		1.0		1.0	1.0					1.0	1.0		0.0
Lost Time Adjust (s)		0.0			0.0						0.0		
Total Lost Time (s)		4.0			4.0						4.0		
Lead/Lag										Lead	Lead		Lag
Lead-Lag Optimize?										Yes	Yes		Yes
Vehicle Extension (s)		2.0		2.0	2.0					2.0	2.0		0.2
Recall Mode		Min		Min	Min					C-Max	C-Max		None
Walk Time (s)		8.0		8.0	8.0								7.0
Flash Dont Walk (s)		12.0		12.0	12.0								16.0
Pedestrian Calls (#/hr)		127		127	127								324
Act Effct Green (s)		23.9			23.9						43.1		
Actuated g/C Ratio		0.24			0.24						0.43		
v/c Ratio		0.82			0.26						0.68		
Control Delay		40.8			32.0						24.2		
Queue Delay		35.7			0.0						0.0		
Total Delay		76.5			32.0						24.2		
LOS		E			C						C		
Approach Delay		76.5			32.0						24.2		
Approach LOS		E			C						C		
Queue Length 50th (ft)		245			44						245		
Queue Length 95th (ft)		m253			77						343		
Internal Link Dist (ft)		215			305			173			188		
Turn Bay Length (ft)													
Base Capacity (vph)		518			382						1483		
Starvation Cap Reductn		167			0						0		
Spillback Cap Reductn		0			0						0		
Storage Cap Reductn		0			0						0		
Reduced v/c Ratio		1.04			0.22						0.68		

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 20 (20%), Referenced to phase 1:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 37.7	Intersection LOS: D
Intersection Capacity Utilization 51.2%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 2: Shawmut Avenue & Tremont Street & Oak Street W

Transit Analysis

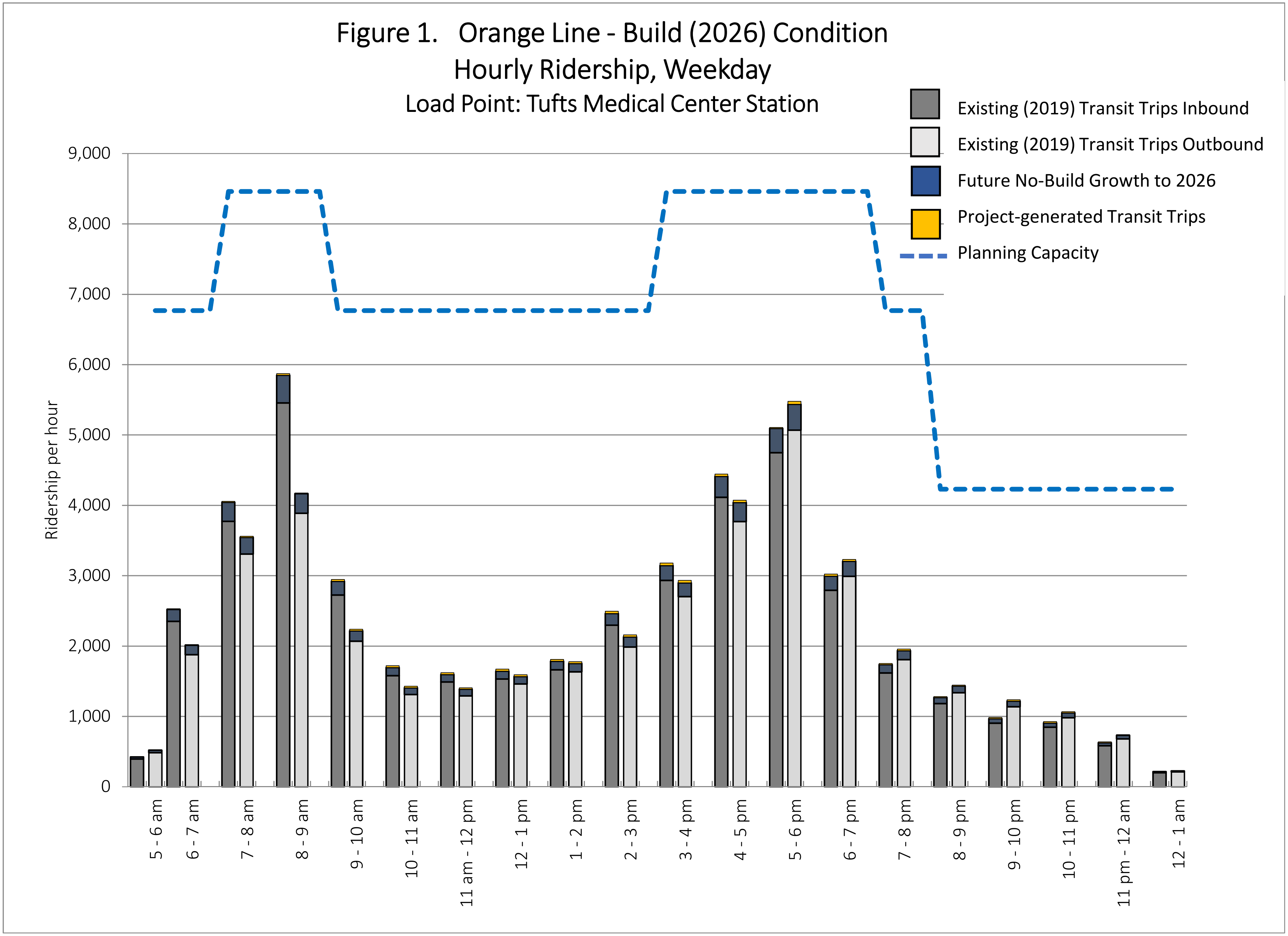


Figure 1. Orange Line - Build (2026) Condition
Hourly Ridership, Weekday
Load Point: Tufts Medical Center Station
Existing (2019) Transit Trips Inbound
Existing (2019) Transit Trips Outbound
Future No-Build Growth to 2026
Project-generated Transit Trips
Planning Capacity
Ridership per hour
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
5 - 6 am
6 - 7 am
7 - 8 am
8 - 9 am
9 - 10 am
10 - 11 am
11 am - 12 pm
12 - 1 pm
1 - 2 pm
2 - 3 pm
3 - 4 pm
4 - 5 pm
5 - 6 pm
6 - 7 pm
7 - 8 pm
8 - 9 pm
9 - 10 pm
10 - 11 pm
11 pm - 12 am
12 - 1 am

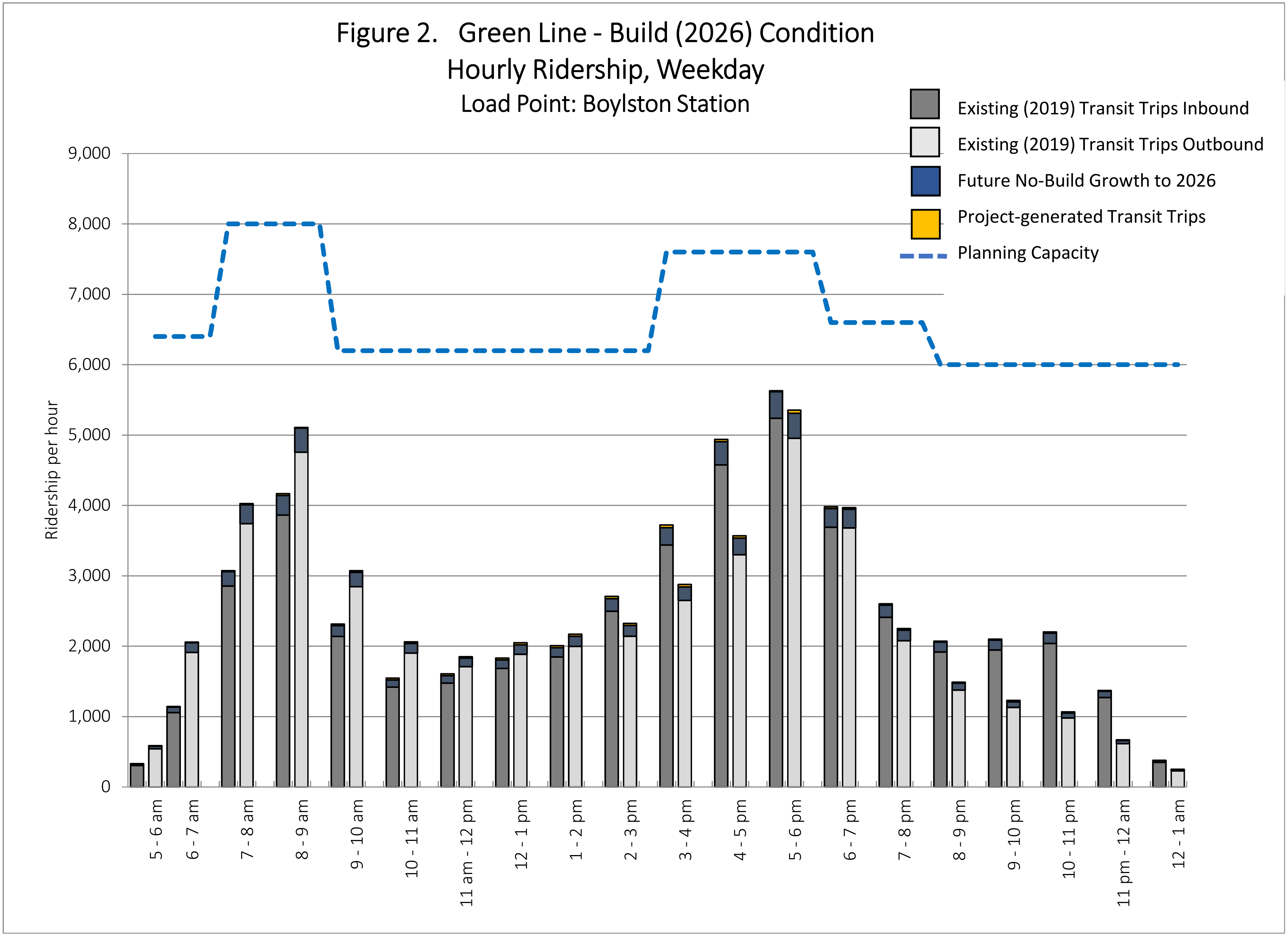


Figure 2. Green Line - Build (2026) Condition
Hourly Ridership, Weekday
Load Point: Boylston Station
Existing (2019) Transit Trips Inbound
Existing (2019) Transit Trips Outbound
Future No-Build Growth to 2026
Project-generated Transit Trips
Planning Capacity
Ridership per hour
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
5 - 6 am
6 - 7 am
7 - 8 am
8 - 9 am
9 - 10 am
10 - 11 am
11 am - 12 pm
12 - 1 pm
1 - 2 pm
2 - 3 pm
3 - 4 pm
4 - 5 pm
5 - 6 pm
6 - 7 pm
7 - 8 pm
8 - 9 pm
9 - 10 pm
10 - 11 pm
11 pm - 12 am
12 - 1 am

Additional 11-Hour Counts

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 1
Location:	Boston, MA
Street 1:	Stuart Street
Street 2:	Charles Street S
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PASSENGER CARS & HEAVY VEHICLES COMBINED

	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	51	10	0	0	0	0	0	37	61	0	0	0	0	113
7:15 AM	0	0	66	11	0	0	0	0	0	40	66	0	0	0	0	140
7:30 AM	0	0	62	16	0	0	0	0	0	50	88	0	0	0	0	149
7:45 AM	0	0	87	12	0	0	0	0	0	61	86	0	0	0	0	142
8:00 AM	0	0	98	15	0	0	0	0	0	56	92	0	0	0	0	136
8:15 AM	0	0	107	13	0	0	0	0	0	54	93	0	0	0	0	134
8:30 AM	0	0	118	18	0	0	0	0	0	63	88	0	0	0	0	138
8:45 AM	0	0	123	17	0	0	0	0	0	59	85	0	0	0	0	146
9:00 AM	0	0	124	13	0	0	0	0	0	71	87	0	0	0	0	145
9:15 AM	0	0	113	18	0	0	0	0	0	72	91	0	0	0	0	142
9:30 AM	0	0	87	20	0	0	0	0	0	59	89	0	0	0	0	123
9:45 AM	0	0	90	19	0	0	0	0	0	57	85	0	0	0	0	128
10:00 AM	0	0	99	15	0	0	0	0	0	58	90	0	0	0	0	132
10:15 AM	0	0	87	17	0	0	0	0	0	64	98	0	0	0	0	136
10:30 AM	0	0	83	26	0	0	0	0	0	47	81	0	0	0	0	130
10:45 AM	0	0	89	18	0	0	0	0	0	66	83	0	0	0	0	128
11:00 AM	0	0	85	21	0	0	0	0	0	60	71	0	0	0	0	119
11:15 AM	0	0	77	16	0	0	0	0	0	48	81	0	0	0	0	130
11:30 AM	0	0	79	20	0	0	0	0	0	62	76	0	0	0	0	141
11:45 AM	0	0	83	17	0	0	0	0	0	55	70	0	0	0	0	137
12:00 PM	0	0	77	22	0	0	0	0	0	56	86	0	0	0	0	128
12:15 PM	0	0	71	23	0	0	0	0	0	55	88	0	0	0	0	122
12:30 PM	0	0	72	26	0	0	0	0	0	52	90	0	0	0	0	134
12:45 PM	0	0	89	27	0	0	0	0	0	64	71	0	0	0	0	124
1:00 PM	0	0	84	21	0	0	0	0	0	58	96	0	0	0	0	116
1:15 PM	0	0	73	25	0	0	0	0	0	71	77	0	0	0	0	139
1:30 PM	0	0	90	23	0	0	0	0	0	67	90	0	0	0	0	127
1:45 PM	0	0	92	29	0	0	0	0	0	70	101	0	0	0	0	130
2:00 PM	0	0	101	26	0	0	0	0	0	79	104	0	0	0	0	126
2:15 PM	0	0	99	24	0	0	0	0	0	90	112	0	0	0	0	129
2:30 PM	0	0	86	19	0	0	0	0	0	72	105	0	0	0	0	135
2:45 PM	0	0	79	24	0	0	0	0	0	82	116	0	0	0	0	132
3:00 PM	0	0	90	26	0	0	0	0	0	85	113	0	0	0	0	126
3:15 PM	0	0	97	19	0	0	0	0	0	87	120	0	0	0	0	124
3:30 PM	0	0	103	22	0	0	0	0	0	90	112	0	0	0	0	128
3:45 PM	0	0	107	20	0	0	0	0	0	98	123	0	0	0	0	125
4:00 PM	0	0	99	24	0	0	0	0	0	86	129	0	0	0	0	130
4:15 PM	0	0	92	23	0	0	0	0	0	70	131	0	0	0	0	135
4:30 PM	0	0	104	18	0	0	0	0	0	99	122	0	0	0	0	132
4:45 PM	0	0	117	20	0	0	0	0	0	87	135	0	0	0	0	138
5:00 PM	0	0	110	24	0	0	0	0	0	98	132	0	0	0	0	140
5:15 PM	0	0	107	16	0	0	0	0	0	85	128	0	0	0	0	141
5:30 PM	0	0	92	23	0	0	0	0	0	46	130	0	0	0	0	134
5:45 PM	0	0	87	22	0	0	0	0	0	91	126	0	0	0	0	132

AM PEAK HOUR 8:30 AM to 9:30 AM	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**478**	**66**	**0**	**0**	**0**	**0**	**0**	**265**	**351**	**0**	**0**	**0**	**0**	**571**
PHF	**0.97**				**0.00**				**0.94**				**0.98**			
HV %	**0.0%**	**0.0%**	**6.9%**	**18.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**7.9%**	**8.5%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**7.5%**

MID PEAK HOUR 1:00 PM to 2:00 PM	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**339**	**98**	**0**	**0**	**0**	**0**	**0**	**266**	**364**	**0**	**0**	**0**	**0**	**512**
PHF	**0.90**				**0.00**				**0.92**				**0.92**			
HV %	**0.0%**	**0.0%**	**5.0%**	**4.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**7.1%**	**5.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**5.5%**

PM PEAK HOUR 4:30 PM to 5:30 PM	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**438**	**78**	**0**	**0**	**0**	**0**	**0**	**369**	**517**	**0**	**0**	**0**	**0**	**551**
PHF	**0.94**				**0.00**				**0.96**				**0.98**			
HV %	**0.0%**	**0.0%**	**4.1%**	**6.4%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**3.0%**	**3.7%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**4.4%**

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 1
Location:	Boston, MA
Street 1:	Stuart Street
Street 2:	Charles Street S
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

HEAVY VEHICLES

	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	2	1	0	0	0	0	0	3	3	0	0	0	0	11
7:15 AM	0	0	7	1	0	0	0	0	0	8	8	0	0	0	0	13
7:30 AM	0	0	2	1	0	0	0	0	0	3	7	0	0	0	0	10
7:45 AM	0	0	11	0	0	0	0	0	0	4	6	0	0	0	0	12
8:00 AM	0	0	8	2	0	0	0	0	0	4	6	0	0	0	0	11
8:15 AM	0	0	5	2	0	0	0	0	0	3	11	0	0	0	0	12
8:30 AM	0	0	7	2	0	0	0	0	0	8	9	0	0	0	0	11
8:45 AM	0	0	9	3	0	0	0	0	0	3	9	0	0	0	0	9
9:00 AM	0	0	10	4	0	0	0	0	0	5	5	0	0	0	0	11
9:15 AM	0	0	7	3	0	0	0	0	0	5	7	0	0	0	0	12
9:30 AM	0	0	6	2	0	0	0	0	0	9	8	0	0	0	0	10
9:45 AM	0	0	3	0	0	0	0	0	0	4	5	0	0	0	0	12
10:00 AM	0	0	5	3	0	0	0	0	0	4	8	0	0	0	0	11
10:15 AM	0	0	7	1	0	0	0	0	0	6	7	0	0	0	0	12
10:30 AM	0	0	6	3	0	0	0	0	0	3	4	0	0	0	0	10
10:45 AM	0	0	5	1	0	0	0	0	0	5	6	0	0	0	0	9
11:00 AM	0	0	4	0	0	0	0	0	0	3	4	0	0	0	0	6
11:15 AM	0	0	5	1	0	0	0	0	0	7	5	0	0	0	0	8
11:30 AM	0	0	5	3	0	0	0	0	0	3	7	0	0	0	0	9
11:45 AM	0	0	2	0	0	0	0	0	0	5	5	0	0	0	0	12
12:00 PM	0	0	4	1	0	0	0	0	0	2	4	0	0	0	0	9
12:15 PM	0	0	2	2	0	0	0	0	0	4	7	0	0	0	0	7
12:30 PM	0	0	4	1	0	0	0	0	0	3	6	0	0	0	0	11
12:45 PM	0	0	6	1	0	0	0	0	0	5	7	0	0	0	0	10
1:00 PM	0	0	7	3	0	0	0	0	0	2	6	0	0	0	0	7
1:15 PM	0	0	2	1	0	0	0	0	0	4	5	0	0	0	0	9
1:30 PM	0	0	6	0	0	0	0	0	0	4	4	0	0	0	0	7
1:45 PM	0	0	2	0	0	0	0	0	0	9	4	0	0	0	0	5
2:00 PM	0	0	4	0	0	0	0	0	0	5	7	0	0	0	0	9
2:15 PM	0	0	6	2	0	0	0	0	0	6	6	0	0	0	0	7
2:30 PM	0	0	8	1	0	0	0	0	0	7	7	0	0	0	0	8
2:45 PM	0	0	3	4	0	0	0	0	0	6	6	0	0	0	0	6
3:00 PM	0	0	5	0	0	0	0	0	0	5	5	0	0	0	0	4
3:15 PM	0	0	5	1	0	0	0	0	0	3	7	0	0	0	0	8
3:30 PM	0	0	3	1	0	0	0	0	0	4	6	0	0	0	0	4
3:45 PM	0	0	7	0	0	0	0	0	0	3	6	0	0	0	0	6
4:00 PM	0	0	8	0	0	0	0	0	0	1	5	0	0	0	0	7
4:15 PM	0	0	8	0	0	0	0	0	0	7	5	0	0	0	0	7
4:30 PM	0	0	5	1	0	0	0	0	0	2	4	0	0	0	0	6
4:45 PM	0	0	9	0	0	0	0	0	0	3	5	0	0	0	0	7
5:00 PM	0	0	4	3	0	0	0	0	0	4	6	0	0	0	0	6
5:15 PM	0	0	0	1	0	0	0	0	0	2	4	0	0	0	0	5
5:30 PM	0	0	3	0	0	0	0	0	0	2	4	0	0	0	0	2
5:45 PM	0	0	0	1	0	0	0	0	0	1	5	0	0	0	0	2

AM PEAK HOUR	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
8:30 AM to 9:30 AM	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**33**	**12**	**0**	**0**	**0**	**0**	**0**	**21**	**30**	**0**	**0**	**0**	**0**	**43**
PHF	**0.80**				**0.00**				**0.75**				**0.90**			

MID PEAK HOUR	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
10:00 AM to 11:00 AM	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**23**	**8**	**0**	**0**	**0**	**0**	**0**	**18**	**25**	**0**	**0**	**0**	**0**	**42**
PHF	**0.86**				**0.00**				**0.83**				**0.88**			

PM PEAK HOUR	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
2:00 PM to 3:00 PM	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**21**	**7**	**0**	**0**	**0**	**0**	**0**	**24**	**26**	**0**	**0**	**0**	**0**	**30**
PHF	**0.78**				**0.00**				**0.89**				**0.83**			

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 1
Location:	Boston, MA
Street 1:	Stuart Street
Street 2:	Charles Street S
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PEDESTRIANS & BICYCLES

	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	0	0	30	0	0	0	22	1	3	0	24	0	0	1	26
7:15 AM	0	1	0	34	0	0	0	25	1	7	0	25	0	1	0	29
7:30 AM	0	2	1	38	0	0	0	26	2	3	0	27	0	0	3	32
7:45 AM	0	0	0	40	0	0	0	28	5	10	0	25	0	0	2	35
8:00 AM	0	2	2	42	0	0	0	30	6	17	0	26	0	0	3	38
8:15 AM	0	3	2	45	0	0	0	29	8	9	0	28	1	0	2	40
8:30 AM	0	2	0	41	0	0	0	27	5	19	0	24	0	0	3	42
8:45 AM	0	4	0	43	0	0	0	26	10	21	0	27	1	1	1	39
9:00 AM	0	0	0	42	0	0	0	28	3	18	0	25	0	0	2	40
9:15 AM	0	2	1	45	0	0	0	30	2	9	0	23	0	0	0	42
9:30 AM	0	2	0	43	0	0	0	27	4	15	0	25	0	0	1	39
9:45 AM	0	0	0	41	0	0	0	26	2	7	0	24	0	0	0	37
10:00 AM	0	3	2	42	0	0	0	28	2	12	0	26	0	2	3	41
10:15 AM	0	2	1	45	0	0	0	32	3	18	0	29	0	0	1	38
10:30 AM	0	1	0	43	0	0	0	31	1	3	0	25	1	0	1	39
10:45 AM	0	0	0	41	0	0	0	29	1	4	0	26	0	0	0	37
11:00 AM	0	1	0	40	0	0	0	30	0	3	0	28	0	0	0	38
11:15 AM	0	0	0	43	1	0	0	28	0	1	0	31	0	0	2	40
11:30 AM	0	1	0	45	0	0	0	26	2	7	0	33	0	0	2	42
11:45 AM	0	0	0	42	0	0	0	28	4	6	0	35	1	0	3	44
12:00 PM	0	0	0	46	0	0	0	30	0	2	0	37	0	1	4	46
12:15 PM	0	0	0	48	0	0	0	26	0	2	0	40	0	2	2	48
12:30 PM	0	2	1	51	0	0	0	28	0	0	0	42	0	0	2	45
12:45 PM	0	2	1	54	0	0	0	32	2	3	0	45	0	1	4	47
1:00 PM	0	3	1	52	0	0	0	29	0	2	0	48	0	0	0	46
1:15 PM	0	3	1	56	1	0	0	32	1	0	0	46	0	0	3	48
1:30 PM	0	2	0	58	0	0	0	28	0	0	0	47	0	1	0	50
1:45 PM	0	1	1	57	0	0	0	31	0	3	0	50	0	0	0	51
2:00 PM	0	1	0	60	0	0	0	30	0	2	0	52	0	0	1	52
2:15 PM	0	0	0	58	0	0	1	28	0	2	0	51	0	0	2	55
2:30 PM	0	2	0	59	0	0	0	26	0	3	0	48	0	1	3	57
2:45 PM	0	0	1	62	0	0	0	24	2	5	0	53	0	1	2	56
3:00 PM	0	0	2	65	0	0	0	25	1	1	0	55	0	1	2	54
3:15 PM	0	0	0	63	0	1	0	26	0	0	0	52	0	1	2	58
3:30 PM	0	0	3	61	0	0	0	24	1	3	0	50	0	2	1	59
3:45 PM	0	0	1	65	0	0	0	28	0	1	0	47	0	1	3	57
4:00 PM	0	2	1	62	0	0	0	30	1	0	0	45	0	1	3	60
4:15 PM	0	4	0	58	0	0	0	38	1	1	0	48	0	0	6	58
4:30 PM	0	0	0	56	0	0	0	45	1	4	0	52	0	1	1	64
4:45 PM	0	2	3	60	0	0	0	53	0	1	0	50	1	0	4	62
5:00 PM	0	2	1	57	0	0	0	60	1	0	0	53	0	1	8	58
5:15 PM	0	4	1	62	0	0	0	58	2	2	0	56	1	0	9	60
5:30 PM	0	2	1	68	0	0	0	57	0	3	0	54	0	0	7	64
5:45 PM	0	2	0	72	0	0	0	62	1	1	0	55	0	1	6	66

AM PEAK HOUR 8:30 AM to 9:30 AM	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	0	8	1	171	0	0	0	111	20	67	0	99	1	1	6	163

MID PEAK HOUR 1:00 PM to 2:00 PM	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	0	9	3	223	1	0	0	120	1	5	0	191	0	1	3	195

PM PEAK HOUR 4:30 PM to 5:30 PM	Charles Street S Northbound				Charles Street S Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	0	8	5	235	0	0	0	216	4	7	0	211	2	2	22	244

NOTE: Peak hour summaries here correspond to peak hours identified for passenger car and heavy vehicles combined.

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 2
Location:	Boston, MA
Street 1:	Stuart Street
Street 2:	Tremont Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PASSENGER CARS & HEAVY VEHICLES COMBINED

	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	0	0	0	19	46	24	0	0	47	24	1	19	89	0
7:15 AM	0	0	0	0	0	16	45	27	0	0	54	23	2	27	113	0
7:30 AM	0	0	0	0	0	17	57	34	0	0	76	28	1	24	115	0
7:45 AM	0	0	0	0	0	18	55	41	0	0	65	33	0	26	101	0
8:00 AM	0	0	0	0	0	20	57	38	0	0	80	27	1	30	98	0
8:15 AM	0	0	0	0	0	22	54	29	1	0	67	38	1	31	104	0
8:30 AM	0	0	0	0	0	21	60	28	0	0	70	36	1	25	110	0
8:45 AM	0	0	0	0	0	20	63	47	0	0	70	32	0	23	99	0
9:00 AM	0	0	0	0	0	28	57	49	0	0	74	26	0	21	96	0
9:15 AM	0	0	0	0	0	22	52	37	0	0	78	31	1	32	105	0
9:30 AM	0	0	0	0	0	30	55	33	0	0	79	30	0	30	90	0
9:45 AM	0	0	0	0	0	23	61	45	0	0	75	29	1	29	83	0
10:00 AM	0	0	0	0	0	25	63	26	0	0	68	37	2	33	106	0
10:15 AM	0	0	0	0	0	27	67	44	0	0	80	35	0	36	92	0
10:30 AM	0	0	0	0	0	31	72	46	0	0	69	38	2	38	84	0
10:45 AM	0	0	0	0	0	32	83	37	0	0	65	36	0	27	91	0
11:00 AM	0	0	0	0	0	23	79	32	0	0	69	23	2	29	87	0
11:15 AM	0	0	0	0	0	31	70	36	0	0	70	27	0	28	94	0
11:30 AM	0	0	0	0	0	22	50	28	0	0	57	39	1	21	113	0
11:45 AM	0	0	0	0	0	31	63	41	0	0	59	28	0	27	96	0
12:00 PM	0	0	0	0	0	30	65	44	0	0	74	34	0	33	84	0
12:15 PM	0	0	0	0	0	35	69	33	0	0	70	41	0	38	89	0
12:30 PM	0	0	0	0	0	38	68	43	0	0	80	36	2	37	91	0
12:45 PM	0	0	0	0	0	34	66	40	0	0	65	33	0	36	84	0
1:00 PM	0	0	0	0	0	29	62	32	0	0	81	36	0	28	84	0
1:15 PM	0	0	0	0	0	31	67	28	0	0	63	39	0	30	111	0
1:30 PM	0	0	0	0	0	33	73	47	0	0	82	31	1	27	80	0
1:45 PM	0	0	0	0	0	34	76	40	0	0	95	42	0	29	90	0
2:00 PM	0	0	0	0	0	43	98	37	0	0	90	40	4	25	89	0
2:15 PM	0	0	0	0	0	47	96	36	0	0	102	34	0	21	93	0
2:30 PM	0	0	0	0	0	48	84	38	0	0	96	28	2	23	97	0
2:45 PM	0	0	0	0	0	46	111	34	0	0	97	43	1	27	98	0
3:00 PM	0	0	0	0	0	37	112	33	0	0	100	39	0	29	93	0
3:15 PM	0	0	0	0	0	45	122	34	0	0	101	38	1	24	90	0
3:30 PM	0	0	0	0	0	38	120	31	0	0	101	33	2	20	97	0
3:45 PM	0	0	0	0	0	33	83	30	0	0	108	35	2	23	95	0
4:00 PM	0	0	0	0	0	49	115	32	0	0	120	33	0	24	98	0
4:15 PM	0	0	0	0	0	40	113	33	1	0	109	44	0	25	101	0
4:30 PM	0	0	0	0	0	36	108	29	0	0	108	32	0	23	103	0
4:45 PM	0	0	0	0	0	42	110	37	0	0	124	31	1	21	101	0
5:00 PM	0	0	0	0	0	45	112	34	0	0	116	40	0	19	106	0
5:15 PM	0	0	0	0	0	39	116	36	0	0	112	32	1	20	105	0
5:30 PM	0	0	0	0	0	38	113	38	0	0	118	35	1	17	96	0
5:45 PM	0	0	0	0	0	42	118	35	0	0	119	29	3	16	97	0

AM PEAK HOUR 8:30 AM to 9:30 AM	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**91**	**232**	**161**	**0**	**0**	**292**	**125**	**2**	**101**	**410**	**0**
PHF	**0.00**				**0.90**				**0.96**				**0.93**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**11.0%**	**8.2%**	**8.7%**	**0.0%**	**0.0%**	**11.3%**	**4.8%**	**0.0%**	**3.0%**	**7.1%**	**0.0%**

MID PEAK HOUR 1:00 PM to 2:00 PM	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**127**	**278**	**147**	**0**	**0**	**321**	**148**	**1**	**114**	**365**	**0**
PHF	**0.00**				**0.90**				**0.86**				**0.85**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**9.4%**	**6.1%**	**3.4%**	**0.0%**	**0.0%**	**5.9%**	**2.0%**	**0.0%**	**5.3%**	**6.3%**	**0.0%**

PM PEAK HOUR 4:45 PM to 5:45 PM	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**164**	**451**	**145**	**0**	**0**	**470**	**138**	**3**	**77**	**408**	**0**
PHF	**0.00**				**0.99**				**0.97**				**0.97**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**7.3%**	**1.6%**	**6.9%**	**0.0%**	**0.0%**	**4.0%**	**2.2%**	**0.0%**	**3.9%**	**3.2%**	**0.0%**

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 2
Location:	Boston, MA
Street 1:	Stuart Street
Street 2:	Tremont Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

HEAVY VEHICLES

	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	0	0	0	3	3	4	0	0	4	0	0	1	7	0
7:15 AM	0	0	0	0	0	3	3	3	0	0	6	3	0	1	8	0
7:30 AM	0	0	0	0	0	4	2	3	0	0	8	0	0	0	7	0
7:45 AM	0	0	0	0	0	2	1	4	0	0	6	0	0	0	8	0
8:00 AM	0	0	0	0	0	2	4	5	0	0	8	0	0	1	6	0
8:15 AM	0	0	0	0	0	4	4	3	0	0	7	4	0	0	9	0
8:30 AM	0	0	0	0	0	4	3	3	0	0	9	0	0	2	8	0
8:45 AM	0	0	0	0	0	3	9	2	0	0	8	3	0	0	7	0
9:00 AM	0	0	0	0	0	1	3	3	0	0	7	2	0	0	8	0
9:15 AM	0	0	0	0	0	2	4	6	0	0	9	1	0	1	6	0
9:30 AM	0	0	0	0	0	6	2	5	0	0	7	3	0	3	5	0
9:45 AM	0	0	0	0	0	4	3	7	0	0	5	1	0	0	5	0
10:00 AM	0	0	0	0	0	4	2	1	0	0	8	1	0	1	8	0
10:15 AM	0	0	0	0	0	1	3	4	0	0	6	2	0	2	7	0
10:30 AM	0	0	0	0	0	3	4	2	0	0	6	1	0	0	8	0
10:45 AM	0	0	0	0	0	4	4	4	0	0	5	2	0	1	5	0
11:00 AM	0	0	0	0	0	2	3	0	0	0	4	0	0	1	6	0
11:15 AM	0	0	0	0	0	3	6	2	0	0	5	1	0	1	6	0
11:30 AM	0	0	0	0	0	2	3	0	0	0	6	4	0	2	8	0
11:45 AM	0	0	0	0	0	3	3	3	0	0	4	1	0	0	7	0
12:00 PM	0	0	0	0	0	4	5	3	0	0	3	2	0	3	6	0
12:15 PM	0	0	0	0	0	3	7	2	0	0	6	3	0	2	5	0
12:30 PM	0	0	0	0	0	3	3	2	0	0	6	1	0	1	9	0
12:45 PM	0	0	0	0	0	4	4	2	0	0	6	2	0	0	8	0
1:00 PM	0	0	0	0	0	4	3	0	0	0	7	0	0	0	7	0
1:15 PM	0	0	0	0	0	3	7	2	0	0	5	1	0	4	7	0
1:30 PM	0	0	0	0	0	4	1	1	0	0	3	2	0	0	6	0
1:45 PM	0	0	0	0	0	1	6	2	0	0	4	0	0	2	3	0
2:00 PM	0	0	0	0	0	5	3	2	0	0	6	1	0	0	7	0
2:15 PM	0	0	0	0	0	3	7	2	0	0	6	2	0	0	5	0
2:30 PM	0	0	0	0	0	3	4	2	0	0	7	1	0	1	6	0
2:45 PM	0	0	0	0	0	0	6	2	0	0	6	2	0	0	4	0
3:00 PM	0	0	0	0	0	2	6	0	0	0	3	2	0	3	4	0
3:15 PM	0	0	0	0	0	6	5	4	0	0	7	0	0	1	4	0
3:30 PM	0	0	0	0	0	2	3	1	0	0	5	2	0	1	3	0
3:45 PM	0	0	0	0	0	1	4	1	0	0	5	1	0	0	5	0
4:00 PM	0	0	0	0	0	2	2	4	0	0	5	0	1	3	3	0
4:15 PM	0	0	0	0	0	2	3	5	0	0	3	2	0	1	2	0
4:30 PM	0	0	0	0	0	4	4	3	0	0	5	0	0	2	3	0
4:45 PM	0	0	0	0	0	3	2	1	0	0	4	1	0	3	6	0
5:00 PM	0	0	0	0	0	4	0	3	0	0	6	2	0	0	4	0
5:15 PM	0	0	0	0	0	3	2	5	0	0	5	0	0	0	2	0
5:30 PM	0	0	0	0	0	2	3	1	0	0	4	0	0	0	1	0
5:45 PM	0	0	0	0	0	3	0	1	0	0	5	0	0	0	2	0

AM PEAK HOUR	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
8:00 AM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
9:00 AM	**0**	**0**	**0**	**0**	**0**	**13**	**20**	**13**	**0**	**0**	**32**	**7**	**0**	**3**	**30**	**0**
PHF	**0.00**				**0.82**				**0.89**				**0.83**			

MID PEAK HOUR	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
12:00 PM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
1:00 PM	**0**	**0**	**0**	**0**	**0**	**14**	**19**	**9**	**0**	**0**	**21**	**8**	**0**	**6**	**28**	**0**
PHF	**0.00**				**0.88**				**0.81**				**0.85**			

PM PEAK HOUR	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
2:00 PM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
3:00 PM	**0**	**0**	**0**	**0**	**0**	**11**	**20**	**8**	**0**	**0**	**25**	**6**	**0**	**1**	**22**	**0**
PHF	**0.00**				**0.81**				**0.97**				**0.82**			

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 2
Location:	Boston, MA
Street 1:	Stuart Street
Street 2:	Tremont Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PEDESTRIANS & BICYCLES

	Tremont Street Northbound				Tremont Street Southbound				Stuart Street Eastbound				Stuart Street Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	0	0	0	0	0	0	50	0	1	0	72	0	1	0	4
7:15 AM	0	0	0	0	0	0	0	58	0	4	0	78	0	1	0	5
7:30 AM	0	0	0	0	0	0	0	70	1	3	2	86	0	4	0	5
7:45 AM	0	0	0	1	0	3	1	78	0	10	0	90	0	2	0	4
8:00 AM	0	0	0	0	0	2	1	85	0	14	0	94	0	2	0	5
8:15 AM	0	1	0	0	0	1	0	90	0	10	1	105	0	3	0	3
8:30 AM	0	0	0	0	0	2	2	98	0	17	1	118	0	1	0	2
8:45 AM	0	0	1	0	1	1	1	102	0	19	1	124	0	2	0	4
9:00 AM	0	0	0	0	1	0	0	114	0	18	0	128	0	1	0	3
9:15 AM	0	0	0	1	0	1	0	118	0	8	0	132	0	2	0	2
9:30 AM	0	0	0	0	0	2	0	124	0	6	0	145	0	0	0	3
9:45 AM	0	0	0	0	0	1	1	132	0	5	0	154	0	1	0	4
10:00 AM	0	0	0	0	0	2	0	145	0	4	0	168	0	1	0	7
10:15 AM	0	0	0	0	0	2	0	140	0	4	0	162	0	2	0	6
10:30 AM	0	1	1	0	0	1	0	134	0	2	0	158	0	0	0	5
10:45 AM	0	0	0	1	0	0	0	130	0	4	0	148	0	1	0	3
11:00 AM	0	0	0	0	0	5	0	126	0	3	0	142	0	0	0	4
11:15 AM	0	0	1	0	0	1	1	132	0	2	0	146	0	2	0	3
11:30 AM	0	0	0	0	0	0	1	135	0	6	0	152	0	2	0	6
11:45 AM	0	0	0	0	0	0	0	140	0	7	0	154	0	3	0	7
12:00 PM	0	0	0	1	0	1	0	138	0	4	0	156	0	4	0	4
12:15 PM	0	0	1	0	0	0	0	142	0	2	0	162	0	2	0	6
12:30 PM	0	1	0	0	1	0	0	135	0	2	0	168	0	2	0	5
12:45 PM	0	1	0	0	0	2	0	138	0	4	0	172	0	4	0	4
1:00 PM	0	0	0	0	0	0	0	130	0	2	0	165	0	0	0	7
1:15 PM	0	0	0	0	2	1	0	136	0	1	1	170	0	3	0	5
1:30 PM	0	0	0	0	0	1	0	142	0	0	0	168	0	0	0	3
1:45 PM	0	0	0	0	0	3	0	146	0	2	0	174	1	1	0	4
2:00 PM	0	0	0	1	0	2	0	150	0	1	0	178	0	1	0	6
2:15 PM	0	0	1	0	0	1	1	155	0	2	0	174	0	2	0	5
2:30 PM	0	0	0	0	0	0	0	158	0	2	0	176	0	3	0	3
2:45 PM	1	0	0	0	0	1	0	162	0	5	0	180	0	2	0	4
3:00 PM	0	0	0	1	0	2	0	166	0	0	1	175	0	2	0	2
3:15 PM	0	0	0	0	0	8	1	170	0	0	0	178	0	2	0	3
3:30 PM	1	1	0	0	0	2	0	174	0	4	0	182	0	2	0	5
3:45 PM	0	0	0	1	0	2	0	172	0	0	0	188	0	3	0	4
4:00 PM	0	0	0	0	0	2	1	176	0	2	0	190	0	4	0	4
4:15 PM	0	1	0	0	0	3	0	180	0	1	1	186	0	5	0	5
4:30 PM	0	0	0	0	0	3	0	176	0	4	0	192	0	2	0	6
4:45 PM	0	0	0	0	0	6	0	174	0	2	0	198	0	4	0	5
5:00 PM	0	0	0	0	0	8	4	182	0	3	1	195	0	7	0	6
5:15 PM	0	0	0	1	0	4	6	190	0	2	1	204	0	8	0	8
5:30 PM	0	1	0	0	0	4	3	196	0	2	1	212	1	6	0	7
5:45 PM	0	0	0	0	0	8	2	198	0	1	0	218	0	5	0	8

AM PEAK HOUR	Tremont Street				Tremont Street				Stuart Street				Stuart Street			
8:30 AM	Northbound				Southbound				Eastbound				Westbound			
to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
9:30 AM	0	0	1	1	2	4	3	432	0	62	2	502	0	6	0	11

MID PEAK HOUR	Tremont Street				Tremont Street				Stuart Street				Stuart Street			
1:00 PM	Northbound				Southbound				Eastbound				Westbound			
to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
2:00 PM	0	0	0	0	2	5	0	554	0	5	1	677	1	4	0	19

PM PEAK HOUR	Tremont Street				Tremont Street				Stuart Street				Stuart Street			
4:45 PM	Northbound				Southbound				Eastbound				Westbound			
to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
5:45 PM	0	1	0	1	0	22	13	742	0	9	3	809	1	25	0	26

NOTE: Peak hour summaries here correspond to peak hours identified for passenger car and heavy vehicles combined.

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 3
Location:	Boston, MA
Street 1:	Washington Street
Street 2:	Stuart Street/Kneeland Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON
TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PASSENGER CARS & HEAVY VEHICLES COMBINED

	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	1	13	21	19	0	0	0	0	0	4	56	7	0	32	96	29
7:15 AM	0	10	22	17	0	0	0	0	1	9	56	6	0	30	131	24
7:30 AM	1	7	26	15	0	0	0	0	1	11	71	11	1	29	132	23
7:45 AM	0	13	32	18	0	0	0	0	1	10	60	12	0	25	113	22
8:00 AM	2	11	33	20	0	0	0	0	1	13	76	11	0	30	117	14
8:15 AM	0	14	36	18	0	0	0	0	1	18	63	8	0	26	121	31
8:30 AM	0	10	39	17	0	0	0	0	2	13	70	7	0	22	124	12
8:45 AM	0	8	41	25	0	0	0	0	2	10	73	5	0	21	112	20
9:00 AM	2	11	39	16	0	0	0	0	1	14	70	17	1	33	105	25
9:15 AM	1	11	38	22	0	0	0	0	2	18	72	9	2	25	125	17
9:30 AM	0	12	41	27	0	0	0	0	4	20	75	10	0	42	104	21
9:45 AM	1	14	38	24	0	0	0	0	3	15	67	14	0	37	96	44
10:00 AM	0	13	34	26	0	0	0	0	2	9	70	14	4	40	126	26
10:15 AM	0	13	36	22	0	0	0	0	1	15	78	13	2	37	114	36
10:30 AM	0	15	28	22	0	0	0	0	2	13	76	11	1	29	107	23
10:45 AM	0	12	26	26	0	0	0	0	5	12	71	9	2	33	101	26
11:00 AM	2	11	24	33	0	0	0	0	2	13	69	10	0	32	105	29
11:15 AM	1	15	28	32	0	0	0	0	5	13	75	8	0	27	102	21
11:30 AM	0	14	26	24	0	0	0	0	4	7	59	10	0	24	117	13
11:45 AM	1	13	25	17	0	0	0	0	3	12	65	10	0	26	107	18
12:00 PM	0	9	23	23	0	0	0	0	2	15	75	12	0	26	106	19
12:15 PM	0	11	28	24	0	0	0	0	4	8	82	11	1	15	112	7
12:30 PM	0	15	26	25	0	0	0	0	1	9	98	12	0	27	114	31
12:45 PM	0	22	21	34	0	0	0	0	3	5	77	14	3	40	95	27
1:00 PM	2	13	27	30	0	0	0	0	2	12	85	11	0	26	97	24
1:15 PM	0	13	20	27	0	0	0	0	2	6	76	10	1	32	126	15
1:30 PM	1	16	22	30	0	0	0	0	0	10	94	12	0	18	92	13
1:45 PM	0	7	18	38	0	0	0	0	0	9	107	13	0	36	112	10
2:00 PM	0	13	28	37	0	0	0	0	0	8	110	19	1	32	105	12
2:15 PM	0	8	24	20	0	0	0	0	6	9	120	14	0	30	100	19
2:30 PM	0	8	31	17	0	0	0	0	1	9	124	12	0	21	113	18
2:45 PM	1	14	21	23	0	0	0	0	4	12	117	11	0	19	108	9
3:00 PM	1	17	25	27	0	0	0	0	1	15	111	10	0	19	104	15
3:15 PM	0	14	20	31	0	0	0	0	0	14	130	3	0	16	101	6
3:30 PM	2	15	38	19	0	0	0	0	1	22	100	18	0	28	103	11
3:45 PM	0	16	26	19	0	0	0	0	1	24	107	11	2	13	103	10
4:00 PM	0	12	23	23	0	0	0	0	1	11	138	19	1	15	109	5
4:15 PM	1	7	20	10	0	0	0	0	1	23	107	18	2	18	118	12
4:30 PM	2	10	27	23	0	0	0	0	2	14	106	22	0	19	114	24
4:45 PM	1	8	25	19	0	0	0	0	2	18	127	20	0	21	113	12
5:00 PM	0	12	28	20	0	0	0	0	4	12	128	17	0	17	109	15
5:15 PM	0	6	30	23	0	0	0	0	2	23	109	18	0	16	118	25
5:30 PM	2	14	28	18	0	0	0	0	4	29	108	16	0	19	96	14
5:45 PM	0	11	26	16	0	0	0	0	4	24	122	14	0	15	101	14

AM PEAK HOUR 9:00 AM to 10:00 AM	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	4	**48**	**156**	**89**	**0**	**0**	**0**	**0**	**10**	**67**	**284**	**50**	**3**	**137**	**430**	**107**
PHF	**0.93**				**0.00**				**0.94**				**0.96**			
HV %	**0.0%**	**4.2%**	**14.7%**	**5.6%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**11.9%**	**8.5%**	**16.0%**	**0.0%**	**8.8%**	**5.8%**	**14.0%**

MID PEAK HOUR 10:00 AM to 11:00 AM	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**53**	**124**	**96**	**0**	**0**	**0**	**0**	**10**	**49**	**295**	**47**	**9**	**139**	**448**	**111**
PHF	**0.93**				**0.00**				**0.94**				**0.90**			
HV %	**0.0%**	**1.9%**	**12.9%**	**1.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**10.2%**	**8.5%**	**14.9%**	**0.0%**	**9.4%**	**6.7%**	**6.3%**

PM PEAK HOUR 4:30 PM to 5:30 PM	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	3	**36**	**110**	**85**	**0**	**0**	**0**	**0**	**10**	**67**	**470**	**77**	**0**	**73**	**454**	**76**
PHF	**0.94**				**0.00**				**0.93**				**0.95**			
HV %	**0.0%**	**0.0%**	**17.3%**	**2.4%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.5%**	**4.9%**	**11.7%**	**0.0%**	**9.6%**	**4.4%**	**6.6%**

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 3
Location:	Boston, MA
Street 1:	Washington Street
Street 2:	Stuart Street/Kneeland Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

HEAVY VEHICLES

	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	6	2	0	0	0	0	0	0	6	1	0	1	8	0
7:15 AM	0	0	3	0	0	0	0	0	0	1	6	2	0	1	9	1
7:30 AM	0	0	6	0	0	0	0	0	0	0	9	3	0	3	7	2
7:45 AM	0	1	8	1	0	0	0	0	0	1	5	2	0	1	6	2
8:00 AM	0	0	10	0	0	0	0	0	0	2	5	3	0	2	7	1
8:15 AM	0	0	5	4	0	0	0	0	0	1	7	3	0	1	9	4
8:30 AM	0	0	4	2	0	0	0	0	0	0	9	2	0	1	8	3
8:45 AM	0	0	8	2	0	0	0	0	0	2	8	1	0	1	7	0
9:00 AM	0	1	8	0	0	0	0	0	0	0	5	4	0	5	6	2
9:15 AM	0	0	6	2	0	0	0	0	0	6	4	1	0	3	7	4
9:30 AM	0	0	4	3	0	0	0	0	0	2	8	2	0	2	8	2
9:45 AM	0	1	5	0	0	0	0	0	0	0	7	1	0	2	4	7
10:00 AM	0	0	3	0	0	0	0	0	0	2	8	2	0	3	8	3
10:15 AM	0	0	5	1	0	0	0	0	0	0	6	1	0	4	9	4
10:30 AM	0	0	1	0	0	0	0	0	0	2	5	2	0	2	8	0
10:45 AM	0	1	7	0	0	0	0	0	0	1	6	2	0	4	5	0
11:00 AM	0	0	3	1	0	0	0	0	0	2	3	2	0	5	7	4
11:15 AM	0	0	2	2	0	0	0	0	0	1	5	2	0	1	7	0
11:30 AM	0	1	5	0	0	0	0	0	0	0	7	1	0	3	9	0
11:45 AM	0	1	5	2	0	0	0	0	0	0	5	2	0	2	6	1
12:00 PM	0	0	4	0	0	0	0	0	0	0	6	1	0	1	9	4
12:15 PM	0	0	3	0	0	0	0	0	0	0	7	2	0	1	7	0
12:30 PM	0	0	4	3	0	0	0	0	0	1	7	1	0	0	9	2
12:45 PM	0	1	3	1	0	0	0	0	0	0	8	2	0	3	7	1
1:00 PM	0	0	3	0	0	0	0	0	0	3	6	2	0	2	7	3
1:15 PM	0	1	4	1	0	0	0	0	0	0	7	1	0	1	10	2
1:30 PM	0	0	4	0	0	0	0	0	0	1	3	3	0	4	6	2
1:45 PM	0	0	3	0	0	0	0	0	0	0	4	1	0	4	5	2
2:00 PM	0	0	5	2	0	0	0	0	0	0	8	3	0	2	7	1
2:15 PM	0	0	6	2	0	0	0	0	0	0	8	1	0	4	5	2
2:30 PM	0	0	1	0	0	0	0	0	0	0	7	3	0	1	7	0
2:45 PM	0	0	3	0	0	0	0	0	0	1	5	0	0	4	4	1
3:00 PM	0	1	6	1	0	0	0	0	0	0	6	1	0	1	6	3
3:15 PM	0	0	4	1	0	0	0	0	0	1	9	0	0	2	5	0
3:30 PM	0	0	5	0	0	0	0	0	0	0	5	2	0	1	4	1
3:45 PM	0	0	3	0	0	0	0	0	0	0	5	1	0	2	5	0
4:00 PM	0	0	6	0	0	0	0	0	0	1	5	2	0	1	7	2
4:15 PM	0	0	3	0	0	0	0	0	0	0	4	1	0	4	3	1
4:30 PM	0	0	5	0	0	0	0	0	0	1	6	2	0	0	5	2
4:45 PM	0	0	6	0	0	0	0	0	0	0	4	3	0	2	9	2
5:00 PM	0	0	4	1	0	0	0	0	0	0	8	1	0	3	4	0
5:15 PM	0	0	4	1	0	0	0	0	0	0	5	3	0	2	2	1
5:30 PM	0	0	4	0	0	0	0	0	0	0	5	1	0	3	1	0
5:45 PM	0	0	4	0	0	0	0	0	0	0	6	2	0	1	2	0

AM PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
8:45 AM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
9:45 AM	**0**	**1**	**26**	**7**	**0**	**0**	**0**	**0**	**0**	**10**	**25**	**8**	**0**	**11**	**28**	**8**
PHF	**0.85**				**0.00**				**0.90**				**0.84**			

MID PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
12:30 PM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
1:30 PM	**0**	**2**	**14**	**5**	**0**	**0**	**0**	**0**	**0**	**4**	**28**	**6**	**0**	**6**	**33**	**8**
PHF	**0.75**				**0.00**				**0.86**				**0.90**			

PM PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
2:00 PM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
3:00 PM	**0**	**0**	**15**	**4**	**0**	**0**	**0**	**0**	**0**	**1**	**28**	**7**	**0**	**11**	**23**	**4**
PHF	**0.59**				**0.00**				**0.82**				**0.86**			

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 3
Location:	Boston, MA
Street 1:	Washington Street
Street 2:	Stuart Street/Kneeland Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PEDESTRIANS & BICYCLES

	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	2	0	22	0	0	0	38	2	1	0	28	0	1	0	30
7:15 AM	0	7	0	28	0	1	0	42	1	4	1	34	0	1	0	42
7:30 AM	1	0	1	34	0	1	0	45	1	2	0	45	0	1	0	55
7:45 AM	0	7	3	38	0	0	0	48	3	4	1	56	0	0	0	62
8:00 AM	1	10	0	42	0	1	0	55	3	8	0	62	0	0	0	75
8:15 AM	0	20	2	45	0	1	0	58	4	6	0	66	0	0	0	78
8:30 AM	1	19	1	48	0	2	0	66	9	11	0	68	1	0	0	83
8:45 AM	1	16	4	46	0	0	0	74	8	9	1	72	0	1	0	87
9:00 AM	0	8	1	50	0	1	0	85	10	13	0	78	0	0	0	92
9:15 AM	0	12	3	48	0	0	0	82	5	3	1	80	0	0	0	98
9:30 AM	0	6	2	43	0	0	0	88	4	4	1	82	0	0	0	95
9:45 AM	0	4	0	45	0	1	0	85	3	3	0	85	0	0	0	97
10:00 AM	0	2	1	40	0	0	0	83	4	2	1	88	0	3	0	94
10:15 AM	0	6	0	38	0	0	0	80	5	3	1	86	0	0	0	90
10:30 AM	0	6	0	36	0	1	0	82	2	1	0	84	0	0	0	96
10:45 AM	0	7	1	39	0	1	0	85	4	1	0	85	0	1	0	95
11:00 AM	1	4	0	34	0	0	0	78	1	3	0	89	0	1	0	92
11:15 AM	0	0	0	32	0	1	0	83	1	3	1	92	0	0	0	98
11:30 AM	0	4	0	30	0	0	0	85	2	4	0	94	0	0	0	102
11:45 AM	0	6	0	35	0	0	0	78	2	6	0	90	0	0	0	103
12:00 PM	0	6	0	32	0	3	0	80	0	3	0	95	0	0	0	105
12:15 PM	1	2	0	36	0	0	0	78	2	1	0	92	0	0	0	98
12:30 PM	0	4	1	33	0	0	0	82	0	2	1	94	1	0	0	102
12:45 PM	0	1	2	30	0	0	0	85	0	4	1	98	0	1	0	105
1:00 PM	0	1	0	34	0	0	0	82	0	1	0	102	0	1	0	108
1:15 PM	0	4	0	32	0	1	0	86	0	1	1	104	0	2	0	102
1:30 PM	0	2	0	26	0	0	0	80	0	2	0	103	1	0	0	98
1:45 PM	0	2	0	24	0	1	0	78	2	1	1	105	0	0	0	100
2:00 PM	0	1	0	26	0	1	0	75	4	1	0	103	0	0	0	98
2:15 PM	0	2	1	22	0	0	0	78	0	1	0	98	0	0	0	104
2:30 PM	2	1	0	24	0	2	0	82	2	0	0	106	0	0	0	108
2:45 PM	0	4	0	25	0	0	0	85	2	1	1	102	0	0	0	110
3:00 PM	0	2	0	22	0	0	0	88	0	0	0	100	0	0	0	106
3:15 PM	1	1	0	23	0	2	0	86	0	1	0	97	0	0	0	102
3:30 PM	1	2	0	21	0	0	0	89	0	3	0	99	0	0	0	108
3:45 PM	1	1	0	24	0	0	0	92	0	1	0	95	0	5	0	112
4:00 PM	0	0	0	20	0	2	0	95	0	2	0	98	0	1	0	118
4:15 PM	0	0	0	22	0	0	0	98	0	2	0	104	0	0	1	120
4:30 PM	0	6	0	21	0	1	0	102	1	3	0	102	0	0	0	117
4:45 PM	1	2	0	22	0	0	0	104	1	1	1	96	0	0	0	112
5:00 PM	1	5	1	25	0	2	0	106	2	3	0	98	0	3	0	115
5:15 PM	0	5	0	21	0	0	0	110	1	0	0	105	0	10	0	118
5:30 PM	0	4	0	23	0	1	0	114	0	0	1	108	1	2	0	120
5:45 PM	2	6	1	20	0	0	0	108	0	0	0	102	0	5	0	116

AM PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
9:00 AM to 10:00 AM	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	0	30	6	186	0	2	0	340	22	23	2	325	0	0	0	382

MID PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
10:00 AM to 11:00 AM	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	0	21	2	153	0	2	0	330	15	7	2	343	0	4	0	375

PM PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Stuart Street Eastbound				Kneeland Street Westbound			
4:30 PM to 5:30 PM	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	2	18	1	89	0	3	0	422	5	7	1	401	0	13	0	462

NOTE: Peak hour summaries here correspond to peak hours identified for passenger car and heavy vehicles combined.

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 4
Location:	Boston, MA
Street 1:	Tremont Street
Street 2:	Charles Street S/Jefferson Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PASSENGER CARS & HEAVY VEHICLES COMBINED

	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	52	15	0	0	0	0	0	0	0	0	1	8	0	10
7:15 AM	0	0	59	15	0	0	0	0	0	0	0	1	0	6	0	15
7:30 AM	0	0	86	14	0	0	0	0	0	0	1	0	0	13	0	18
7:45 AM	0	0	81	16	0	0	0	0	0	0	0	0	0	15	0	24
8:00 AM	0	0	103	18	0	0	0	0	0	0	0	1	0	12	0	20
8:15 AM	0	0	109	23	0	0	0	0	0	0	0	0	0	15	0	29
8:30 AM	0	0	113	26	0	0	0	0	0	0	0	3	0	17	0	26
8:45 AM	0	0	117	29	0	0	0	0	0	0	0	0	0	15	0	24
9:00 AM	0	0	120	33	0	0	0	0	0	1	0	0	0	12	0	23
9:15 AM	0	0	112	37	0	0	0	0	0	0	0	0	0	13	0	20
9:30 AM	0	0	108	35	0	0	0	0	0	0	0	0	0	16	0	19
9:45 AM	0	0	104	28	0	0	0	0	0	1	0	0	0	13	0	21
10:00 AM	0	0	101	23	0	0	0	0	0	0	0	0	0	15	0	22
10:15 AM	0	0	77	26	0	0	0	0	0	0	0	2	0	17	0	19
10:30 AM	0	0	90	22	0	0	0	0	0	0	0	0	0	18	0	25
10:45 AM	0	0	91	19	0	0	0	0	0	0	0	2	0	17	0	20
11:00 AM	1	0	95	24	0	0	0	0	0	0	1	2	0	11	0	24
11:15 AM	0	0	90	17	0	0	0	0	0	1	0	1	0	18	0	21
11:30 AM	0	0	74	18	0	0	0	0	0	1	0	1	0	16	0	30
11:45 AM	0	0	80	22	0	0	0	0	0	0	0	0	0	16	0	29
12:00 PM	0	0	76	20	0	0	0	0	0	1	0	0	0	13	0	32
12:15 PM	0	0	70	27	0	0	0	0	0	0	1	2	0	15	0	25
12:30 PM	0	0	87	27	0	0	0	0	0	0	0	0	0	16	0	27
12:45 PM	0	0	86	30	0	0	0	0	0	0	0	1	0	19	0	28
1:00 PM	0	0	82	24	0	0	0	0	0	0	0	1	0	15	0	26
1:15 PM	0	0	73	19	0	0	0	0	0	0	0	1	0	14	0	27
1:30 PM	0	0	76	23	0	0	0	0	0	1	0	0	0	15	0	29
1:45 PM	0	0	76	26	0	0	0	0	0	0	0	1	0	21	0	33
2:00 PM	0	0	74	29	0	0	0	0	0	0	0	3	0	25	0	38
2:15 PM	0	0	87	21	0	0	0	0	0	0	0	1	0	19	0	27
2:30 PM	0	0	78	28	0	0	0	0	0	0	0	0	0	23	0	30
2:45 PM	0	0	72	25	0	0	0	0	0	0	0	0	0	24	0	31
3:00 PM	0	0	69	25	0	0	0	0	0	0	0	1	0	31	0	32
3:15 PM	0	0	104	28	0	0	0	0	0	0	0	0	0	26	0	24
3:30 PM	0	0	82	29	0	0	0	0	0	0	0	2	0	32	0	30
3:45 PM	0	0	91	24	0	0	0	0	0	0	0	1	0	28	0	35
4:00 PM	0	0	83	28	0	0	0	0	0	0	2	1	0	26	0	28
4:15 PM	0	0	64	27	0	0	0	0	0	0	1	0	0	29	0	33
4:30 PM	0	0	85	26	0	0	0	0	0	0	1	0	0	32	0	31
4:45 PM	0	0	96	29	0	0	0	0	0	0	1	0	0	36	0	26
5:00 PM	0	0	99	27	0	0	0	0	0	0	0	1	0	37	0	32
5:15 PM	0	0	93	25	0	0	0	0	0	0	0	0	0	39	0	27
5:30 PM	0	0	87	26	0	0	0	0	0	0	0	0	0	36	0	24
5:45 PM	0	0	82	24	0	0	0	0	0	0	0	0	0	37	0	21

AM PEAK HOUR 8:30 AM to 9:30 AM	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**462**	**125**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**3**	**0**	**57**	**0**	**93**
PHF	**0.96**				**0.00**				**0.33**				**0.87**			
HV %	**0.0%**	**0.0%**	**5.6%**	**9.6%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**15.8%**	**0.0%**	**4.3%**

MID PEAK HOUR 10:30 AM to 11:30 AM	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	1	**0**	**366**	**82**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**5**	**0**	**64**	**0**	**90**
PHF	**0.94**				**0.00**				**0.58**				**0.90**			
HV %	**0.0%**	**0.0%**	**4.6%**	**3.7%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**14.1%**	**0.0%**	**10.0%**

PM PEAK HOUR 4:30 PM to 5:30 PM	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**373**	**107**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**144**	**0**	**116**
PHF	**0.95**				**0.00**				**0.75**				**0.94**			
HV %	**0.0%**	**0.0%**	**1.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**3.5%**	**0.0%**	**5.2%**

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 4
Location:	Boston, MA
Street 1:	Tremont Street
Street 2:	Charles Street S/Jefferson Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

HEAVY VEHICLES

	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	3	1	0	0	0	0	0	0	0	0	0	2	0	0
7:15 AM	0	0	4	0	0	0	0	0	0	0	0	0	0	1	0	1
7:30 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0
7:45 AM	0	0	6	1	0	0	0	0	0	0	0	0	0	2	0	2
8:00 AM	0	0	4	0	0	0	0	0	0	0	0	0	0	1	0	1
8:15 AM	0	0	4	2	0	0	0	0	0	0	0	0	0	2	0	3
8:30 AM	0	0	7	2	0	0	0	0	0	0	0	0	0	4	0	1
8:45 AM	0	0	9	1	0	0	0	0	0	0	0	0	0	3	0	1
9:00 AM	0	0	7	3	0	0	0	0	0	0	0	0	0	1	0	0
9:15 AM	0	0	3	6	0	0	0	0	0	0	0	0	0	1	0	2
9:30 AM	0	0	5	1	0	0	0	0	0	0	0	0	0	2	0	5
9:45 AM	0	0	4	0	0	0	0	0	0	0	0	0	0	1	0	1
10:00 AM	0	0	0	7	0	0	0	0	0	0	0	0	0	1	0	1
10:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
10:30 AM	0	0	5	0	0	0	0	0	0	0	0	0	0	1	0	2
10:45 AM	0	0	4	1	0	0	0	0	0	0	0	0	0	2	0	3
11:00 AM	0	0	5	1	0	0	0	0	0	0	0	0	0	2	0	2
11:15 AM	0	0	3	1	0	0	0	0	0	0	0	0	0	4	0	2
11:30 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	3
11:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	1
12:00 PM	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1
12:15 PM	0	0	3	0	0	0	0	0	0	0	0	0	0	5	0	2
12:30 PM	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
12:45 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	2	0	4
1:00 PM	0	0	3	0	0	0	0	0	0	0	0	0	0	2	0	4
1:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	3
1:30 PM	0	0	3	4	0	0	0	0	0	0	0	0	0	3	0	2
1:45 PM	0	0	1	4	0	0	0	0	0	0	0	0	0	2	0	0
2:00 PM	0	0	2	1	0	0	0	0	0	0	0	1	0	1	0	1
2:15 PM	0	0	5	0	0	0	0	0	0	0	0	0	0	1	0	2
2:30 PM	0	0	6	1	0	0	0	0	0	0	0	0	0	3	0	3
2:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	0
3:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	1
3:15 PM	0	0	4	1	0	0	0	0	0	0	0	0	0	3	0	1
3:30 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	3
3:45 PM	0	0	3	1	0	0	0	0	0	0	0	0	0	1	0	1
4:00 PM	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
4:30 PM	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4
4:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
5:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
5:30 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1

AM PEAK HOUR 8:30 AM to 9:30 AM	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**26**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**4**
PHF	**0.95**				**0.00**				**0.00**				**0.65**			

MID PEAK HOUR 10:30 AM to 11:30 AM	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**17**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**9**
PHF	**0.83**				**0.00**				**0.00**				**0.75**			

PM PEAK HOUR 3:15 PM to 4:15 PM	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**13**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**7**
PHF	**0.59**				**0.00**				**0.00**				**0.65**			

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 4
Location:	Boston, MA
Street 1:	Tremont Street
Street 2:	Charles Street S/Jefferson Street
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PEDESTRIANS & BICYCLES

	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	0	3	7	0	0	0	1	0	0	0	13	0	0	0	10
7:15 AM	0	0	0	9	0	0	0	0	0	0	0	12	0	0	0	14
7:30 AM	1	2	4	8	0	0	0	1	0	0	0	14	0	0	0	18
7:45 AM	0	1	3	7	0	0	0	2	0	0	0	10	0	0	0	24
8:00 AM	0	4	5	10	0	0	0	1	0	0	0	12	0	0	1	28
8:15 AM	0	2	6	9	0	0	0	0	0	0	0	14	0	0	1	25
8:30 AM	0	3	1	7	0	1	0	0	0	0	0	16	2	0	0	26
8:45 AM	0	2	3	8	0	0	0	1	0	0	0	15	0	0	0	28
9:00 AM	0	0	4	10	0	0	0	0	0	0	0	13	0	0	0	25
9:15 AM	0	1	3	11	0	0	0	1	0	0	0	15	1	0	1	27
9:30 AM	0	2	2	8	0	0	0	0	0	0	0	16	0	0	0	26
9:45 AM	0	2	3	9	0	0	0	1	0	0	0	17	1	0	0	28
10:00 AM	0	0	3	12	1	0	0	2	0	0	0	18	0	0	0	30
10:15 AM	0	1	1	10	0	0	0	0	0	0	0	20	0	0	0	28
10:30 AM	0	2	1	11	0	0	0	1	0	0	0	16	1	0	0	34
10:45 AM	0	0	0	15	0	0	0	1	0	0	0	18	0	0	0	28
11:00 AM	0	1	2	38	0	0	0	6	0	0	0	14	2	0	0	32
11:15 AM	0	0	1	14	0	0	0	5	0	0	0	15	0	0	0	28
11:30 AM	0	1	1	15	0	0	0	34	0	0	0	16	0	0	0	26
11:45 AM	0	0	3	16	0	0	0	6	0	0	0	13	0	0	0	27
12:00 PM	0	0	2	13	0	0	0	4	0	0	0	14	4	0	0	30
12:15 PM	0	0	3	15	0	0	0	5	0	0	0	13	0	0	0	25
12:30 PM	0	2	1	12	0	0	0	3	0	0	0	15	0	0	0	26
12:45 PM	0	3	3	14	0	0	0	5	0	0	0	13	1	0	0	24
1:00 PM	0	2	1	11	0	0	0	2	0	0	0	12	0	0	0	25
1:15 PM	0	4	0	10	0	0	0	3	0	0	0	15	0	0	0	23
1:30 PM	0	2	1	8	0	0	0	2	0	0	0	12	1	0	0	26
1:45 PM	0	1	0	7	0	0	0	3	0	0	0	11	1	0	0	27
2:00 PM	0	1	0	6	0	0	0	4	0	0	0	10	2	0	0	25
2:15 PM	0	0	0	5	0	0	0	2	0	0	0	12	0	0	0	28
2:30 PM	0	2	3	7	0	0	0	0	0	0	0	14	0	0	0	27
2:45 PM	0	1	1	8	0	0	0	1	0	0	0	11	0	0	0	26
3:00 PM	0	2	0	9	0	1	0	0	0	0	0	13	0	0	2	24
3:15 PM	0	0	1	7	0	0	0	2	0	0	0	15	1	0	0	28
3:30 PM	0	1	2	8	0	0	0	1	0	0	0	12	1	0	0	25
3:45 PM	0	0	1	9	0	0	0	0	0	0	0	11	1	0	0	27
4:00 PM	0	0	0	10	0	0	0	1	0	0	0	14	1	0	1	28
4:15 PM	0	0	0	7	0	0	0	0	0	0	0	12	2	0	1	32
4:30 PM	0	0	0	8	0	0	0	1	0	0	0	13	6	0	0	27
4:45 PM	0	1	1	9	0	0	0	1	0	0	0	15	5	0	0	28
5:00 PM	0	2	0	10	0	0	0	2	0	0	0	16	3	0	0	30
5:15 PM	0	3	0	8	0	0	0	0	0	0	0	13	3	0	0	32
5:30 PM	0	3	1	11	0	0	0	1	0	0	0	12	2	0	0	27
5:45 PM	0	2	0	10	0	0	0	0	0	0	0	11	4	0	1	29

AM PEAK HOUR	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
8:30 AM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
9:30 AM	0	6	11	36	0	1	0	2	0	0	0	59	3	0	1	106

MID PEAK HOUR	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
10:30 AM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
11:30 AM	0	3	4	78	0	0	0	13	0	0	0	63	3	0	0	122

PM PEAK HOUR	Tremont Street Northbound				Charles Street S Southbound				Jefferson Street Eastbound				Tremont Street Westbound			
4:30 PM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
5:30 PM	0	6	1	35	0	0	0	4	0	0	0	57	17	0	0	117

NOTE: Peak hour summaries here correspond to peak hours identified for passenger car and heavy vehicles combined.

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 5
Location:	Boston, MA
Street 1:	Tremont Street
Street 2:	Shawmut Avenue & Oak Street W
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON
TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PASSENGER CARS & HEAVY VEHICLES COMBINED

	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	0	0	0	10	35	12	0	0	10	4	0	1	6	0
7:15 AM	0	0	0	0	0	7	38	16	0	0	11	3	0	1	11	0
7:30 AM	0	0	0	0	0	11	77	24	0	0	11	1	0	3	11	0
7:45 AM	0	0	0	0	0	8	40	27	0	0	8	2	0	2	12	0
8:00 AM	0	0	0	0	0	6	42	20	0	0	11	4	0	4	15	0
8:15 AM	0	0	0	0	0	15	42	26	0	0	17	3	0	6	20	0
8:30 AM	0	0	0	0	0	8	57	28	0	0	22	4	0	4	17	0
8:45 AM	0	0	0	0	0	12	48	27	0	0	24	7	0	7	7	0
9:00 AM	0	0	0	0	0	9	51	23	0	0	27	10	0	8	10	0
9:15 AM	0	0	0	0	0	13	49	25	0	0	26	12	1	4	7	0
9:30 AM	0	0	0	0	0	15	37	24	0	0	28	8	0	11	5	0
9:45 AM	0	0	0	0	0	12	51	17	0	0	25	5	0	6	6	0
10:00 AM	0	0	0	0	0	13	65	30	0	0	22	6	0	7	5	0
10:15 AM	0	0	0	0	0	14	62	30	0	0	17	9	0	2	6	0
10:30 AM	0	0	0	0	0	16	66	32	0	0	15	7	0	11	7	0
10:45 AM	0	0	0	0	0	19	61	24	0	0	10	6	0	4	14	0
11:00 AM	0	0	0	0	0	16	89	27	0	0	8	7	0	4	19	0
11:15 AM	0	0	0	0	0	16	87	29	0	0	9	2	0	1	14	0
11:30 AM	0	0	0	0	0	11	84	38	0	0	7	5	0	3	12	0
11:45 AM	0	0	0	0	0	15	73	40	0	0	8	5	0	1	17	0
12:00 PM	0	0	0	0	0	18	92	37	0	0	7	5	0	3	13	0
12:15 PM	0	0	0	0	0	28	79	35	0	0	10	8	0	5	20	0
12:30 PM	0	0	0	0	0	25	91	27	0	0	11	9	0	3	15	0
12:45 PM	0	0	0	0	0	22	83	26	0	0	8	10	0	2	21	0
1:00 PM	0	0	0	0	0	23	95	29	0	0	10	8	0	2	18	0
1:15 PM	0	0	0	0	0	23	83	27	0	0	13	9	0	5	13	0
1:30 PM	0	0	0	0	0	21	98	30	0	0	11	10	0	6	19	0
1:45 PM	0	0	0	0	0	23	89	28	0	0	12	12	0	8	18	0
2:00 PM	0	0	0	0	0	28	101	30	0	0	14	9	0	10	21	0
2:15 PM	0	0	0	0	0	30	105	27	0	0	15	7	0	6	19	0
2:30 PM	0	0	0	0	0	34	94	31	0	0	10	10	0	4	23	0
2:45 PM	0	0	0	0	0	36	96	41	0	0	9	11	0	1	30	0
3:00 PM	0	0	0	0	0	45	97	50	0	0	12	8	0	3	29	0
3:15 PM	0	0	0	0	0	44	105	32	0	0	10	7	0	3	32	0
3:30 PM	0	0	0	0	0	31	93	44	0	0	11	6	0	0	38	0
3:45 PM	0	0	0	0	0	30	89	38	0	0	10	8	0	1	36	0
4:00 PM	0	0	0	0	0	29	107	42	0	0	12	9	0	3	33	0
4:15 PM	0	0	0	0	0	34	102	43	0	0	11	10	0	2	32	0
4:30 PM	0	0	0	0	0	33	96	34	0	0	14	12	0	2	34	0
4:45 PM	0	0	0	0	0	38	89	37	0	0	13	14	0	5	30	0
5:00 PM	0	0	0	0	0	43	93	39	0	0	15	15	0	4	29	0
5:15 PM	0	0	0	0	0	41	96	37	0	0	14	12	0	4	30	0
5:30 PM	0	0	0	0	0	43	95	35	0	0	16	11	0	5	27	0
5:45 PM	0	0	0	0	0	40	92	34	0	0	13	10	0	2	25	0

AM PEAK HOUR 8:30 AM to 9:30 AM	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**42**	**205**	**103**	**0**	**0**	**99**	**33**	**1**	**23**	**41**	**0**
PHF	**0.00**				**0.94**				**0.87**				**0.77**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**9.5%**	**5.9%**	**9.7%**	**0.0%**	**0.0%**	**10.1%**	**9.1%**	**0.0%**	**0.0%**	**4.9%**	**0.0%**

MID PEAK HOUR 1:00 PM to 2:00 PM	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**90**	**365**	**114**	**0**	**0**	**46**	**39**	**0**	**21**	**68**	**0**
PHF	**0.00**				**0.95**				**0.89**				**0.86**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**2.2%**	**2.5%**	**7.9%**	**0.0%**	**0.0%**	**4.3%**	**5.1%**	**0.0%**	**9.5%**	**10.3%**	**0.0%**

PM PEAK HOUR 4:45 PM to 5:45 PM	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**165**	**373**	**148**	**0**	**0**	**58**	**52**	**0**	**18**	**116**	**0**
PHF	**0.00**				**0.98**				**0.92**				**0.96**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.6%**	**0.3%**	**4.7%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.9%**	**0.0%**

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 5
Location:	Boston, MA
Street 1:	Tremont Street
Street 2:	Shawmut Avenue & Oak Street W
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON
TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

HEAVY VEHICLES

	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	0	0	0	0	2	3	0	0	0	2	0	0	0	0
7:15 AM	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
8:00 AM	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0
8:15 AM	0	0	0	0	0	0	3	2	0	0	1	1	0	0	1	0
8:30 AM	0	0	0	0	0	0	1	2	0	0	0	0	0	0	2	0
8:45 AM	0	0	0	0	0	2	3	3	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	6	1	0	0	3	1	0	0	0	0
9:15 AM	0	0	0	0	0	2	2	4	0	0	7	2	0	0	0	0
9:30 AM	0	0	0	0	0	1	3	2	0	0	2	1	0	0	0	0
9:45 AM	0	0	0	0	0	1	3	2	0	0	1	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0
10:15 AM	0	0	0	0	0	1	1	3	0	0	1	0	0	1	0	0
10:30 AM	0	0	0	0	0	1	4	4	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	3	6	0	0	0	0	0	1	1	0
11:00 AM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0
11:15 AM	0	0	0	0	0	0	1	4	0	0	0	0	0	0	1	0
11:30 AM	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0
11:45 AM	0	0	0	0	0	0	1	3	0	0	0	1	0	0	1	0
12:00 PM	0	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	4	4	0	0	0	1	0	0	2	0
12:30 PM	0	0	0	0	0	0	2	1	0	0	1	1	0	0	0	0
12:45 PM	0	0	0	0	0	0	2	5	0	0	1	0	0	0	1	0
1:00 PM	0	0	0	0	0	1	1	1	0	0	1	0	0	1	0	0
1:15 PM	0	0	0	0	0	1	3	3	0	0	1	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	2	3	0	0	0	0	0	1	2	0
1:45 PM	0	0	0	0	0	0	3	2	0	0	0	2	0	0	5	0
2:00 PM	0	0	0	0	0	1	2	1	0	0	0	0	0	0	2	0
2:15 PM	0	0	0	0	0	0	3	3	0	0	0	0	0	1	0	0
2:30 PM	0	0	0	0	0	0	3	5	0	0	0	0	0	0	1	0
2:45 PM	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	1	4	4	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0
3:30 PM	0	0	0	0	0	1	3	3	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	1	3	4	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	2	1	0	0	0	0	0	0	1	0
4:15 PM	0	0	0	0	0	1	2	1	0	0	1	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0
5:00 PM	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

AM PEAK HOUR	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
8:45 AM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
9:45 AM	**0**	**0**	**0**	**0**	**0**	**5**	**14**	**10**	**0**	**0**	**12**	**4**	**0**	**0**	**0**	**0**
PHF	**0.00**				**0.91**				**0.44**				**0.00**			

MID PEAK HOUR	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
1:00 PM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
2:00 PM	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**9**	**0**	**0**	**2**	**2**	**0**	**2**	**7**	**0**
PHF	**0.00**				**0.71**				**0.50**				**0.45**			

PM PEAK HOUR	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
2:15 PM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
3:15 PM	**0**	**0**	**0**	**0**	**0**	**2**	**11**	**14**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**
PHF	**0.00**				**0.75**				**0.00**				**0.50**			

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 5
Location:	Boston, MA
Street 1:	Tremont Street
Street 2:	Shawmut Avenue & Oak Street W
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PEDESTRIANS & BICYCLES

	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	0	0	10	0	1	0	22	0	2	0	14	0	1	0	12
7:15 AM	0	0	0	14	0	1	0	28	0	0	0	15	0	0	0	18
7:30 AM	0	0	2	15	0	0	1	32	0	1	0	16	0	1	0	22
7:45 AM	0	0	1	16	0	3	1	35	0	0	0	17	0	4	0	26
8:00 AM	1	0	1	18	0	1	0	38	0	1	0	16	0	3	0	30
8:15 AM	0	0	0	16	0	1	0	34	0	1	0	18	0	2	0	28
8:30 AM	1	0	0	18	0	0	2	32	1	1	0	17	0	2	0	25
8:45 AM	1	0	0	17	0	1	0	30	0	2	0	19	0	0	0	27
9:00 AM	0	0	0	20	0	0	0	28	0	1	0	20	0	0	0	26
9:15 AM	0	0	0	19	0	0	0	32	0	1	1	22	0	1	1	28
9:30 AM	0	0	0	22	0	0	1	30	0	2	0	24	0	0	0	24
9:45 AM	0	0	0	24	0	3	1	28	0	0	0	21	0	0	0	27
10:00 AM	0	0	0	23	0	1	0	26	0	4	0	24	0	1	0	25
10:15 AM	0	0	0	22	0	2	1	28	0	0	0	25	0	0	0	29
10:30 AM	0	0	0	25	0	0	1	29	0	0	0	23	0	0	0	25
10:45 AM	0	0	2	24	0	0	0	26	0	1	0	24	0	0	0	27
11:00 AM	1	0	1	23	0	1	2	28	0	0	0	27	0	3	0	24
11:15 AM	0	0	0	26	0	1	1	30	0	1	0	23	0	1	0	25
11:30 AM	0	0	0	27	1	1	0	27	0	1	0	25	0	2	0	27
11:45 AM	0	0	0	26	0	0	0	28	0	1	0	28	0	2	0	26
12:00 PM	1	0	0	28	0	0	1	30	0	4	0	26	0	0	0	28
12:15 PM	0	0	0	30	0	0	0	32	0	2	0	29	0	2	0	30
12:30 PM	0	0	0	26	0	0	0	34	0	2	0	30	0	0	0	32
12:45 PM	0	0	0	27	0	1	1	32	0	1	0	26	0	0	0	34
1:00 PM	0	0	1	23	0	1	0	35	0	0	0	28	0	1	0	31
1:15 PM	0	0	0	22	0	1	0	32	0	0	0	25	0	0	0	33
1:30 PM	0	0	0	26	0	1	1	31	0	1	0	27	0	0	0	32
1:45 PM	0	0	0	25	0	3	1	30	0	0	0	29	0	0	0	35
2:00 PM	0	0	0	22	0	1	1	34	0	0	0	27	0	1	0	36
2:15 PM	0	0	0	21	0	1	0	32	0	1	0	30	0	1	0	40
2:30 PM	1	0	1	25	0	1	0	31	0	2	0	32	0	2	0	42
2:45 PM	0	0	0	24	0	1	0	34	0	1	0	33	0	1	0	37
3:00 PM	0	0	0	27	0	0	1	33	0	2	0	35	0	0	0	39
3:15 PM	0	1	0	25	0	6	1	35	0	0	0	32	0	2	0	40
3:30 PM	0	0	1	24	0	2	0	32	0	0	0	34	0	3	0	38
3:45 PM	0	0	3	26	0	0	1	36	0	1	0	33	0	0	0	36
4:00 PM	0	0	0	23	0	2	0	34	0	1	0	31	0	0	0	38
4:15 PM	0	0	0	22	0	3	1	30	0	2	0	35	0	1	0	40
4:30 PM	0	0	0	25	0	5	0	32	0	2	0	33	0	4	0	42
4:45 PM	0	1	0	26	0	2	1	31	0	3	0	36	0	1	0	37
5:00 PM	0	0	0	28	0	6	1	33	1	2	0	33	1	1	0	38
5:15 PM	1	0	0	24	0	2	3	35	0	0	0	35	0	0	0	37
5:30 PM	0	0	0	26	0	2	1	32	0	1	0	33	0	1	0	42
5:45 PM	0	0	0	25	0	7	1	35	0	3	0	34	0	0	0	40

AM PEAK HOUR 8:30 AM to 9:30 AM	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	2	0	0	74	0	1	2	122	1	5	1	78	0	3	1	106

MID PEAK HOUR 1:00 PM to 2:00 PM	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	0	0	1	96	0	6	2	128	0	1	0	109	0	1	0	131

PM PEAK HOUR 4:45 PM to 5:45 PM	Shawmut Avenue Northbound				Tremont Street Southbound				Tremont Street Eastbound				Oak Street W Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	1	1	0	104	0	12	6	131	1	6	0	137	1	3	0	154

NOTE: Peak hour summaries here correspond to peak hours identified for passenger car and heavy vehicles combined.

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 6
Location:	Boston, MA
Street 1:	Washington Street
Street 2:	Oak Street & Oak Street W
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON
TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PASSENGER CARS & HEAVY VEHICLES COMBINED

	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	5	53	8	0	8	12	6	0	10	5	3	0	0	0	0
7:15 AM	0	5	58	7	0	9	17	8	0	4	8	1	0	0	0	0
7:30 AM	1	6	62	20	1	6	19	11	0	14	7	0	0	0	0	0
7:45 AM	0	16	65	10	4	3	14	5	0	10	8	2	0	0	0	0
8:00 AM	1	8	67	18	2	8	17	9	0	9	15	2	0	0	0	0
8:15 AM	1	15	63	10	6	8	15	11	0	13	12	2	0	0	0	0
8:30 AM	1	13	62	14	2	3	16	4	0	15	8	3	0	0	0	0
8:45 AM	1	11	64	8	2	1	17	6	0	12	14	8	0	0	0	0
9:00 AM	2	15	63	13	1	8	21	9	0	12	12	5	0	0	0	0
9:15 AM	4	11	61	17	4	6	20	5	0	14	15	6	0	0	0	0
9:30 AM	3	8	58	20	3	2	13	7	0	16	14	7	0	0	0	0
9:45 AM	2	6	55	26	3	5	15	7	0	18	13	3	0	0	0	0
10:00 AM	0	5	50	24	4	9	14	10	0	20	12	1	0	0	0	0
10:15 AM	1	4	47	13	5	9	12	9	0	19	10	5	0	0	0	0
10:30 AM	4	7	39	7	5	6	20	7	0	21	9	2	0	0	0	0
10:45 AM	1	5	37	4	1	5	16	4	0	20	11	3	0	0	0	0
11:00 AM	3	6	32	4	3	6	22	3	0	18	12	2	0	0	0	0
11:15 AM	5	8	35	3	4	8	15	5	0	22	8	0	0	0	0	0
11:30 AM	2	5	31	6	2	5	12	5	0	17	10	6	0	0	0	0
11:45 AM	1	8	33	4	1	8	13	4	0	20	11	2	0	0	0	0
12:00 PM	3	9	32	6	3	8	14	6	0	21	10	0	0	0	0	0
12:15 PM	3	8	24	8	3	7	15	8	0	26	17	3	0	0	0	0
12:30 PM	2	8	22	9	2	8	16	9	0	23	18	3	0	0	0	0
12:45 PM	4	7	21	16	4	7	14	15	0	20	14	3	0	0	0	0
1:00 PM	4	5	19	4	4	6	13	14	0	19	12	2	0	0	0	0
1:15 PM	5	10	20	11	1	5	20	12	0	20	7	3	0	0	0	0
1:30 PM	1	6	22	6	2	2	21	16	0	23	15	4	0	0	0	0
1:45 PM	1	11	26	13	1	10	15	15	0	20	17	7	0	0	0	0
2:00 PM	2	8	27	13	2	3	17	13	0	27	20	12	0	0	0	0
2:15 PM	1	9	30	8	1	2	19	10	0	19	25	2	0	0	0	0
2:30 PM	3	8	28	7	3	6	13	8	1	13	28	5	0	0	0	0
2:45 PM	2	9	29	5	2	3	19	9	0	21	30	2	0	0	0	0
3:00 PM	2	11	27	7	1	8	19	10	0	25	33	1	0	0	0	0
3:15 PM	3	10	31	12	3	10	20	11	0	21	35	6	0	0	0	0
3:30 PM	3	9	32	11	2	8	21	12	0	14	37	1	0	0	0	0
3:45 PM	2	11	29	6	2	8	14	10	0	17	36	1	0	0	0	0
4:00 PM	2	14	27	5	2	13	16	12	0	19	39	1	0	0	0	0
4:15 PM	3	13	31	7	2	12	15	16	0	20	37	1	0	0	0	0
4:30 PM	3	16	28	8	2	13	16	15	0	21	34	3	0	0	0	0
4:45 PM	6	15	32	5	6	9	15	14	1	18	35	4	0	0	0	0
5:00 PM	4	14	34	15	3	10	14	15	0	20	32	4	0	0	0	0
5:15 PM	2	13	30	6	2	8	12	11	0	17	34	2	0	0	0	0
5:30 PM	2	15	28	7	2	13	14	10	0	19	32	1	0	0	0	0
5:45 PM	1	12	26	4	1	3	13	8	0	15	30	5	0	0	0	0

AM PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
9:00 AM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
10:00 AM	**11**	**40**	**237**	**76**	**11**	**21**	**69**	**28**	**0**	**60**	**54**	**21**	**0**	**0**	**0**	**0**
PHF	**0.98**				**0.83**				**0.91**				**0.00**			
HV %	**0.0%**	**0.0%**	**13.5%**	**0.0%**	**0.0%**	**4.8%**	**26.1%**	**0.0%**	**0.0%**	**8.3%**	**0.0%**	**61.9%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

MID PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
10:00 AM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
11:00 AM	**6**	**21**	**173**	**48**	**15**	**29**	**62**	**30**	**0**	**80**	**42**	**11**	**0**	**0**	**0**	**0**
PHF	**0.78**				**0.89**				**0.98**				**0.00**			
HV %	**0.0%**	**0.0%**	**9.8%**	**2.1%**	**0.0%**	**0.0%**	**17.7%**	**0.0%**	**0.0%**	**3.8%**	**2.4%**	**9.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

PM PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
4:15 PM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
5:15 PM	**16**	**58**	**125**	**35**	**13**	**44**	**60**	**60**	**1**	**79**	**138**	**12**	**0**	**0**	**0**	**0**
PHF	**0.87**				**0.96**				**0.99**				**0.00**			
HV %	**0.0%**	**0.0%**	**10.4%**	**11.4%**	**0.0%**	**0.0%**	**16.7%**	**1.7%**	**0.0%**	**1.3%**	**2.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 6
Location:	Boston, MA
Street 1:	Washington Street
Street 2:	Oak Street & Oak Street W
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

HEAVY VEHICLES

	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	0	9	1	0	0	1	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	3	1	0	0	4	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	9	0	0	0	4	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	7	2	0	0	2	0	0	0	1	0	0	0	0	0
8:00 AM	0	0	8	0	0	0	4	0	0	1	0	0	0	0	0	0
8:15 AM	0	1	10	1	0	0	3	0	0	3	0	1	0	0	0	0
8:30 AM	0	0	3	0	0	0	3	0	0	1	1	1	0	0	0	0
8:45 AM	0	0	10	3	0	0	2	0	0	1	1	2	0	0	0	0
9:00 AM	0	0	11	0	0	0	6	0	0	0	0	3	0	0	0	0
9:15 AM	0	0	5	0	0	0	7	0	0	1	0	7	0	0	0	0
9:30 AM	0	0	9	0	0	0	3	0	0	1	0	2	0	0	0	0
9:45 AM	0	0	7	0	0	1	2	0	0	3	0	1	0	0	0	0
10:00 AM	0	0	5	1	0	0	3	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	5	0	0	0	2	0	0	0	0	1	0	0	0	0
10:30 AM	0	0	6	0	0	0	5	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	1	0	0	0	1	0	0	3	1	0	0	0	0	0
11:00 AM	0	0	7	0	0	0	5	0	0	3	0	0	0	0	0	0
11:15 AM	0	1	4	0	0	0	4	0	0	2	0	0	0	0	0	0
11:30 AM	0	0	2	1	0	0	2	1	0	1	1	0	0	0	0	0
11:45 AM	0	0	4	0	0	0	3	0	0	3	0	0	0	0	0	0
12:00 PM	0	0	3	0	0	0	3	0	0	0	1	0	0	0	0	0
12:15 PM	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	2	1	0	0	2	1	0	0	0	0	0	0	0	0
12:45 PM	0	0	3	0	0	0	3	0	0	0	1	0	0	0	0	0
1:00 PM	0	0	2	1	0	0	2	0	0	3	0	0	0	0	0	0
1:15 PM	0	0	3	1	0	0	3	0	0	2	1	1	0	0	0	0
1:30 PM	0	0	6	0	0	0	7	0	0	0	0	2	0	0	0	0
1:45 PM	0	0	2	0	0	0	2	0	0	2	0	3	0	0	0	0
2:00 PM	0	0	3	0	0	0	3	0	0	1	0	5	0	0	0	0
2:15 PM	0	0	5	0	0	0	5	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	2	0	0	0	4	0	0	1	0	0	0	0	0	0
2:45 PM	0	0	3	1	0	0	2	0	0	2	0	0	0	0	0	0
3:00 PM	0	0	1	0	0	0	1	0	0	1	1	1	0	0	0	0
3:15 PM	0	0	4	0	0	0	4	0	0	0	1	0	0	0	0	0
3:30 PM	0	0	4	0	0	0	4	0	0	0	2	0	0	0	0	0
3:45 PM	0	0	2	0	0	0	2	0	0	1	1	0	0	0	0	0
4:00 PM	0	0	2	0	0	0	2	0	0	1	0	0	0	0	0	0
4:15 PM	0	0	3	2	0	0	0	1	0	0	1	0	0	0	0	0
4:30 PM	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	4	2	0	0	4	0	0	0	2	0	0	0	0	0
5:00 PM	0	0	3	0	0	0	3	0	0	1	0	0	0	0	0	0
5:15 PM	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	4	0	0	0	3	0	0	1	0	0	0	0	0	0
5:45 PM	0	0	3	0	0	0	3	0	0	0	2	0	0	0	0	0

AM PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
8:45 AM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
9:45 AM	**0**	**0**	**35**	**3**	**0**	**0**	**18**	**0**	**0**	**3**	**1**	**14**	**0**	**0**	**0**	**0**
PHF	**0.73**				**0.64**				**0.56**				**0.00**			

MID PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
11:00 AM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
12:00 PM	**0**	**1**	**17**	**1**	**0**	**0**	**14**	**1**	**0**	**9**	**1**	**0**	**0**	**0**	**0**	**0**
PHF	**0.68**				**0.75**				**0.83**				**0.00**			

PM PEAK HOUR	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
2:00 PM to	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
3:00 PM	**0**	**0**	**13**	**1**	**0**	**0**	**14**	**0**	**0**	**4**	**0**	**5**	**0**	**0**	**0**	**0**
PHF	**0.70**				**0.70**				**0.38**				**0.00**			

Client:	Melissa Restrepo
Project #:	407_C37_HSH
BTD #:	Location 6
Location:	Boston, MA
Street 1:	Washington Street
Street 2:	Oak Street & Oak Street W
Count Date:	6/19/2019
Day of Week:	Wednesday
Weather:	Sun & Clouds, 70°F

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

PEDESTRIANS & BICYCLES

	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	1	0	14	0	0	1	28	1	0	0	25	0	0	0	17
7:15 AM	1	7	0	18	0	0	0	30	0	0	0	28	0	0	0	22
7:30 AM	2	2	0	22	0	1	0	32	1	0	0	30	0	0	0	24
7:45 AM	0	7	0	25	0	0	0	35	5	1	0	32	0	0	0	26
8:00 AM	2	10	0	26	0	2	0	38	4	1	0	35	0	0	0	28
8:15 AM	1	23	2	30	0	0	0	40	6	0	0	36	0	0	2	35
8:30 AM	0	20	0	28	0	2	1	108	1	0	0	38	0	0	0	85
8:45 AM	0	13	0	32	0	1	1	45	1	3	0	45	0	0	0	42
9:00 AM	0	8	0	70	0	0	0	52	2	3	0	95	0	0	0	40
9:15 AM	0	4	0	156	0	0	0	60	0	1	0	145	0	0	0	55
9:30 AM	0	2	1	130	0	0	0	78	1	3	0	128	0	0	0	58
9:45 AM	0	5	1	42	0	1	0	38	1	3	0	50	0	0	0	35
10:00 AM	0	1	0	44	0	0	0	34	1	5	0	54	0	0	0	38
10:15 AM	1	3	0	45	0	1	0	32	2	0	0	55	0	0	0	40
10:30 AM	0	1	0	48	0	1	0	35	1	0	0	53	0	0	1	35
10:45 AM	0	1	1	46	0	1	1	32	1	2	0	54	1	0	0	37
11:00 AM	0	0	0	44	0	0	0	30	2	0	0	56	0	0	0	34
11:15 AM	0	3	1	42	0	2	1	34	0	0	0	53	0	0	0	35
11:30 AM	0	0	0	45	0	0	1	32	2	1	0	50	0	0	0	33
11:45 AM	0	0	0	42	0	0	0	36	2	0	0	48	0	0	0	35
12:00 PM	0	0	4	40	0	0	5	35	1	1	0	44	0	0	0	36
12:15 PM	0	0	0	42	0	0	0	32	1	1	0	46	0	0	0	38
12:30 PM	0	2	1	44	0	2	1	36	0	1	0	48	0	0	0	34
12:45 PM	0	3	0	45	0	3	0	38	0	3	0	43	0	0	0	35
1:00 PM	0	0	0	42	0	0	1	40	0	1	0	48	0	0	0	37
1:15 PM	0	4	0	45	0	4	0	37	0	0	0	52	0	0	0	35
1:30 PM	0	4	0	48	0	4	0	42	0	0	0	55	0	0	0	38
1:45 PM	0	1	0	54	0	1	0	45	0	0	0	58	0	0	0	42
2:00 PM	0	0	0	128	0	0	0	70	0	1	0	136	0	0	0	85
2:15 PM	0	0	0	140	0	0	0	65	0	0	0	132	0	0	0	80
2:30 PM	0	2	1	102	0	3	1	72	1	2	0	108	0	0	0	78
2:45 PM	0	4	0	82	0	4	1	65	0	2	1	70	0	0	0	76
3:00 PM	0	2	0	75	0	2	0	62	1	1	1	64	0	1	0	73
3:15 PM	0	2	0	70	0	3	0	60	0	0	0	65	0	0	0	71
3:30 PM	0	0	0	78	0	0	1	55	0	2	1	63	0	0	0	74
3:45 PM	0	2	0	65	0	3	0	58	2	0	0	65	0	0	0	75
4:00 PM	0	3	0	72	0	3	0	54	0	1	0	68	0	1	0	73
4:15 PM	0	1	1	74	0	1	2	57	1	0	0	63	0	1	0	68
4:30 PM	0	0	0	70	0	0	1	50	2	1	0	61	2	0	2	72
4:45 PM	0	0	2	68	0	1	1	46	0	2	0	64	0	0	0	70
5:00 PM	1	2	1	65	1	2	2	43	1	3	1	62	0	0	0	74
5:15 PM	0	2	0	72	0	2	0	46	0	1	0	66	0	0	0	75
5:30 PM	0	5	1	75	0	5	1	50	0	1	0	64	0	0	0	72
5:45 PM	0	3	3	70	0	3	3	45	0	0	1	65	0	0	0	77

AM PEAK HOUR 9:00 AM to 10:00 AM	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	0	19	2	398	0	1	0	228	4	10	0	418	0	0	0	188

MID PEAK HOUR 10:00 AM to 11:00 AM	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	1	6	1	183	0	3	1	133	5	7	0	216	1	0	1	150

PM PEAK HOUR 4:15 PM to 5:15 PM	Washington Street Northbound				Washington Street Southbound				Oak Street W Eastbound				Oak Street Westbound			
	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
	1	3	4	277	1	4	6	196	4	6	1	250	2	1	2	284

NOTE: Peak hour summaries here correspond to peak hours identified for passenger car and heavy vehicles combined.

Attachment D

Wind

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
1	A	Annual	10		Sitting	16		Acceptable
	B	Annual	15	50%	Standing	21	31%	Acceptable
2	A	Annual	10		Sitting	16		Acceptable
	B	Annual	11		Sitting	17		Acceptable
3	A	Annual	9		Sitting	15		Acceptable
	B	Annual	12	33%	Sitting	18	20%	Acceptable
4	A	Annual	10		Sitting	16		Acceptable
	B	Annual	12	20%	Sitting	17		Acceptable
5	A	Annual	11		Sitting	18		Acceptable
	B	Annual	10		Sitting	16	-11%	Acceptable
6	A	Annual	12		Sitting	19		Acceptable
	B	Annual	11		Sitting	18		Acceptable
7	A	Annual	9		Sitting	14		Acceptable
	B	Annual	16	78%	Walking	23	64%	Acceptable
8	A	Annual	8		Sitting	15		Acceptable
	B	Annual	16	100%	Walking	24	60%	Acceptable
9	A	Annual	11		Sitting	18		Acceptable
	B	Annual	18	64%	Walking	25	39%	Acceptable
10	A	Annual	9		Sitting	15		Acceptable
	B	Annual	9		Sitting	14		Acceptable
11	A	Annual	11		Sitting	17		Acceptable
	B	Annual	10		Sitting	15	-12%	Acceptable
12	A	Annual	10		Sitting	16		Acceptable
	B	Annual	12	20%	Sitting	18	12%	Acceptable
13	A	Annual	11		Sitting	18		Acceptable
	B	Annual	13	18%	Standing	19		Acceptable
14	A	Annual	8		Sitting	14		Acceptable
	B	Annual	10	25%	Sitting	16	14%	Acceptable
15	A	Annual	8		Sitting	13		Acceptable
	B	Annual	6	-25%	Sitting	10	-23%	Acceptable
16	A	Annual	13		Standing	19		Acceptable
	B	Annual	10	-23%	Sitting	16	-16%	Acceptable
17	A	Annual	13		Standing	19		Acceptable
	B	Annual	11	-15%	Sitting	17	-11%	Acceptable
18	A	Annual	10		Sitting	16		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
	B	Annual	9		Sitting	16		Acceptable
19	A	Annual	14		Standing	21		Acceptable
	B	Annual	12	-14%	Sitting	18	-14%	Acceptable
20	A	Annual	12		Sitting	18		Acceptable
	B	Annual	11		Sitting	15	-17%	Acceptable
21	A	Annual	12		Sitting	17		Acceptable
	B	Annual	5	-58%	Sitting	9	-47%	Acceptable
22	A	Annual	11		Sitting	17		Acceptable
	B	Annual	8	-27%	Sitting	13	-24%	Acceptable
23	A	Annual	12		Sitting	18		Acceptable
	B	Annual	3	-75%	Sitting	5	-72%	Acceptable
24	A	Annual	10		Sitting	16		Acceptable
	B	Annual	9		Sitting	13	-19%	Acceptable
25	A	Annual	11		Sitting	18		Acceptable
	B	Annual	9	-18%	Sitting	15	-17%	Acceptable
26	A	Annual	10		Sitting	17		Acceptable
	B	Annual	19	90%	Walking	26	53%	Acceptable
27	A	Annual	9		Sitting	15		Acceptable
	B	Annual	20	122%	Uncomfortable	26	73%	Acceptable
28	A	Annual	10		Sitting	17		Acceptable
	B	Annual	13	30%	Standing	20	18%	Acceptable
29	A	Annual	9		Sitting	14		Acceptable
	B	Annual	16	78%	Walking	22	57%	Acceptable
30	A	Annual	13		Standing	19		Acceptable
	B	Annual	17	31%	Walking	23	21%	Acceptable
31	A	Annual	13		Standing	21		Acceptable
	B	Annual	21	62%	Uncomfortable	28	33%	Acceptable
32	A	Annual	14		Standing	22		Acceptable
	B	Annual	20	43%	Uncomfortable	27	23%	Acceptable
33	A	Annual	15		Standing	23		Acceptable
	B	Annual	16		Walking	24		Acceptable
34	A	Annual	19		Walking	29		Acceptable
	B	Annual	18		Walking	27		Acceptable
35	A	Annual	20		Uncomfortable	29		Acceptable
	B	Annual	21		Uncomfortable	28		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
36	A	Annual	15		Standing	22		Acceptable
	B	Annual	16		Walking	23		Acceptable
37	A	Annual	13		Standing	20		Acceptable
	B	Annual	15	15%	Standing	22		Acceptable
38	A	Annual	10		Sitting	16		Acceptable
	B	Annual	15	50%	Standing	21	31%	Acceptable
39	A	Annual	9		Sitting	15		Acceptable
	B	Annual	16	78%	Walking	21	40%	Acceptable
40	A	Annual	7		Sitting	12		Acceptable
	B	Annual	12	71%	Sitting	17	42%	Acceptable
41	A	Annual	14		Standing	20		Acceptable
	B	Annual	18	29%	Walking	26	30%	Acceptable
42	A	Annual	10		Sitting	17		Acceptable
	B	Annual	18	80%	Walking	28	65%	Acceptable
43	A	Annual	11		Sitting	18		Acceptable
	B	Annual	15	36%	Standing	24	33%	Acceptable
44	A	Annual	13		Standing	20		Acceptable
	B	Annual	15	15%	Standing	22		Acceptable
45	A	Annual	17		Walking	24		Acceptable
	B	Annual	20	18%	Uncomfortable	26		Acceptable
46	A	Annual	12		Sitting	20		Acceptable
	B	Annual	12		Sitting	19		Acceptable
47	A	Annual	14		Standing	21		Acceptable
	B	Annual	13		Standing	20		Acceptable
48	A	Annual	14		Standing	20		Acceptable
	B	Annual	12	-14%	Sitting	19		Acceptable
49	A	Annual	11		Sitting	18		Acceptable
	B	Annual	10		Sitting	16	-11%	Acceptable
50	A	Annual	14		Standing	21		Acceptable
	B	Annual	12	-14%	Sitting	19		Acceptable
51	A	Annual	10		Sitting	17		Acceptable
	B	Annual	13	30%	Standing	19	12%	Acceptable
52	A	Annual	11		Sitting	18		Acceptable
	B	Annual	12		Sitting	19		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
53	A	Annual	11		Sitting	18		Acceptable
	B	Annual	11		Sitting	19		Acceptable
54	A	Annual	10		Sitting	16		Acceptable
	B	Annual	13	30%	Standing	22	38%	Acceptable
55	A	Annual	11		Sitting	18		Acceptable
	B	Annual	9	-18%	Sitting	15	-17%	Acceptable
56	A	Annual	13		Standing	20		Acceptable
	B	Annual	11	-15%	Sitting	17	-15%	Acceptable
57	A	Annual	11		Sitting	18		Acceptable
	B	Annual	9	-18%	Sitting	16	-11%	Acceptable
58	A	Annual	8		Sitting	13		Acceptable
	B	Annual	8		Sitting	14		Acceptable
59	A	Annual	9		Sitting	15		Acceptable
	B	Annual	9		Sitting	15		Acceptable
60	A	Annual	8		Sitting	13		Acceptable
	B	Annual	9	12%	Sitting	14		Acceptable
61	A	Annual	10		Sitting	18		Acceptable
	B	Annual	10		Sitting	17		Acceptable
62	A	Annual	9		Sitting	16		Acceptable
	B	Annual	10	11%	Sitting	16		Acceptable
63	A	Annual	11		Sitting	18		Acceptable
	B	Annual	12		Sitting	19		Acceptable
64	A	Annual	9		Sitting	15		Acceptable
	B	Annual	9		Sitting	15		Acceptable
65	A	Annual	12		Sitting	21		Acceptable
	B	Annual	10	-17%	Sitting	18	-14%	Acceptable
66	A	Annual	7		Sitting	13		Acceptable
	B	Annual	7		Sitting	12		Acceptable
67	A	Annual	12		Sitting	19		Acceptable
	B	Annual	10	-17%	Sitting	17	-11%	Acceptable
68	A	Annual	12		Sitting	18		Acceptable
	B	Annual	12		Sitting	18		Acceptable
69	A	Annual	11		Sitting	19		Acceptable
	B	Annual	11		Sitting	18		Acceptable
70	A	Annual	19		Walking	25		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
	B	Annual	17	-11%	Walking	24		Acceptable
71	A	Annual	13		Standing	20		Acceptable
	B	Annual	11	-15%	Sitting	18		Acceptable
72	A	Annual	16		Walking	23		Acceptable
	B	Annual	17		Walking	24		Acceptable
73	A	Annual	16		Walking	23		Acceptable
	B	Annual	17		Walking	23		Acceptable
74	A	Annual	7		Sitting	12		Acceptable
	B	Annual	17	143%	Walking	26	117%	Acceptable
75	A	Annual	9		Sitting	14		Acceptable
	B	Annual	16	78%	Walking	25	79%	Acceptable
76	A	Annual	13		Standing	19		Acceptable
	B	Annual	17	31%	Walking	24	26%	Acceptable
77	A	Annual	14		Standing	20		Acceptable
	B	Annual	16	14%	Walking	23	15%	Acceptable
78	A	Annual	9		Sitting	14		Acceptable
	B	Annual	11	22%	Sitting	16	14%	Acceptable
79	A	Annual	9		Sitting	16		Acceptable
	B	Annual	10	11%	Sitting	18	12%	Acceptable
80	A	Annual	14		Standing	21		Acceptable
	B	Annual	17	21%	Walking	24	14%	Acceptable
81	A	Annual	10		Sitting	17		Acceptable
	B	Annual	14	40%	Standing	21	24%	Acceptable
82	A	Annual	10		Sitting	16		Acceptable
	B	Annual	15	50%	Standing	23	44%	Acceptable
83	A	Annual	16		Walking	23		Acceptable
	B	Annual	17		Walking	24		Acceptable
84	A	Annual	18		Walking	26		Acceptable
	B	Annual	14	-22%	Standing	22	-15%	Acceptable
85	A	Annual	14		Standing	20		Acceptable
	B	Annual	15		Standing	22		Acceptable
86	A	Annual	8		Sitting	13		Acceptable
	B	Annual	11	38%	Sitting	17	31%	Acceptable
87	A	Annual	13		Standing	20		Acceptable
	B	Annual	13		Standing	21		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
88	A	Annual	16		Walking	22		Acceptable
	B	Annual	16		Walking	22		Acceptable
89	A	Annual	13		Standing	19		Acceptable
	B	Annual	13		Standing	19		Acceptable
90	A	Annual	14		Standing	20		Acceptable
	B	Annual	13		Standing	20		Acceptable
91	A	Annual	13		Standing	20		Acceptable
	B	Annual	14		Standing	21		Acceptable
92	A	Annual	16		Walking	21		Acceptable
	B	Annual	15		Standing	20		Acceptable
93	A	Annual	16		Walking	21		Acceptable
	B	Annual	16		Walking	22		Acceptable
94	A	Annual	16		Walking	21		Acceptable
	B	Annual	16		Walking	21		Acceptable
95	A	Annual	14		Standing	21		Acceptable
	B	Annual	11	-21%	Sitting	17	-19%	Acceptable
96	A	Annual	12		Sitting	19		Acceptable
	B	Annual	12		Sitting	18		Acceptable
97	A	Annual	19		Walking	26		Acceptable
	B	Annual	15	-21%	Standing	22	-15%	Acceptable
98	A	Annual	14		Standing	19		Acceptable
	B	Annual	13		Standing	20		Acceptable
99	A	Annual	9		Sitting	15		Acceptable
	B	Annual	16	78%	Walking	24	60%	Acceptable
100	A	Annual	9		Sitting	14		Acceptable
	B	Annual	12	33%	Sitting	18	29%	Acceptable
101	A	Annual	9		Sitting	14		Acceptable
	B	Annual	11	22%	Sitting	16	14%	Acceptable
102	A	Annual	10		Sitting	15		Acceptable
	B	Annual	11		Sitting	16		Acceptable
103	A	Annual	7		Sitting	12		Acceptable
	B	Annual	10	43%	Sitting	16	33%	Acceptable
104	A	Annual	11		Sitting	17		Acceptable
	B	Annual	16	45%	Walking	22	29%	Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
105	A	Annual	7		Sitting	12		Acceptable
	B	Annual	10	43%	Sitting	17	42%	Acceptable
106	A	Annual	8		Sitting	13		Acceptable
	B	Annual	12	50%	Sitting	18	38%	Acceptable
107	A	Annual	9		Sitting	13		Acceptable
	B	Annual	11	22%	Sitting	18	38%	Acceptable
108	A	Annual	8		Sitting	12		Acceptable
	B	Annual	7	-12%	Sitting	11		Acceptable
109	A	Annual	10		Sitting	16		Acceptable
	B	Annual	9		Sitting	15		Acceptable
110	A	Annual	8		Sitting	12		Acceptable
	B	Annual	7	-12%	Sitting	11		Acceptable
111	A	Annual	11		Sitting	17		Acceptable
	B	Annual	11		Sitting	17		Acceptable
112	A	Annual	9		Sitting	15		Acceptable
	B	Annual	8	-11%	Sitting	13	-13%	Acceptable
113	A	Annual	12		Sitting	19		Acceptable
	B	Annual	12		Sitting	18		Acceptable
114		N/A			N/A			N/A
	B	Annual	5	67%	Sitting	9	125%	Acceptable
115		N/A			N/A			N/A
	B	Annual	5	67%	Sitting	9	125%	Acceptable

Configurations	Mean Wind Criteria Speed (mph)		Effective Gust Criteria (mph)	
No Build	≤ 12	Comfortable for Sitting	≤ 31	Acceptable
	13 - 15	Comfortable for Standing	> 31	Unacceptable
Build	16 - 19	Comfortable for Walking		
	20 - 27	Uncomfortable for Walking		
	> 27	Dangerous Conditions		

Notes

1) Wind Speeds are for a 1% probability of exceedance

2) % Change is based on comparison with Configuration A

3) % changes less than 10% are excluded

Table 2: Mean Speed and Effective Gust Categories - Seasonal

Location	Configuration	Mean Wind Speed (mph)				Effective Gust Wind Speed (mph)			
		Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
1	A	10	8	10	11	17	14	16	18
	B	15	12	14	17	21	17	20	23
2	A	10	8	9	11	16	13	15	17
	B	11	9	10	11	17	14	16	18
3	A	10	8	9	10	16	13	15	16
	B	12	9	11	13	19	14	17	20
4	A	11	9	10	11	17	14	16	17
	B	13	11	12	12	18	15	16	18
5	A	12	10	11	12	18	15	17	19
	B	10	8	9	11	17	13	15	18
6	A	13	11	12	13	20	17	19	20
	B	11	9	11	12	18	14	17	20
7	A	9	7	9	10	15	12	14	16
	B	16	13	15	17	24	19	22	25
8	A	8	7	8	9	15	12	14	16
	B	16	12	15	17	24	18	22	26
9	A	11	9	11	12	18	15	17	19
	B	18	14	17	20	25	20	23	27
10	A	9	8	9	10	15	13	15	17
	B	9	7	8	10	14	10	13	15
11	A	11	9	10	12	18	14	16	19
	B	10	8	9	11	16	12	15	17
12	A	10	8	9	11	16	13	15	18
	B	12	10	12	13	19	15	17	20
13	A	12	10	11	12	18	15	18	20
	B	14	12	13	14	20	16	18	20
14	A	9	7	8	9	15	12	14	15
	B	10	8	10	11	16	13	15	18
15	A	8	7	8	9	13	11	12	14
	B	6	5	6	6	11	9	10	11
16	A	13	12	13	14	19	16	18	20
	B	10	7	9	11	16	12	15	17
17	A	13	11	12	13	19	16	18	20
	B	12	9	11	13	17	13	16	19
18	A	10	9	10	11	16	13	15	18

Table 2: Mean Speed and Effective Gust Categories - Seasonal

Location	Configuration	Mean Wind Speed (mph)				Effective Gust Wind Speed (mph)			
		Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
	B	9	8	9	10	15	15	15	17
19	A B	15 13	12 11	14 12	16 12	21 19	17 15	20 17	23 19
20	A B	12 11	10 10	12 10	13 11	19 16	15 14	18 15	20 16
21	A B	12 6	10 5	11 5	12 6	18 9	16 7	17 9	18 10
22	A B	11 8	10 7	11 8	11 9	18 14	15 11	17 12	18 14
23	A B	12 3	11 3	12 3	12 3	18 5	16 4	18 5	19 5
24	A B	11 9	9 8	10 9	11 10	17 14	14 11	16 13	17 14
25	A B	11 9	9 7	11 9	12 9	19 16	15 12	17 15	20 16
26	A B	11 19	9 15	10 18	11 22	17 26	14 20	16 25	18 29
27	A B	9 20	8 16	9 19	10 23	15 26	13 21	15 25	16 29
28	A B	11 13	9 10	10 12	11 15	17 20	14 15	16 19	18 22
29	A B	9 16	8 14	9 16	9 18	15 22	12 18	14 20	15 24
30	A B	13 17	11 14	13 16	14 18	19 23	16 19	18 22	21 25
31	A B	14 21	11 17	12 20	15 23	22 28	17 22	20 26	23 31
32	A B	14 20	12 16	13 19	15 22	22 27	19 21	21 25	24 29
33	A B	15 16	11 13	13 15	17 17	24 25	18 19	21 23	26 27
34	A B	20 19	14 14	17 17	21 20	29 28	21 21	26 25	32 30
35	A B	21 21	19 18	20 20	22 22	30 29	26 24	28 27	30 30

Table 2: Mean Speed and Effective Gust Categories - Seasonal

Location	Configuration	Mean Wind Speed (mph)				Effective Gust Wind Speed (mph)			
		Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
36	A	16	12	14	17	23	17	20	24
	B	16	12	15	17	23	18	21	25
37	A	13	10	12	14	21	16	19	22
	B	15	12	15	17	22	17	21	24
38	A	10	8	9	11	16	13	15	17
	B	16	12	15	17	22	17	20	24
39	A	10	8	9	10	15	12	14	16
	B	16	13	15	18	22	17	20	24
40	A	8	6	7	8	12	10	12	13
	B	12	9	11	13	17	13	16	19
41	A	14	12	14	15	20	17	19	22
	B	18	13	17	20	26	20	24	29
42	A	10	8	10	11	17	14	16	18
	B	18	14	17	20	29	21	26	31
43	A	11	10	11	12	18	16	18	19
	B	15	12	14	17	24	18	23	27
44	A	14	11	13	14	21	17	20	22
	B	15	13	15	17	23	19	22	24
45	A	18	14	17	19	25	19	23	27
	B	20	15	19	22	27	20	25	29
46	A	12	9	11	14	20	15	18	22
	B	12	9	11	13	19	14	17	22
47	A	14	12	13	14	22	18	20	22
	B	13	11	12	14	21	18	19	22
48	A	14	12	13	15	21	17	19	21
	B	13	11	12	13	19	16	18	20
49	A	11	9	10	12	18	14	17	19
	B	10	9	10	11	17	13	16	17
50	A	14	11	13	16	22	17	20	23
	B	12	10	11	13	20	15	18	21
51	A	11	9	10	11	17	15	16	18
	B	13	12	13	14	19	17	19	20
52	A	12	10	11	12	18	15	18	20
	B	12	10	12	13	20	15	19	21

Table 2: Mean Speed and Effective Gust Categories - Seasonal

Location	Configuration	Mean Wind Speed (mph)				Effective Gust Wind Speed (mph)			
		Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
53	A	12	9	11	12	18	14	17	20
	B	11	9	11	12	19	15	18	20
54	A	10	8	9	11	16	13	15	17
	B	14	10	12	15	23	17	21	24
55	A	11	9	11	13	18	14	17	19
	B	9	8	9	10	16	12	15	16
56	A	14	11	13	15	20	16	19	22
	B	11	9	11	12	18	14	17	19
57	A	12	9	11	12	19	15	17	20
	B	10	8	9	10	17	13	15	17
58	A	9	7	8	8	14	11	13	14
	B	9	7	9	8	15	11	14	14
59	A	10	7	9	10	16	12	15	16
	B	10	7	9	9	17	12	16	16
60	A	8	6	8	8	14	11	13	14
	B	9	7	9	9	15	11	14	15
61	A	11	8	10	11	19	14	17	20
	B	11	8	10	10	19	13	17	18
62	A	11	8	10	9	18	13	16	16
	B	11	8	10	9	19	13	17	16
63	A	13	9	11	11	20	14	18	18
	B	14	9	13	11	21	15	19	18
64	A	9	7	8	9	15	11	14	15
	B	10	7	9	10	16	12	15	16
65	A	13	9	12	14	22	16	20	24
	B	11	8	10	12	19	14	17	21
66	A	7	6	7	8	13	10	12	14
	B	7	6	7	8	13	10	12	14
67	A	12	10	11	13	20	15	18	21
	B	11	9	10	11	18	14	16	19
68	A	12	10	11	13	19	15	17	20
	B	12	10	11	12	18	15	17	19
69	A	11	9	10	12	19	15	17	21
	B	12	10	11	12	19	15	17	20
70	A	19	16	18	20	26	22	25	27

Table 2: Mean Speed and Effective Gust Categories - Seasonal

Location	Configuration	Mean Wind Speed (mph)				Effective Gust Wind Speed (mph)			
		Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
	B	18	15	17	19	25	20	23	26
71	A	13	10	12	14	21	15	19	22
	B	12	9	11	12	19	14	17	20
72	A	18	13	16	18	25	19	23	25
	B	19	13	17	18	26	19	24	25
73	A	18	13	16	18	25	18	23	25
	B	18	13	17	17	26	18	23	24
74	A	7	6	7	7	12	10	12	13
	B	17	13	16	19	27	20	24	29
75	A	9	7	8	9	14	12	14	15
	B	16	12	15	18	26	19	23	28
76	A	13	10	13	14	20	16	19	21
	B	17	13	16	19	24	19	23	26
77	A	14	11	13	15	21	16	19	22
	B	16	13	15	18	23	18	22	25
78	A	9	7	8	10	14	11	13	15
	B	11	9	10	12	16	13	15	18
79	A	9	7	9	10	16	12	15	18
	B	10	8	10	12	18	14	17	20
80	A	14	12	13	15	21	18	20	23
	B	17	13	16	18	24	20	23	26
81	A	11	8	10	12	17	13	16	19
	B	14	11	13	16	21	16	20	23
82	A	10	8	9	10	16	13	15	17
	B	15	12	14	17	23	18	22	25
83	A	16	12	15	18	23	17	22	26
	B	17	12	16	19	25	19	23	27
84	A	18	14	17	21	26	19	25	29
	B	15	11	14	16	23	18	22	24
85	A	14	11	14	16	21	16	20	22
	B	15	12	14	17	22	17	21	24
86	A	8	6	7	8	13	11	12	14
	B	11	9	10	12	17	13	16	19
87	A	13	10	12	14	20	16	19	22
	B	14	11	13	15	21	17	20	23

Table 2: Mean Speed and Effective Gust Categories - Seasonal

Location	Configuration	Mean Wind Speed (mph)				Effective Gust Wind Speed (mph)			
		Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
88	A B	18 17	13 13	16 16	16 17	25 24	18 19	22 22	23 24
89	A B	16 14	10 10	14 13	13 13	22 21	15 15	20 19	20 20
90	A B	17 15	11 11	15 14	14 13	23 22	16 16	21 20	20 20
91	A B	14 14	11 12	13 14	14 15	21 21	17 18	19 20	21 22
92	A B	17 16	12 12	15 15	16 16	23 22	17 17	21 20	22 22
93	A B	17 17	13 13	16 16	17 17	23 23	17 18	22 22	23 23
94	A B	17 17	13 13	16 16	16 16	24 23	17 18	22 21	22 22
95	A B	14 12	10 9	13 11	15 12	21 18	15 14	20 17	23 19
96	A B	13 12	9 9	12 12	14 13	19 18	14 14	18 17	21 19
97	A B	20 17	15 12	18 15	21 16	27 24	20 17	25 21	28 24
98	A B	15 14	11 10	14 13	14 14	21 21	15 16	19 20	20 22
99	A B	9 16	7 12	8 15	10 18	16 25	13 18	14 23	17 27
100	A B	9 12	7 10	8 11	9 12	14 18	12 15	13 17	15 20
101	A B	9 11	7 9	9 11	10 12	14 17	12 13	14 16	15 18
102	A B	11 11	8 9	10 11	10 12	16 17	12 13	15 16	16 18
103	A B	7 11	6 8	7 10	8 12	12 16	9 12	12 15	13 18
104	A B	12 16	9 12	11 15	11 18	19 23	14 17	17 21	17 25

Table 2: Mean Speed and Effective Gust Categories - Seasonal

Location	Configuration	Mean Wind Speed (mph)				Effective Gust Wind Speed (mph)			
		Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
105	A	8	6	7	8	13	10	12	13
	B	11	8	10	11	17	13	16	19
106	A	8	6	8	8	13	10	12	14
	B	13	10	12	14	18	14	17	20
107	A	9	7	9	9	14	11	13	14
	B	11	8	10	13	18	14	17	20
108	A	8	6	7	8	13	10	12	13
	B	7	6	7	7	12	9	11	12
109	A	10	8	9	10	17	13	16	18
	B	10	7	9	10	16	12	15	16
110	A	8	6	7	8	13	10	12	13
	B	7	6	7	7	12	9	11	12
111	A	13	9	12	12	19	14	17	18
	B	12	9	11	11	18	13	17	17
112	A	9	8	8	9	15	13	14	16
	B	8	6	8	8	14	10	13	14
113	A	13	10	12	13	21	16	19	20
	B	13	9	12	12	20	15	18	19
114	N/A	N/A				N/A			
	B	6	5	5	6	9	7	8	9
115	N/A	N/A				N/A			
	B	5	4	5	6	9	7	8	9

Seasons	Months	Mean Wind Criteria Speed (mph)		Effective Gust Criteria (mph)
Spring	March - May	≤ 12	Comfortable for Sitting	≤ 31 Acceptable
Summer	June - August	13 - 15	Comfortable for Standing	> 31 Unacceptable
Fall	September - November	16 - 19	Comfortable for Walking	
Winter	December - February	20 - 27	Uncomfortable for Walking	
Annual	January - December	> 27	Dangerous Conditions	

Configurations

No Build

Build

Notes

1) Wind Speeds are for a 1% probability of exceedance

Attachment E

Air Quality

ATTACHMENT E – AIR QUALITY

Introduction

This Attachment provides assumptions and backup data for results presented in the PNF/DEIR. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions calculations supporting the air quality analysis.

Mesoscale and Greenhouse Analysis Gas Supporting Data

Traffic data supporting the mesoscale and greenhouse gas analyses can be found in the Transportation Appendix. The assumptions and calculations used in quantifying the emissions of NOx, VOC, and CO2e attributable to the project are presented. The EPA MOVES computer program generated roadway motor vehicle emissions used in the air quality analysis. The model input parameters were provided by MassDEP. Emissions and emission rates were derived for 2019 and 2026 for 0 mph for idle and from 5 mph to 65 mph speeds for use in Microsoft Excel to calculate emissions.

Microscale Analysis Supporting Data

Traffic data supporting the microscale analysis can also be found in the Transportation Appendix. The USEPA MOVES program was used to generate vehicle carbon monoxide emission rates for 2019 and 2026 for 0 mph (idle) to 65 mph at 5 mph intervals. The USEPA CAL3QHC model was used to estimate CO concentrations at sidewalk receptors along the intersection roadways.

Ambient Background Data

The ambient background data used in the report was obtained from the MassDEP's Annual Air Quality Reports. Where specific data is not reported within these documents, data were obtained from the USEPA's AIRData website (https://www.epa.gov/outdoor-air-quality-data).

Model Input/Output Files

Due to excessive size model inputs, databases, and output files are available on digital media upon request.

Parcel P12C

Roads

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2019 Existing	6.5	1.18	4.3	0.79	4,492	820
2026 No-Build	3.7	0.68	1.6	0.29	3,728	680
delta from 2019 Existing	-2.8	-0.50	-2.7	-0.50	-764	-139
2026 Build	3.9	0.71	1.6	0.30	3,924	716
delta from 2026 No-Build	0.2	0.03	0.1	0.02	197	36

Intersections

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2019 Existing	0.3	0.05	0.3	0.05	579	106
2026 No-Build	0.1	0.02	0.1	0.02	520	95
delta from 2019 Existing	-0.1	-0.03	-0.2	-0.03	-59	-11
2026 Build	0.1	0.03	0.1	0.02	546	100
delta from 2026 No-Build	0.0	0.00	0.0	0.00	26	5

Total

Pollutant	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2019 Existing	6.7	1.23	4.6	0.83	5,071	925
2026 No-Build	3.8	0.70	1.7	0.30	4,247	775
delta from 2019 Existing	-2.9	-0.53	-2.9	-0.53	-823	-150
2026 Build	4.0	0.73	1.7	0.32	4,470	816
delta from 2026 No-Build	0.2	0.03	0.1	0.02	223	41

Minor differences in sums are due to rounding of individual values.

Pound per day to tons per year is based on an 100% factor to account for peak daily to annual data.

Flower Exchange South End

	units	2019 Existing	2026 No-Build	2026 Build
Daily VMT	veh-miles/day	4,783	5,036	5,301
Net Change	veh-miles/day	-	253	266
Net Delay	veh-hrs/day	78	90	94
Net Change	veh-hrs/day	-	12	5
Roadway CO_2e	tpy	820	680	716
2024 Mitigated Build	tpy	106	95	100
Roadway CO_2e	tpy	925	775	816
Net CO_2e Change	tpy	-	-150	41

Parcel P12C

	units	Case 1 2024 Build minus 2024 No-Build
Daily VMT	veh-miles/day	265.6
Net Change	veh-miles/day	-
Net Delay	veh-hrs/day	4.5
Net Change	veh-hrs/day	-
Roadway CO_2e	tpy	36
Intersection CO_2e	tpy	5
Net CO_2e Emissions	tpy	41
Net CO_2e Change	tpy	-
Percent Change		-

Parcel P-12C

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	Weekday AM Peak Hour Volume			Weekday PM Peak Hour Volume		
				2019 Existing	2026 No Build	2026 Build	2019 Existing	2026 No Build	2026 Build
1	Tremont St, N of Stuart	0.05	25	466	483	499	743	770	784
2	Stuart St, W of Tremont	0.06	25	1,126	1,220	1,242	1,260	1,356	1,375
3	Stuart St, E of Tremont	0.10	25	1,020	1,110	1,133	1,266	1,362	1,382
4	Tremont St, Stuart to Oak St W	0.17	25	431	446	479	827	857	954
5	Oak St W, W of Tremont St	0.06	25	313	324	343	559	579	635
6	Oak St W, E of Tremont St	0.07	25	254	262	265	450	465	474
7	Tremont St, S of Oak St W	0.07	25	298	308	319	476	493	525

Parcel P-12C

Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data

Link Number	Roadway Segment	Link Distance (miles)	Estimated Average Speed (mph)	K-factor	Average Daily Traffic (ADT) 2019 Existing	2026 No Build	2026 Build	Average Hourly Traffic Volumes 2019 Existing	2026 No Build	2026 Build
1	Tremont St, N of Stuart	0.05	25	10.0%	7,430	7,700	7,840	310	321	327
2	Stuart St, W of Tremont	0.06	25	10.0%	12,600	13,560	13,750	525	565	573
3	Stuart St, E of Tremont	0.10	25	10.0%	12,660	13,620	13,820	528	568	576
4	Tremont St, Stuart to Oak St W	0.17	25	10.0%	8,270	8,570	9,540	345	357	398
5	Oak St W, W of Tremont St	0.06	25	10.0%	5,590	5,790	6,350	233	241	265
6	Oak St W, E of Tremont St	0.07	25	10.0%	4,500	4,650	4,740	188	194	198
7	Tremont St, S of Oak St W	0.07	25	10.0%	4,760	4,930	5,250	198	205	219

Flower Exchange South End

	SUM	

Daily VMT: 4,783 | 5,036 | 5,301

Link Number	Roadway Segment	Link Distance (miles)	Average Daily Traffic (ADT) Volumes			Daily VMT		
			2019 Existing	2026 No Build	2026 Build	2019 Existing	2026 No Build	2026 Build
1	Tremont St, N of Stuart	0.05	7,430	7,700	7,840	372	385	392
2	Stuart St, W of Tremont	0.06	12,600	13,560	13,750	756	814	825
3	Stuart St, E of Tremont	0.10	12,660	13,620	13,820	1,266	1,362	1,382
4	Tremont St, Stuart to Oak St W	0.17	8,270	8,570	9,540	1,406	1,457	1,622
5	Oak St W, W of Tremont St	0.06	5,590	5,790	6,350	335	347	381
6	Oak St W, E of Tremont St	0.07	4,500	4,650	4,740	315	326	332
7	Tremont St, S of Oak St W	0.07	4,760	4,930	5,250	333	345	368

Parcel P12C

	2019 Existing Weekday AM Peak			2019 Existing Weekday PM Peak		
Intersections (Signalized and *Unsignalized*)	**LOS**	**Delay (Sec)**	**Traffic Volume**	**LOS**	**Delay (Sec)**	**Traffic Volume**
1: Tremont Street & Stuart Street	C	23.8	1578	C	30.8	1986
2: Shawmut Avenue & Tremont Street & Oak Street W	B	17.6	648	C	30.1	1156

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.
Color Code:
Red = Signalized intersections at LOS D or worse.
Green = Top 3 signalized intersections based on volume.
Dark Blue = Volume increase >20%
Light Blue = Volume increase > 10%
Yellow = New intersection to be constructed.
Yellow = Unsignalized intersection with delay > 180s. Capped at 180s
Purple/Orange = mitigated delay times decreased/increased

Parcel P12C

Intersections (Signalized and *Unsignalized*)	2026 No-Build Weekday AM Peak LOS	Delay (Sec)	Traffic Volume	2026 No-Build Weekday PM Peak LOS	Delay (Sec)	Traffic Volume
1: Tremont Street & Stuart Street	C	24.2	1673	C	31.6	2108
2: Shawmut Avenue & Tremont Street & Oak Street W	B	19.4	668	D	37.9	1197

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.
Color Code:
Red = Signalized intersections at LOS D or worse.
Green = Top 3 signalized intersections based on volume.
Dark Blue = Volume increase >20%
Light Blue = Volume increase > 10%
Yellow = New intersection to be constructed.
Yellow = Unsignalized intersection with delay > 180s. Capped at 180s
Purple/Orange = mitigated delay times decreased/increased

Parcel P12C

Intersections (Signalized and *Unsignalized*)	2026 Build Weekday AM Peak LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Change	2026 Build Weekday PM Peak LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Change
1: Tremont Street & Stuart Street	C	24.5	1740	4%	C	31.7	2161	3%
2: Shawmut Avenue & Tremont Street & Oak Street W	B	19.4	703	5%	D	37.7	1294	8%

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.
Color Code:
Red = Signalized intersections at LOS D or worse.
Green = Top 3 signalized intersections based on volume.
Dark Blue = Volume increase >20%
Light Blue = Volume increase > 10%
Yellow = New intersection to be constructed.
Yellow = Unsignalized intersection with delay > 180s. Capped at 180s
Purple/Orange = mitigated delay times decreased/increased

Parcel P12C
2019 Existing

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (7 days/wk, 52 wk/yr)	100%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOVES VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOVES NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOVES CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1: Tremont Street & Stuart Street	27.70	19860	1.6263576	0.18	0.03	1.48065754	0.17	0.030	3361.53667	377.50	68.706
2: Shawmut Avenue & Tremont Street & Oak Street W	25.61	11560	1.626	0.10	0.02	1.481	0.09	0.016	3361.537	203.15	36.973
Totals	hrs	78.350622		0.28	0.05		0.26	0.05		580.65	105.68

Parcel P12C
2026 No-Build

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (7 days/wk, 52 wk/yr)	100%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOVES VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOVES NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOVES CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1: Tremont Street & Stuart Street	28.33	21080	0.6839	0.08	0.02	0.4292	0.05	0.010	2627.33261	320.24	58.284
2: Shawmut Avenue & Tremont Street & Oak Street W	31.27	11970	0.684	0.05	0.01	0.429	0.03	0.006	2627.333	200.77	36.540
Totals	hrs	89.9492466		0.14	0.02		0.09	0.02		521.01	94.82

Parcel P12C
2026 Build

K Factor	10%	factors peak hour vehicle volumes to daily volumes
Peak hr delay to daily Factor (8hr/day)	33%	Factors peak hour delay to daily delay
Daily delay to annual Factor (7 days/wk, 52 wk/yr)	100%	factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOVES VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOVES NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOVES CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1: Tremont Street & Stuart Street	28.49	21610	0.6839	0.09	0.02	0.4292	0.05	0.010	2627.33261	330.18	60.093
2: Shawmut Avenue & Tremont Street & Oak Street W	31.26	12940	0.684	0.06	0.01	0.429	0.04	0.006	2627.333	216.93	39.481
Totals	hrs	94.454989		0.14	0.03		0.09	0.02		547.11	99.57

Calculation of Microscale Modeling Emission Factors
Summary of MOVES2014b Output

Carbon Monoxide Only

		2019	**2026**
Free Flow	25 mph	2.992	1.614
Right Turns	10 mph	4.667	2.474
Left Turns	15 mph	4.021	2.182
Queues	Idle	10.463	2.866

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

Ambient Background Data

POLLUTANT	AVERAGING TIME	Form	2016	2017	2018	Units	ppm/ppb to μg/m³ Conversion Factor	2016-2018 Background Concentration (μg/m³)	Location
SO_2 (1)(6)	1-Hour (5)	99th %	4.1	2.8	3.3	ppb	2.62	8.9	Kenmore Sq., Boston
	3-Hour	H2H	3.8	3.2	2.8	ppb	2.62	10.0	Kenmore Sq., Boston
PM-10	24-Hour	H2H	30	27	23	μg/m³	1	30	Kenmore Sq., Boston
PM-2.5	24-Hour (5)	98th %	14.7	14.6	15.9	μg/m³	1	15.1	174 North St., Boston (FRM)
	Annual (5)	H	7.7	7.2	6.0	μg/m³	1	6.9	174 North St., Boston (FRM)
NO_2 (3)	1-Hour (5)	98th %	47	46	45	ppb	1.88	86.5	Kenmore Sq., Boston
	Annual	H	15.0	25.3	13.1	ppb	1.88	47.5	Kenmore Sq., Boston
CO (2)	1-Hour	H2H	2.4	1.3	1.1	ppm	1146	2750.4	Harrison Ave., Boston
	8-Hour	H2H	1.2	1.3	0.7	ppm	1146	1439.4	Harrison Ave., Boston
Ozone (4)	8-Hour	H4H	0.058	0.069	0.067	ppm	1963	135.4	Harrison Ave., Boston
Lead (7)	Rolling 3-Month	H	0.017	N/A	N/A	μg/m³	1	0.017	Harrison Ave., Boston

Notes:
From MassDEP Air Quality Monitor reports or EPA's AirData Website
(1) SO_2 reported ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2.62 $\mu g/m^3$.
(2) CO reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1146 $\mu g/m^3$.
(3) NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1.88 $\mu g/m^3$.
(4) O_3 reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1963 $\mu g/m^3$.
(5) Background level is the average concentration of the three years.
(6) The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.
(7) Lead is not reported at any site in Massachusetts in 2017 or 2018.

Available Upon Request

Attachment F

Climate Change Checklist

Boston Planning & Development Agency

Climate Resiliency Report Summary

Submitted: 10/15/2019 09:27:11

A.1 - Project Information

Project Name:	Parcel P-12C			
Project Address:	286-290 Tremont Street			
Filing Type:	Initial (PNF, EPNF, NPC or other substantial filing)			
Filing Contact:	Fiona Vardy	Epsilon Associates, Inc.	fvardy@epsilonassociates.com	9784616243
Is MEPA approval required?	Yes	MEPA date:		

A.2 - Project Team

Owner / Developer:	288 Tremont Street Partners LLC, a Partnership between Asian Community Development Corporation, Corcoran Jennison Company, Inc., MPB Tremont LLC (an affiliate of MP Boston) and Tufts Shared Services, Inc., c/o MP Boston
Architect:	Stantec
Engineer:	Nitsch Engineering
Sustainability / LEED:	Lambert Sustainability, LLC
Permitting:	Epsilon Associates, Inc.
Construction Management:	TBD

A.3 - Project Description and Design Conditions

List the principal Building Uses:	Community space, hotel, residential, garage addition
List the First Floor Uses:	Residential lobby, hotel lobby, community space
List any Critical Site Infrastructure and or Building Uses:	N/A

Site and Building:

Site Area (SF):	29152	Building Area (SF):	426500
Building Height (Ft):	350	Building Height (Stories):	30
Existing Site Elevation – Low (Ft BCB):	26.5	Existing Site Elevation – High (Ft BCB):	30.5
Proposed Site Elevation – Low (Ft BCB):	24.5	Proposed Site Elevation – High (Ft BCB):	30.5
Proposed First Floor Elevation (Ft BCB):	30	Below grade spaces/levels (#):	1

Article 37 Green Building:

Climate Resiliency Report Summary

LEED Version - Rating System:	LEED BD+C v4	LEED Certification:	No
Proposed LEED rating:	Certified	Proposed LEED point score (Pts.):	44

Building Envelope:

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

Roof:	30	Exposed Floor :	10
Foundation Wall:	15	Slab Edge (at or below grade):	

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

Area of Opaque Curtain Wall & Spandrel Assembly:	0	Wall & Spandrel Assembly Value:	
Area of Framed & Insulated / Standard Wall:	>76	Wall Value:	0.05
Area of Vision Window:	<24	Window Glazing Assembly Value:	0.42
		Window Glazing SHGC:	0.40
Area of Doors:	0.3	Door Assembly Value :	0.4

Energy Loads and Performance

For this filing – describe how energy loads & performance were determined	Whole building energy simulation using eQuest.		
Annual Electric (kWh):	2855000	Peak Electric (kW):	800
Annual Heating (MMbtu/hr):	13600	Peak Heating (MMbtu):	7
Annual Cooling (Tons/hr):	450000	Peak Cooling (Tons):	500
Energy Use - Below ASHRAE 90.1 - 2013 (%):	22	Have the local utilities reviewed the building energy performance?:	No
Energy Use - Below Mass. Code (%):	22	Energy Use Intensity (kBtu/SF):	55.7

Back-up / Emergency Power System

Electrical Generation Output (kW):	750	Number of Power Units:	1
System Type (kW):	Combustion engine.	Fuel Source:	Fuel oil

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

Electric (kW):	750	Heating (MMbtu/hr):	3
		Cooling (Tons/hr):	0

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

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

B.1 – GHG Emissions - Design Conditions

For this filing - Annual Building GHG Emissions (Tons): 1417

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

The energy model, following ASHRAE Appendix G, has been used as a design tool to test various design options for envelope, glazing, lighting & HVAC considerations.

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

High performance building envelope, access to outdoor spaces, compact massing.

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

High performance HVAC plant, lighting controls, LPD reductions and DHW savings.

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

The Proponent is studying the incorporation of solar PV.

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

No area or district scale energy systems are available at the Project site.

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

The Project will work with Eversource to determine what programs and incentives will be available for the Project.

B.2 - GHG Reduction - Adaptation Strategies

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

Consideration will be given to "all-electric ready building systems."

C - Extreme Heat Events

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

C.1 – Extreme Heat - Design Conditions

Temperature Range - Low (Deg.):	7	Temperature Range - High (Deg.):	91
Annual Heating Degree Days:	5621	Annual Cooling Degree Days	2938

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

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

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

The building will include high-albedo rooftops.

C.2 - Extreme Heat – Adaptation Strategies

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

HVAC systems have been sized to design weather factors with safety factors included.

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

High-performance building envelope and access to exterior spaces.

D - Extreme Precipitation Events

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

D.1 – Extreme Precipitation - Design Conditions

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

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

The Project will be designed to reduce peak rates and volumes of storm water from the site and promote infiltration to the greatest extent practicable. The Project will decrease the impervious area onsite, use areas of green roof, collect rainwater for reuse in the building and contract surface and underground infiltration structures.

D.2 - Extreme Precipitation - Adaptation Strategies

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

The first inch and a quarter of storm water will be retained onsite in an infiltration system.

E – Sea Level Rise and Storms

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

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

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

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

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

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

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

First Floor Elevation (Ft BCB):

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

What is the Accessible Route Elevation (Ft BCB)?

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

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

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

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

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

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

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

Thank you for completing the Boston Climate Change Checklist!

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

Attachment G

Greenhouse Gas Analysis

ATTACHMENT G GREENHOUSE GAS ANALYSIS

G.1 Alternative Energy Credit Calculations

G.2 Passive House Study

G.3 Modeling Input

G.4 Modeling Output

G.5 GHG Mitigation Matrix

Residential portion

Scenario A:	Qualifying small HP system is in each apartment unit, each HP system is separate, exactly one HP system per apartment unit				
	aparment unit size		840	sf	143,640 sf	user input

Scenario A: Qualifying small HP system is in each apartment unit, each HP system is separate, exactly one HP system per apartment unit

aparment unit size		840	sf	143,640 sf · user input
number of apartment units in building		171	units	
FOR EACH APARTMENT UNIT				
Enet out (premultiplier)		3.0	MWH/yr	see formula on right
Multiplier		3	if PHIUS, PHI, HERS50 or less, of Zero energy put 5 here; otherwise 3, see multiplier guidelines	
Enet out (postmultiplier)		9.0	MWHrs/yr	
Enet out (for 10 year strip)		90	MWHrs for 10 year strip, always rounds down to nearest integer	
Approx value	$	15.00	$/MWHrs	(assumption, check what's current, usually varies $15 to $20)
Approx value for strip	$	1,350	per apartment unit	
FOR WHOLE BUILDING				depending upon whether AECs are being forward minted or not:
Approximate value	$	230,850	per building	could be $ 230,850 lump sum, once
				OR $ 5,771 every 3 months for 10 years

Scenario B: Qualifying small HP system is used across multiple apartment units

PHIUS limit heating intensity	4.4	Btu/sf-hr	(in Boston, heating is larger, not cooling) · user input
unit size	840	sf	
unit heating rate	3.7	Mbtu/yr	
AEC upper bound for small	134.0	Mbtu/yr	
number of unit serve by one condenser, staying withn small	36.3	units	
number of apart. units covered by single condenser	10	select this - be smaller than E33, 10 to 15 unts is probably max realistic considering floor plates, etc	
apartment unit size	840	sf	
area covered by single condenser	8,400	sf	
number of apartment units in building	171	units	
total number of HP systems	17.1	HP systems	
FOR EACH HP SYSTEM			
Enet out (premultiplier)	16.8	MWH/yr	
Multiplier	5	if PHIUS, PHI, HERS50 or less, of Zero energy put 5 here; otherwise 3, see multiplier guidelines	
Enet out (postmultiplier)	84.0	MWHrs/yr	
Enet out (for 10 year strip)	840	MWHrs for 10 year strip, always rounds down to nearest integer	
Approx value	$ 15.00	$/MWHrs	(assumption, check what's current, usually varies $15 to $20)
Approx value for strip	$ 12,600	per HP system	
FOR WHOLE BUILDING			depending upon whether AECs are being forward minted or not:
Approximate value	$ 215,460	per building	could be $ 215,460 lump sum, once
			OR $ 5,386.50 every 3 months for 10 years

(Scenario A and B will yield same result if apartment units are 1500 or more in size, otherwise, Scenario A will yield larger value because of floor effect in formula)

Residential portion (Passive House Multiplier)

Scenario A: Qualifying small HP system is in each apartment unit, each HP system is separate, exactly one HP system per apartment unit

apartment unit size		840	sf	143,640 sf	user input
number of apartment units in building		171	units		
FOR EACH APARTMENT UNIT					
Enet out (premultiplier)		3.0	MWH/yr	see formula on right	
Multiplier		5	if PHIUS, PHI, HERS50 or less, of Zero energy put 5 here; otherwise 3, see multiplier guidelines		
Enet out (postmultiplier)		15.0	MWHrs/yr		
Enet out (for 10 year strip)		150	MWHrs for 10 year strip, always rounds down to nearest integer		
Approx value	$	15.00	$/MWHrs	(assumption, check what's current, usually varies $15 to $20)	
Approx value for strip	$	2,250	per apartment unit		
FOR WHOLE BUILDING				depending upon whether AECs are being forward minted or not:	
Approximate value	$	384,750	per building	could be $ 384,750 lump sum, once	
				OR $ 9,619 every 3 months for 10 years	

Scenario B Qualifying small HP system is used across multiple apartment units

PHIUS limit heating intensity		4.4	Btu/sf-hr	(in Boston, heating is larger, not cooling)	user input
unit size		840	sf		
unit heating rate		3.7	Mbtu/yr		
AEC upper bound for small		134.0	Mbtu/yr		
number of unit serve by one condenser, staying withn small		36.3	units		
number of apart. units covered by single condenser		10	select this - be smaller than E33, 10 to 15 unts is probably max realistic considering floor plates, etc		
apartment unit size		840	sf		
area covered by single condenser		8,400	sf		
number of apartment units in building		171	units		
total number of HP systems		17.1	HP systems		
FOR EACH HP SYSTEM					
Enet out (premultiplier)		16.8	MWH/yr		
Multiplier		5	if PHIUS, PHI, HERS50 or less, of Zero energy put 5 here; otherwise 3, see multiplier guidelines		
Enet out (postmultiplier)		84.0	MWHrs/yr		
Enet out (for 10 year strip)		840	MWHrs for 10 year strip, always rounds down to nearest integer		
Approx value	$	15.00	$/MWHrs	(assumption, check what's current, usually varies $15 to $20)	
Approx value for strip	$	12,600	per HP system		
FOR WHOLE BUILDING				depending upon whether AECs are being forward minted or not:	
Approximate value	$	215,460	per building	could be $ 215,460 lump sum, once	
				OR $ 5,386.50 every 3 months for 10 years	

(Scenario A and B will yield same result if apartment units are 1500 or more in size, otherwise, Scenario A will yield larger value because of floor effect in formula)

Hotel portion

Scenario A: Qualifying small HP system is in each apartment unit, each HP system is separate, exactly one HP system per apartment unit

hotel room size		390	sf	65,520 sf
number of apartment units in building		168	units	
FOR EACH APARTMENT UNIT				
Enet out (premultiplier)		3.0	MWH/yr	see formula on right
Multiplier		3	if PHIUS, PHI, HERS50 or less, of Zero energy put 5 here; otherwise 3, see multiplier guidelines	
Enet out (postmultiplier)		9.0	MWHrs/yr	
Enet out (for 10 year strip)		90	MWHrs for 10 year strip, always rounds down to nearest integer	
Approx value	$	15.00	$/MWHrs	(assumption, check what's current, usually varies $15 to $20)
Approx value for strip	$	1,350	per apartment unit	
FOR WHOLE BUILDING				
Approximate value	$	226,800	per building	

user input

depending upon whether AECs are being forward minted or not:

could be	$	226,800	lump sum, once
OR	$	5,670	every 3 months for 10 years

Scenario B Qualifying small HP system is used across multiple apartment units

PHIUS limit heating intensity		4.4	Btu/sf-hr	(in Boston, heating is larger, not cooling)
unit size		390	sf	
unit heating rate		1.7	Mbtu/yr	
AEC upper bound for small		134.0	Mbtu/yr	
number of unit serve by one condenser, staying withn small		78.1	units	
number of apart. units covered by single condenser		10	select this - be smaller than E33, 10 to 15 unts is probably max realistic considering floor plates, etc	
apartment unit size		390	sf	
area covered by single condenser		3,900	sf	
number of apartment units in building		168	units	
total number of HP systems		16.8	HP systems	
FOR EACH HP SYSTEM				
Enet out (premultiplier)		7.8	MWH/yr	
Multiplier		5	if PHIUS, PHI, HERS50 or less, of Zero energy put 5 here; otherwise 3, see multiplier guidelines	
Enet out (postmultiplier)		39.0	MWHrs/yr	
Enet out (for 10 year strip)		390	MWHrs for 10 year strip, always rounds down to nearest integer	
Approx value	$	15.00	$/MWHrs	(assumption, check what's current, usually varies $15 to $20)
Approx value for strip	$	5,850	per HP system	
FOR WHOLE BUILDING				
Approximate value	$	98,280	per building	

user input

depending upon whether AECs are being forward minted or not:

could be	$	98,280	lump sum, once
OR	$	2,457.00	every 3 months for 10 years

(Scenario A and B will yield same result if apartment units are 1500 or more in size, otherwise, Scenario A will yield larger value because of floor effect in formula)

Parcel 12 C
Utility Costs
Rev: 09/19/2019

Input Summary ***Note: Green cells indicate C406.1 Measures***	**Natural Gas Baseline Case (ASHRAE 90.1-2013, App. G)**	**Proposed WSHP Scheme (WSHP)**	**Alternative 1: Residential VRF (WSHP Hotel)**	**Alternative 2: Residential Air Cooled VRF and Hotel Water Cooled VRF**	**PH Alternative: Proposed WSHP Scheme with Passive House Envelope**
kWh	2,747,417	2,855,208	2,758,554	2,672,726	2,495,334
Therms	127,822	75,790	55,974	47,436	47,064
kwh metric lb GHG	1,873,738	1,947,252	1,881,334	1,822,799	1,701,818
natural gas lb GHG	1,495,517	886,743	654,896	555,001	550,649
	3,369,256	2,833,995	2,536,230	2,377,800	2,252,467
		84.11%	75.28%	70.57%	66.85%
	% savings	15.89%	24.72%	29.43%	33.15%
	GHG [tons]	1417	1268	1189	1126
	delta from baseline [lbs]	535261	624943	672035	1116789
	delta [tons of GHG]	268	312	336	558
Annual Utility Costs					
Gas	$146,995	$87,159	$64,370	$54,551	$54,124
Electric	$439,587	$456,833	$441,369	$427,636	$399,253
Total	**$586,582**	**$543,992**	**$505,739**	**$482,188**	**$453,377**
		Annual utility cost savings over proposed case	$38,253	$61,804	$90,615

Cost of Electricity	
Electricity	$0.16 per kWh
Natural Gas	$1.15 per Therm

Steven Winter Associates, Inc.

Parcel 12 Passive House Feasibility Study - Boston, MA

Prepared for: Halle Thomas, MPB Tremont LLC

Prepared by: Dylan Martello, Steven Winter Associates, Inc.

August 9, 2019

Halle Thomas
288 Tremont Street Partners
c/o MPB Tremont LLC
33 Arch Street, Suite 2520
Boston, MA 02110
617.451.0300
hthomas@mpbos.com

Re: PHI Certification for Parcel 12 – 288 Tremont

Dear Halle,

Steven Winter Associates has (SWA) completed our preliminary Passive House review to assess compliance with the Passive House certification criteria for the Parcel 12 development in Boston, MA. This building is a 30-story mixed use development containing 171 affordable units, 140 hotel units, and a community facility. All of these spaces have been assessed for compliance with the PHI standard.

As currently represented in the plans and in conjunction with the information contained in this document, the project meets all of the requirements for certification by the Passive House Institute (PHI); any changes or additions to that plan set or the information contained in this document must be reviewed and approved by SWA to ensure PHI compliance. Note that gross and net square-foot values shown herein are calculated according to Passive House certification methodology and will differ from square footage stated elsewhere in the project documents.

Please let us know if you have any questions or concerns regarding the information contained in this report. Thank you for the opportunity to provide you with Passive House Certification Support.

Sincerely,

Dylan Martello, CPHD
Senior Building Systems Consultant
Steven Winter Associates, Inc.
203.857.0200 x231 | dmartello@swinter.com

GENERAL PASSIVE HOUSE PROJECT REQUIREMENTS: PARCEL 12

PASSIVE HOUSE CERTIFICATION CRITERIA

Due to local site conditions and attributes of the building design, we have recommended that this project pursue certification through Passive House Institute (PHI). The PHI Standard requires the project to meet three energy metrics, as well as an airtightness metric. The following table lists the requirements for this PHI certification for Parcel 12. SWA is assuming the entire building, including the residential spaces, hotel spaces, and ground floor community spaces are all included in the PH certified boundary. The parking garage on-site is considered outside the PH certified boundary. Note, three separate energy models are being run for the three respective spaces in Parcel 12. The PHI criteria shown below are blended averages for the entire building as this is an acceptable compliance check for mixed use projects.

Criteria for Certification	**PHI Requirement**
Space Heating Demand (kBTU/ft^2·yr)	≤ 4.75
Space Cooling Demand (kBTU/ft^2·yr)	≤ 5.11
Primary Energy Demand (kBTU/ft^2·yr)	≤ 42.80
Pressurized Airtightness (ACH/hr)	≤ 0.60

DECLARATION OF THE CONSTRUCTION SUPERVISOR

Implementation of the project design must follow all Passive House specifications and attendant exhibit documents provided by SWA. Any variation in terms of implementation should be mentioned, approved by SWA, and documented. For any products not mentioned in the plans, corresponding documentation must be provided; a template for this document can be provided upon request.

The general contractor will be responsible for communicating construction schedules in order for SWA to perform all required inspections at the appropriate time, and to ensure that no delays are caused to any project activities by SWA's inspections or tests.

PASSIVE HOUSE FEASIBILITY

PASSIVE HOUSE MODELING RESULTS

PHI energy modeling was conducted using PHPP Version 9.7. Modeling assumptions and inputs were based on the early conceptual documents / SDs, and specs provided, and discussions with and assumptions provided by the project team and SWA. SWA is assuming that the residential, hotel, and community spaces are all included within the PH certified boundary.

The results of the modeling indicate that the building evaluated, as currently designed **and** with the assumptions provided in this document, will be compliant with PHI requirements. The required space conditioning thresholds and energy demands for this project, reflected as weighted averages for the entire building, are displayed in the following table.

Criteria for Certification	PHI Requirement	SWA PH Model Avg for whole building
Space Heating Demand (kBTU/ft^2·yr)	≤ 4.75	4.12 (Y)
Space Cooling Demand (kBTU/ft^2·yr)	≤ 5.71	2.66 (Y)
Primary Energy Demand (kBTU/ft^2·yr)	≤ 42.80	40.15 (Y)
Pressurized Airtightness (ACH/hr)	≤ 0.60	0.60 (Y)

For reference, the two graphs below show the PH compliance results of the individual models in addition to the weighted averages for the entire building.

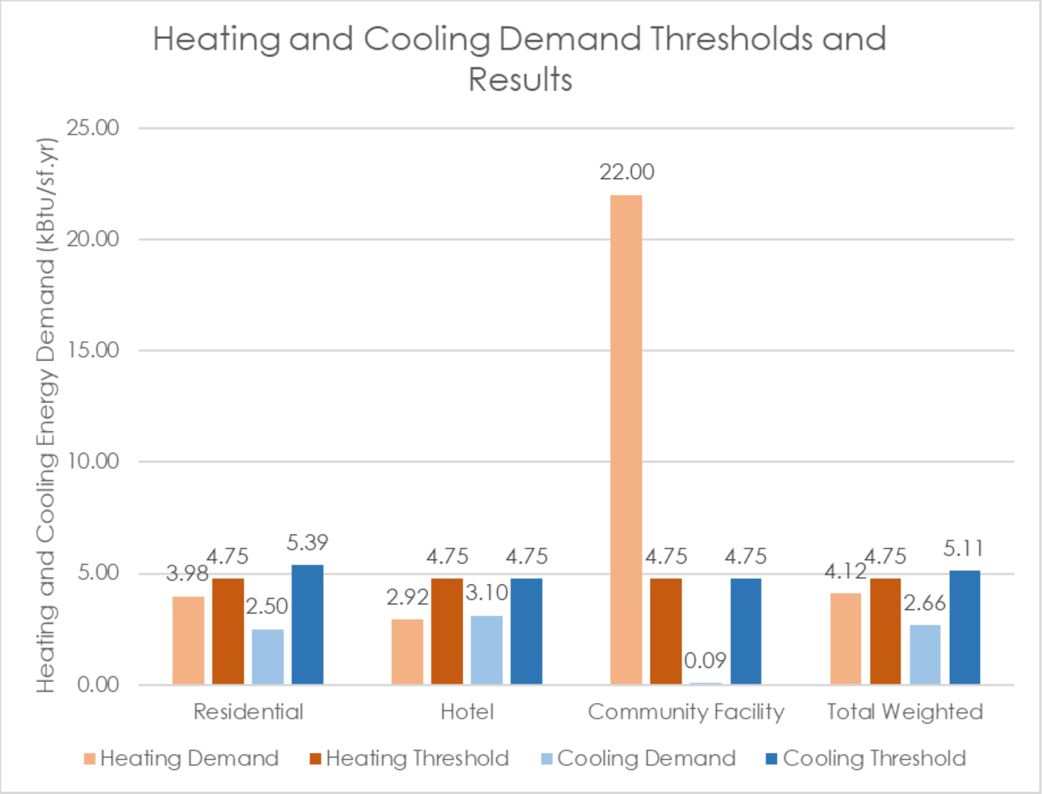


Figure 1. PH heating and cooling demands and thresholds for each Parcel 12 space type & the whole-building area weighted averages.

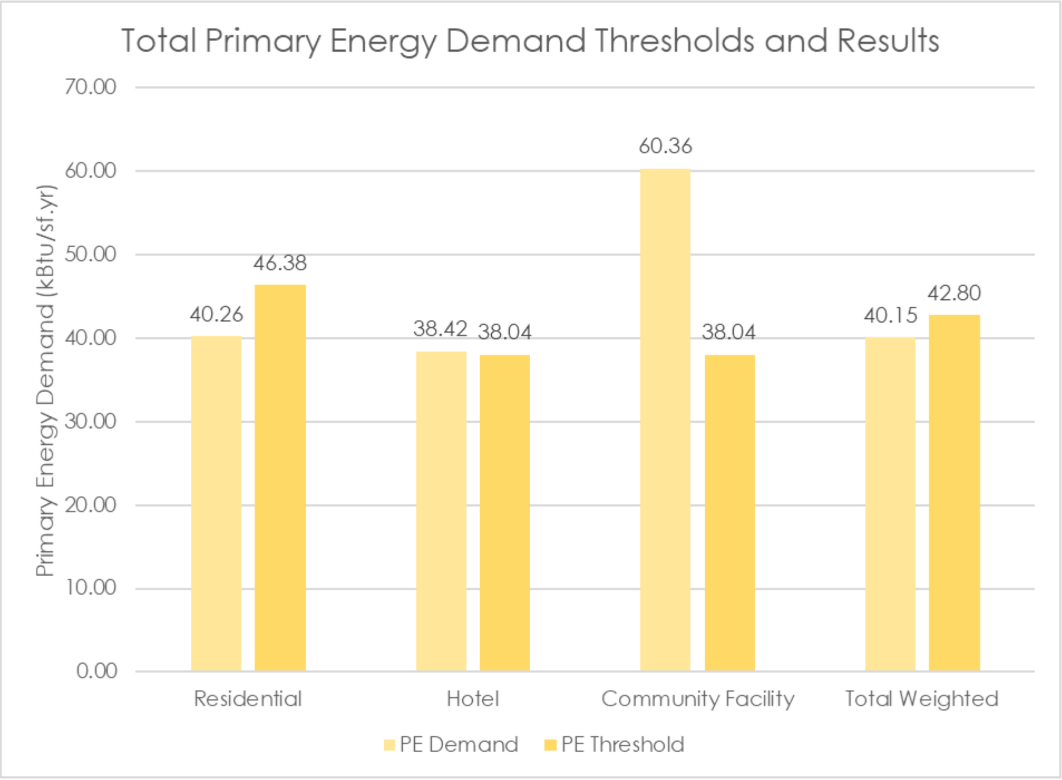


Figure 2. PH source primary energy demands and thresholds for each Parcel 12 space type & the whole-building area weighted average.

RECOMMENDED DESIGN

The following sets out (1) the design and construction assumptions, discussed and defined by the development team, used in our modeling; and, (2) a detailed description of the system efficiency levels used in PHPP to determine PHI compliance.

Thermal Envelope Component	Recommendation
Roof	R-40 hr·ft^2·°F/Btu
Above-Grade Walls	R-22 hr·ft^2·°F/Btu
Above-Grade Walls Adjacent to Garage	R-22 hr·ft^2·°F/Btu
Library Ceiling Below Garage	R-40 hr·ft^2·°F/Btu
Maximum Window U-value	0.148 Btu/hr·ft^2·°F
Window SHGC	0.35

- **Roofs**: R-40 can be achieved with 8” of XPS at R-5.0/inch.
- **Above-Grade Walls**: SWA is assuming a concrete and steel superstructure with pre-cast concrete panels attached to the slab edges. An R-22 wall can be achieved with 3” of closed cell-spray foam applied to the interior face of the pre-cast panel. These assumptions can be altered and refined if a different design or insulation choice is intended as long as the minimum R-value is met.
- **Library Ceiling Below Garage (ambient)**: R-40 can be achieved with 7” of closed cell medium density polyurethane spray foam at R-6.0/inch. SWA is assuming this garage is unheated. This requirement may be relaxed if the garage is partially or completely heated and cooled.

- **Punched Windows**: Windows shall be triple-pane, with casement and fixed operation, and have a solar heat gain coefficient near or equal to 0.35.

  In order to meet PHI's thermal comfort requirements for Boston, each window would need to achieve a maximum U-value of 0.127 Btu/h·ft^2·˚F. SWA believes this is overly strict for this climate and given the very limited availability of window system that are suitable for high-rise construction in this market. **Therefore, SWA recommends an early discussion with PHI regarding relaxation of this requirement. SWA is assuming this requirement is relaxed, and therefore the current maximum window U-value in the Parcel 12 models is 0.148 Btu/h·ft^2·˚F**. This overall U-value includes the thermal performance of the glazing, frame, and glazing spacer. These values can be varied, as long as the overall window U-value requirement is met.

  For reference the values below are what is currently being modeled for component-specific performance values in the PHPP to meet this window U-value requirement:
    - center-of-glazing U-value = 0.09 Btu/h·ft^2·˚F
    - frame U-value = 0.198 Btu/h·ft^2·˚F
    - glazing spacer psi-value = 0.023 Btu/h·ft·˚F
    - window install details with minimal thermal bridging and no metal flashing

- **Opaque Exterior Doors**: R-2.5 insulated doors
- **Storefront**: The storefront system shall be triple-pane with a maximum U-value of 0.24 Btu/h·ft^2·˚F and a SHGC = 0.35. It is likely that these windows will not achieve the U-value needed to comply with PHI's thermal comfort requirement. Therefore, it is recommended that a perimeter heat source is provided at all storefront locations to qualify for an exemption from this requirement.

AIRTIGHT BUILDING ENVELOPE

The building envelope is to achieve a maximum infiltration rate of 0.6 ACH/hr at ±50 Pascals of pressurization relative to outdoor ambient pressure. This is much tighter than typical new construction, and requires diligent taping and sealing of all joints, penetrations, and transitions. Construction drawings clearly defining a continuous building air barrier at all envelope details along with an air sealing specification document shall be provided to the construction team to aid them in executing these details properly.

Training, testing and inspections will be implemented to ensure tightness of façade. Air tightness testing will be performed by SWA at specified milestones in the construction process including at least one window mockup. In addition to third party inspections by SWA, one or more dedicated individuals on the construction team shall be tasked with daily inspections of air sealing progress, and the general contractor will be responsible to ensure that construction sequencing allows proper air sealing and visual access for inspections. Upon completion, the building as a whole will undergo a blower door test to verify compliance with the PHI limit.

The air-barrier drawing set will be developed by SWA based on the exterior wall construction and cladding options. It will outline the air and weather barriers for the project. Critical junctions will need to be fully detailed and reviewed/ approved by SWA and included in the 100% construction drawing set.

NOTE: To prevent infiltration through the sanitary plumbing piping one of the following measures must be implemented: 1) an air admittance valve shall be installed at the top of the sanitary pipe vent stacks within the thermal envelope, or 2) a backwater valve shall be installed at the base of each sanitary pipe that enters the building, or 3) a P-style plumbing trap shall be installed.

THERMAL BRIDGE MITIGATION

Mitigating thermal bridges must be addressed in the design phase and detailed in the project drawings; the design and construction drawing set shall be reviewed for thermal bridges and improved with iterative thermal modeling and recommendations by SWA. This review includes major construction connections, including windows and doors. Iterative modifications to connection details may be needed to ensure thermal bridge-free construction. Under no circumstances should insulation be removed or reduced by the construction team without the express consent of the architect. SWA is currently assuming minor thermal bridging at the following locations:

- Roof parapets
- Roof penetrations and dunnage
- Structural supports at garage ceiling over community spaces
- Structural attachments for pre-cast concrete panel
- Window to wall connection

OCCUPANCY RATES AND ASSUMPTIONS

SWA is modeling the residential occupancy according to PHI's standard assumption as required for certification.

The hotel occupancy is being modeled according to feedback from the ownership team – 1.5 people per hotel room with 78% of the hotel rooms being occupied on average.

The ground floor community / office space is being modeled as follows:

- Hotel / residential offices
  - 5 people present from 8am – 6pm for 6 days/week
- Public library
  - 5 people present from 8am – 8pm for 7 days/week
  - 8 visitors on average from 8am – 8pm for 7 days/week
    - Derived from PHI standard absenteeism assumptions for libraries and assumed visitor design occupancy of 75 people for public library

APPLIANCES / OFFICE EQUIPMENT

All appliances shall be ENERGY STAR® certified and all project specifications for exact appliance model numbers must be provided to SWA. Any deviation from the appliance specifications must be approved by the architect. Ventless electric clothes dryers are preferred to avoid additional penetrations through the building envelope and to avoid the provision of dryer makeup air. Selected residential and hotel appliances must perform better than or equal to the following values provided:

Residential / Hotel Appliance	Energy Consumption	Notes / Assumptions
Dishwasher	0.70 kWh/use	Can be removed from model if n/a
Laundry washer	0.87 kWh/use	-
12 common laundry dryers	3.50 kWh/use	Electric exhaust
63 in-unit dryers	1.50 kWh/use	Electric condensing ventless
Residential refrigerator	365 kWh/yr	No internal ice-maker assumed
Hotel mini-refrigerator	250 kWh/yr	No internal ice-maker assumed
Residential electric kitchen cooktop	0.22 kWh/use	Conduction cooktop assumed

Hotel kitchen	0.25 kWh/meal @ 143 meals/day	PHI standard assumption for non-residential cooking
Office Equipment	**Energy Consumption**	**Notes / Assumptions**
Computer towers	35 Watts/tower	Qty = 6, in standby (2 Watts) during office off-hours
Computer monitors	28 Watts/monitor	Qty = 10, in standby (2 Watts) during office off-hours
Printers / copiers	300 Watts/printer	Qty = 2, in standby for 75% of hours in year
Servers	100 Watts (total)	On full load 24/7

LIGHTING

All lighting fixtures, including installed lighting within dwelling units and hotel units, should target 70 lumens per watt or greater. Common area lighting shall be LED, wherever possible.

The following installed lighting power densities (LPD) in W/ft2 should be pursued as a maximum, prior to the integration of area lighting controls.

Room Type	W/ft^2	Hours/Day
Corridor	0.4	24
Offices	0.6	10
Library	0.6	12
Lobby	0.8	10
Common Stair	0.4	24
Electrical/Mechanical	0.4	4

LIGHTING CONTROLS

All non-apartment common spaces must have either bi-level lighting, occupancy or vacancy sensors. The following control strategies should be integrated into these major space types.

Room Type	Control Strategies
Corridor	bi-level
Lobby	bi-level
Vestibule(s)	bi-level
Stairs	bi-level
Central Restroom	occupancy/vacancy sensor
Offices	occupancy/vacancy sensor
Building Storage	occupancy/vacancy sensor
Laundry Room	occupancy/vacancy sensor
Janitor Room	occupancy/vacancy sensor
Electrical Room	occupancy/vacancy sensor
Mechanical Room(s)	occupancy/vacancy sensor

MECHANICAL VENTILATION

Dwelling units and common areas should be continuously ventilated via balanced energy recovery ventilators (ERV) with sensible recovery efficiencies no less than 83% and fan power of 0.85 W/CFM or less. ERVs should include thermally controlled summer bypass. Mechanical specifications and drawings must indicate the size and type of air handler as well as duct sizing and layout. SWA is assuming a centralized ventilation system. Constant air flow regulators must be specified for each supply and return grill to provide the specific requirements to each space.

The ventilation rates were originally modeled according to MEP/FP Systems Narrative provided by the MEP engineer on May 30, 2019. SWA is outlining below recommended ventilation rates for the hotel and residential spaces in order to comply with the PHI standard. For the residential spaces, fresh air from the ERV will be supplied directly to the bedrooms and living rooms and exhausted from the kitchens and full baths. For the hotel spaces, each unit will contain supply and exhaust air with the hotel units slightly negatively pressurized with respect to the corridors. Each ERV's supply and exhaust flow rate must be balanced within 10% of each other.

Recommended ventilation rates assumed to comply with PHI standard

- Residential units
  - Exhaust = 25 CFM per kitchen + 20 CFM per bathroom.
  - Supply air rates should be balanced with exhaust air.
- Hotel rooms
  - Exhaust = 50 CFM per hotel room
  - Supply = 45 CFM per hotel room

The common areas and community spaces should be ventilated via ERVs with sensible recovery efficiencies of no less than 83%, fan power of 0.76 W/CFM; and in accordance with ASHRAE minimum ventilation rates. Specifically, 0.06 CFM/ft2 for major space types including common corridors, staircases, offices space, and community room; and, 0.12 CFM/ft2 for common laundry, and janitorial storage rooms. Mechanical dampers should be installed for the common area rooms and controlled by occupancy sensors such that flow can be reduced to 0 CFM if unoccupied. The ventilation system must be capable of 0.30 average air change rates ACH and should have an average air change rate no higher than 0.60 ACH.

Ductwork shall be:

- Installed and hung in a manner that does not interrupt the insulation or air barrier layers.
- Insulated with a minimum of R-8 vapor-tight insulation on both the intake and exhaust ductwork between the ERV and exterior wall where applicable.
- Sealed per SWA's ERV/HRV Duct Sealing and Insulating Guide, using high quality, durable sealants or tapes.
- Individual flexible ducts lengths shall be kept to the absolute minimum required to complete the connections between ventilation system components.
- A minimum of MERV 13 filter in the intake air duct and MERV 8 filter in the extract air duct is required for all ventilation systems, as well as ducted heating/cooling systems.
- The kitchen exhaust register must be located at minimum 6' from the stovetop (in plan).
- All central ventilation ductwork is to be Aerosealed and have constant airflow regulators (CARs) at all registers to ensure proper balancing of the system.

SPACE HEATING AND COOLING

SWA is assuming the heating and cooling system for the residential spaces, hotel, and community spaces are **water sourced heat pumps with a centralized boiler plant and cooling tower**. Efficiencies of these units should be rated no lower than a heating COP of 3.5 at an incoming water temperature of 70°F and a cooling SEER no lower than 14.0 at an incoming water temperature of 88°F.

All primary and secondary condenser water piping for the water sourced heat pump system shall be insulated to code minimum levels. SWA is assuming 10,000 linear feet of condenser water piping for the entire building. This loop is maintained at 70°F in heating operation and 88°F in cooling operation.

This hydronic system could allow for future electrification via a centralized air to water heat pump system that would be able to maintain the condenser water loop at it's required temperature in both the heating and cooling systems in lieu of the boiler plant and cooling tower. There is currently a limited market availability of units that are large enough for a building of this scale, but new larger units that may be suitable for this project are expected to come to market within a year. Centralized air to water heat pumps are not required for PH certification and have not been modeled for this project, but should considered as a potential option for future electrification of the Parcel 12 development.

DHW SYSTEM

Central domestic hot water (DHW) for the residential and retail spaces can be provided with **natural gas condensing boiler(s)**. The condensing boiler should have an energy efficiency of 94% or greater. Central DHW re-circulation lines should be insulated to R-8 and pipe lengths should be kept to a minimum via optimized layouts of plumbing fixtures and recirculation loops.

SWA is assuming point of use electric heaters for the ground floor community and office spaces.

PHI APPLICATION AND FEES

The project owner is responsible for entering directly into contract with PHI for passive house certification; SWA will be responsible for submitting all documentation. The project team parties will all be responsible for compiling specific Passive House documentation as requested by SWA for certification. At a minimum, the following plans and information must be provided:

- Site Plan – site plan and photographs must be submitted showing the building orientation, as well as, shading objects with their heights and distances.
- Design Drawings – for every input into the PHPP there must be a corresponding label on the design drawings for quick auditing (SWA to provide). These include the area of the thermal envelope, the rough opening dimensions of all windows, the position and lengths of thermal bridges and the distances to any shading features.
- Construction Details – construction details for all junctions of the thermal envelope (anywhere there is a change in direction, a corner, piercing of the insulation layer either partial or full, or a change in thickness/conductivity of insulation materials). The materials and the airtight layer must be clearly indicated on the drawings.
- Ventilation Layout – show the placement of: ventilation units, ductwork, filters, sound protection (silencers etc.), supply and extract valves, air transfer openings (grilles/door undercuts), outdoor air and exhaust outlets, lengths of duct runs from the appliance to the thermal envelope, ducting diameters, and insulation thicknesses.
- Heating, Cooling and Plumbing Drawings – a schematic of the heating, cooling & hot water systems showing the generators, hot water storage, pumps, coils and controls. Also needed are

layouts showing the lengths of space heat and domestic hot water piping with insulation thicknesses and locations of circulation pumps, if any.

- Electrical Service Plans –illustrating lighting schedule, elevators, photovoltaic systems etc.
- Technical Brochures – describing all building components, e.g. furnaces, heat pumps, solar panels, heating coils/elements, frost protection, energy recovery ventilation efficiencies, insulation product thermal conductivities, and any other components used.
- In addition to the information provided in the body of this report, all separately provided PHI program documents and passive house specifications must be followed to ensure that this project is eligible for PHI certification

Parcel 12 C
Energy Model Inputs & Results
Rev: 09/19/2019

Input Summary *Note: Green cells indicate C406.1 Measures*	**Natural Gas Baseline Case (ASHRAE 90.1-2013, App. G)**	**Proposed WSHP Scheme (WSHP)**	**Alternative 1: Residential VRF (WSHP Hotel)**	**Alternative 2: Residential Air Cooled VRF and Hotel Water Cooled VRF**	**PH Alternative: Proposed WSHP Scheme with Passive House Envelope**
Roof Insulation	R-30 c.i. U-0.032 per Table A2.2.3	R-30 c.i. (all construction types) U-0.032 per Table A2.2.3	R-30 c.i. (all construction types) U-0.032 per Table A2.2.3	R-30 c.i. (all construction types) U-0.032 per Table A2.2.3	**R-40 c.i.** **U-0.025 per Table A2.2.3**
Wall Insulation	R-13 + R-10 c.i (metal stud) U-0.055 per Table A3.3.3.1	**R-17.5 ci (all construction types)** **U-0.05 per Table A3.3.3.1**	R-17.5 ci (all construction types) U-0.05 per Table A3.3.3.1	R-17.5 ci (all construction types) U-0.05 per Table A3.3.3.1	**R-22 ci** **U-0.04 per Table A3.3.3.1** ***Air sealing reduces infiltration 30%**
Windows / Glazing	U-0.42 (fixed) U-0.50 (operable) SHGC-0.40 (both)	U-0.42 (assembly, all construction types) SHGC-0.40 (all construction types)	U-0.42 (assembly, all construction types) SHGC-0.40 (all construction types)	U-0.42 (fixed) U-0.50 (operable) SHGC-0.40 (both)	**Triple Glazing U-0.148** **SHGC 0.35**
Window-to-Wall Ratio	same as proposed (residential)	<24%	<24%	<24%	<24%
Temperature Setpoints	Cooling: 75°F Heating: 70°F	Cooling: 75°F Heating: 70°F	Cooling: 75°F Heating: 70°F	Cooling: 75°F Heating: 70°F	**Cooling: 77°F** **Heating: 68°F**
Corridor and Makeup Air HVAC System C406.6 Measure	DX RTU with Gas-Fired Furnace and heat recovery (50% Eff.)	**DX RTU with Gas-Fired Furnace and heat recovery (60% Eff.)**	DX RTU with Gas-Fired Furnace and heat recovery (60% Eff.)	DX RTU with Gas-Fired Furnace and heat recovery (60% Eff.)	DX RTU with Gas-Fired Furnace and heat recovery (>80% Eff.)
Corridor Cooling Efficiency	10.8 EER	**12 EER**	12 EER	12 EER	12 EER
Corridor Heating Efficiency	80% Et Gas Fired Furnace	80% Et Gas Fired Furnace	80% Et Gas Fired Furnace	80% Et Gas Fired Furnace	80% Et Gas Fired Furnace
Residential HVAC System	PTAC - DX with hot water coil	**WSHP**	**WSHP (Hotel)** **VRF with ERVs (Residential)**	**VRF with ERVs (Residential and Hotel)**	WSHP
Residential Cooling Efficiency C406.2 Measure	9.3 EER	**14.3 EER**	15 EER WSHP 14.1 EER VRF	14.1 EER VRF	14.3 EER
Residential Heating Efficiency	90% Ec Boiler	**95% Ec Boiler, 4.7 COP**	**95% Ec Boiler** **4.2 COP VRF**	**95% Ec Boiler** **4.2 COP VRF**	95% Ec Boiler, 4.7 COP
Retail HVAC System	Air Cooled Packaged VAV w/ Hot Water Coils	Air Cooled Packaged VAV w/ Hot Water Coils	Air Cooled Packaged VAV w/ Hot Water Coils	Air Cooled Packaged VAV w/ Hot Water Coils	Air Cooled Packaged VAV w/ Hot Water Coils
Retail Cooling Efficiency	12.2 EER	**13 EER**	13 EER	13 EER	13 EER
Retail Heating Efficiency	82% Ec Boiler	**95% Ec Boiler**	95% Ec Boiler	95% Ec Boiler	95% Ec Boiler
Domestic Hot Water	80% Et Boiler	**95% Et Boiler (central)**	95% Et Boiler (central)	95% Et Boiler (central)	95% Et Boiler (central)
Lighting LPD (Space by Space) C406.3 Measure	0.51 x 90% = 0.46 W/SF (Residential) 0.66 x 90% = 0.594 W/SF (Corridor) 0.69 x 90% = 0.621 W/SF (Stairwell) 1.44 W/SF (Retail) 0.19 x 90% = 0.171 W/SF (Parking) 0.42 x 90% = 0.378 W/SF (Mechanical) *Vacancy sensors in common spaces *Dimming panels	**0.41 W/SF (Residential)** **0.594 W/SF (Corridor)** **0.60 W/SF (Stairwell)** **1.44 W/SF (Retail)** **0.14 W/SF (Parking)** **0.32 (Mechanical)** ***Vacancy sensors in common spaces** ***Dimming panels**	0.41 W/SF (Residential) 0.594 W/SF (Corridor) 0.60 W/SF (Stairwell) 1.44 W/SF (Retail) 0.095 W/SF (Parking) 0.32 (Mechanical) *Vacancy sensors in common spaces *Dimming panels	0.41 W/SF (Residential) 0.594 W/SF (Corridor) 0.60 W/SF (Stairwell) 1.44 W/SF (Retail) 0.095 W/SF (Parking) 0.32 (Mechanical) *Vacancy sensors in common spaces *Dimming panels	0.41 W/SF (Residential) 0.594 W/SF (Corridor) 0.60 W/SF (Stairwell) 1.44 W/SF (Retail) 0.14 W/SF (Parking) 0.32 (Mechanical) *Vacancy sensors in common spaces *Dimming panels
Appliances	Standard Efficiency	Energy Star Rated	Energy Star Rated	Energy Star Rated	Energy Star Rated
Bathroom Fans	N/A - exhaust fans included in total system fan energy	N/A - exhaust fans included in total system fan energy	N/A - exhaust fans included in total system fan energy	N/A - exhaust fans included in total system fan energy	N/A - exhaust fans included in total system fan energy
Elevators	same as proposed	Regenerative Drive	Regenerative Drive	Regenerative Drive	Regenerative Drive
Additional Efficiency Package(s) Included in Baseline	Lighting and 10% Improved HVAC Eff.	Lighting and 10% Improved HVAC Eff.	Lighting and 10% Improved HVAC Eff.	Lighting and 10% Improved HVAC Eff.	Lighting and 10% Improved HVAC Eff.

Notes:

(1) Utility rates assumed to be $0.14 per KWH (electric) and $1.10 per therm (gas) for both cases

(2) Wall and roof insulation values are "equivalent" R-values and include inside and outside film effects

(3) Window U-value and SHGC are for fenestration total assembly

(4) The energy model summarized in this report shall be used for comparison purposes only. Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by the ASHRAE 90.1 App. G procedure, changes in the energy rates between design of the building and occupancy, and the precision of the calculation tool.

REPORT- BEPS Building Energy Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
MBTU	2671.0	0.0	2336.0	0.0	1539.0	0.0	65.5	2765.0	0.0	0.0	0.0	0.0	9376.8
FM1 NATURAL-GAS													
MBTU	0.0	0.0	0.0	8901.0	0.0	0.0	0.0	0.0	0.0	0.0	3881.0	0.0	12782.0
MBTU	2671.0	0.0	2336.0	8901.0	1539.0	0.0	65.5	2765.0	0.0	0.0	3881.0	0.0	22159.0

TOTAL SITE ENERGY 22159.10 MBTU 54.5 KBTU/SQFT-YR GROSS-AREA 54.5 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 40912.80 MBTU 100.7 KBTU/SQFT-YR GROSS-AREA 100.7 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.75
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 11
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 55

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	782499.	0.	684569.	0.	450995.	0.	19202.	810153.	0.	0.	0.	0.	2747417.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	89009.	0.	0.	0.	0.	0.	0.	38813.	0.	127822.

TOTAL ELECTRICITY	2747417. KWH	6.762 KWH	/SQFT-YR GROSS-AREA	6.762 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	127822. THERM	0.315 THERM	/SQFT-YR GROSS-AREA	0.315 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.75
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 11
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 55

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPS Building Energy Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
MBTU	2317.0	0.0	2336.0	838.1	1170.0	23.5	605.7	2454.0	0.0	0.0	0.0	0.0	9744.7
FM1 NATURAL-GAS													
MBTU	0.0	0.0	0.0	4316.0	0.0	0.0	0.0	0.0	0.0	0.0	3263.0	0.0	7579.0
MBTU	2317.0	0.0	2336.0	5154.0	1170.0	23.5	605.7	2454.0	0.0	0.0	3263.0	0.0	17324.0

TOTAL SITE ENERGY 17323.80 MBTU 42.6 KBTU/SQFT-YR GROSS-AREA 42.6 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 36813.30 MBTU 90.6 KBTU/SQFT-YR GROSS-AREA 90.6 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.83
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 8
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 152

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	678814.	0.	684569.	245567.	342865.	6900.	177457.	719034.	0.	0.	0.	0.	2855208.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	43163.	0.	0.	0.	0.	0.	0.	32627.	0.	75790.

TOTAL ELECTRICITY	2855208. KWH	7.028 KWH	/SQFT-YR GROSS-AREA	7.028 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	75790. THERM	0.187 THERM	/SQFT-YR GROSS-AREA	0.187 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.83
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 8
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 152

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPS Building Energy Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
MBTU	2317.0	0.0	2336.0	1049.0	756.2	6.9	323.1	2454.0	0.0	172.5	0.0	0.0	9414.9
FM1 NATURAL-GAS													
MBTU	0.0	0.0	0.0	2335.0	0.0	0.0	0.0	0.0	0.0	0.0	3263.0	0.0	5597.4
MBTU	2317.0	0.0	2336.0	3384.0	756.2	6.9	323.1	2454.0	0.0	172.5	3263.0	0.0	15012.0

TOTAL SITE ENERGY 15012.30 MBTU 37.0 KBTU/SQFT-YR GROSS-AREA 37.0 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 33842.10 MBTU 83.3 KBTU/SQFT-YR GROSS-AREA 83.3 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.81
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 8
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 151

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	678814.	0.	684569.	307308.	221576.	2027.	94680.	719029.	0.	50550.	0.	0.	2758554.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	23347.	0.	0.	0.	0.	0.	0.	32627.	0.	55974.

TOTAL ELECTRICITY	2758554. KWH	6.790 KWH	/SQFT-YR GROSS-AREA	6.790 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	55974. THERM	0.138 THERM	/SQFT-YR GROSS-AREA	0.138 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.81
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 8
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 151

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

Parcel P-12C DOE-2.2-48y 9/19/2019 15:05:00 BDL RUN 10

REPORT- BEPS Building Energy Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
MBTU	2317.0	0.0	2336.0	1133.0	610.7	0.0	20.5	2454.0	0.0	250.5	0.0	0.0	9121.9
FM1 NATURAL-GAS													
MBTU	0.0	0.0	0.0	1481.0	0.0	0.0	0.0	0.0	0.0	0.0	3263.0	0.0	4743.6
MBTU	2317.0	0.0	2336.0	2614.0	610.7	0.0	20.5	2454.0	0.0	250.5	3263.0	0.0	13866.0

TOTAL SITE ENERGY 13865.50 MBTU 34.1 KBTU/SQFT-YR GROSS-AREA 34.1 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 32109.40 MBTU 79.0 KBTU/SQFT-YR GROSS-AREA 79.0 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.81
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 8
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 151

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	678814.	0.	684569.	331975.	178923.	0.	6010.	719029.	0.	73403.	0.	0.	2672726.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	14808.	0.	0.	0.	0.	0.	0.	32627.	0.	47436.

TOTAL ELECTRICITY	2672726.	KWH	6.578 KWH	/SQFT-YR GROSS-AREA	6.578 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	47436.	THERM	0.117 THERM	/SQFT-YR GROSS-AREA	0.117 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.81
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 8
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 151

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPS Building Energy Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
MBTU	2243.0	0.0	2336.0	10.3	1181.0	17.6	278.8	2449.0	0.0	0.0	0.0	0.0	8516.5
FM1 NATURAL-GAS													
MBTU	0.0	0.0	0.0	1444.0	0.0	0.0	0.0	0.0	0.0	0.0	3263.0	0.0	4706.4
MBTU	2243.0	0.0	2336.0	1454.0	1181.0	17.6	278.8	2449.0	0.0	0.0	3263.0	0.0	13223.0

TOTAL SITE ENERGY 13222.90 MBTU 32.5 KBTU/SQFT-YR GROSS-AREA 32.5 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY 30255.90 MBTU 74.5 KBTU/SQFT-YR GROSS-AREA 74.5 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 4.91
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 7
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 423

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance WEATHER FILE- Boston MA TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH	657191.	0.	684569.	3031.	346099.	5149.	81675.	717621.	0.	0.	0.	0.	2495334.
FM1 NATURAL-GAS													
THERM	0.	0.	0.	14436.	0.	0.	0.	0.	0.	0.	32627.	0.	47064.

TOTAL ELECTRICITY	2495334. KWH	6.142 KWH	/SQFT-YR GROSS-AREA	6.142 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	47064. THERM	0.116 THERM	/SQFT-YR GROSS-AREA	0.116 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 4.91
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 7
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 423

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

GHG Mitigation Technologies

Millennium Parcel P12C

10/1/2019

KEY: P = Proposed (Case 2) - included in modeling
A = Examined as alternative - not included in modeling (real numbers discussed in write-up)
S = to be studied at later design phase - no quantitative analysis, potential for inclusion at a later date
X = Not applicable or not feasible

Mitigation Measure/Technology	Building Use				Remarks
Building	Retail/ Community	Residential	Hotel	Garage	
Building Type	New Construction	New Construction	New Construction	New Construction	
Energy Use Reduction					
Building Orientation	X	X	X	X	
High performance building envelope	P	P	P	P	
Green roof/podium areas	X	X	X	X	
Light or reflective roof	P	P	P	P	
Exterior shading devices	S	S	S	S	
Premium electric motors	P	P	P	P	
Radiant heat	X	X	X	X	
Under-floor air distribution/displacement	X	X	X	X	
Heat or energy recovery	P	P	P	P	
Demand-controlled Ventilation	P	P	P	P	Where required by code
Room occupancy sensor, lighting	P	P	P	P	Garage, common spaces, conference rooms
Natural lighting	P	P	P	P	
Daylighting Controls	P	X	X	X	
Reduced LPD interior	P	P	P	P	
High performance lighting, exterior	P	P	P	P	
Energy-Star appliances	P	P	P	P	
Advanced elevators	P	P	P	P	
High efficiency mechanical equipment	P	P	P	P	
Energy Generation					
Cogeneration, CHP	X	X	X	X	
District heating/cooling	X	X	X	X	
Fuel cell	X	X	X	X	
Solar hot water generation	X	X	X	X	Potential PV area better utilized for power generation
PV - roof	S	S	S	S	At the garage
3rd Party PV	S	S	S	S	
PV-ready construction	X	S	X	P	
Ground source heat pumps	X	X	X	X	
Wind turbines	X	X	X	X	
Purchased Green Energy	S	S	S	S	
Other Related (not quantified)					
LEED target					
Owner Influence on tenant	P	P	P	P	
Rainwater harvesting	X	X	X	X	
Low flow fixtures, water conservation	P	P	P	P	
Recycling collection areas	P	P	P	P	
Enhanced refrigerant management	S	S	S	S	
Energy management system	P	P	P	P	
Enhanced building commissioning	S	S	S	S	
Construction waste recycling	P	P	P	P	
Recycled content materials	S	S	S	S	Approximately 10% to 20%
Regional materials	S	S	S	S	Approximately 10% to 20%

Attachment H

Accessibility Checklist

Article 80 – Accessibility Checklist

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

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

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

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

Accessibility Analysis Information Sources:

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

Glossary of Terms:

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

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

Project Name:	Parcel P-12C		
Primary Project Address:	286-290 Tremont Street		
Total Number of Phases/Buildings:	1/1		
Primary Contact (Name / Title / Company / Email / Phone):	Halle A. Thomas / MP Boston / hthomas@mpbos.com / 617-451-0300		
Owner / Developer:	288 Tremont Street Partners LLC, A Partnership between Asian Community Development Corporation, Corcoran Jennison Company, Inc., MPB Tremont LLC (an affiliate of MP Boston) and Tufts Shared Services, Inc. c/o MP Boston		
Architect:	Stantec		
Civil Engineer:	Nitsch Engineering		
Landscape Architect:	GROUND, Inc.		
Permitting:	Epsilon Associates, Inc.		
Construction Management:	TBD		
At what stage is the project at time of this questionnaire? Select below:			
	PNF / Expanded PNF Submitted	Draft / Final Project Impact Report Submitted	BPDA Board Approved
	BPDA Design Approved	Under Construction	Construction Completed:
Do you anticipate filing for any variances with the Massachusetts Architectural Access Board (MAAB)? ***If yes,*** identify and explain.	Yes. 1. Pending the design of the kitchens, the knee clearance & sink depth in accessible Group 2A units may require a variance to comply with CMR 521 Section 45.4. 2. Pending the sill height design of the perimeter windows, a variance may be required for electrical outlet mounting heights to comply with both CMR 521 Section 6 & NEC 210.52.A.2.		

2. Building Classification and Description:
This section identifies preliminary construction information about the project including size and uses.

What are the dimensions of the project?				
Site Area:	*29,152 SF*	Building Area:		*426,500 GSF*
Building Height:	*350 above avg. mean grade FT.*	Number of Stories:		*30 Flrs.*
First Floor Elevation:	**Varies 26'-30'**	Is there below grade space:		***Yes*** */ No*
What is the Construction Type? (Select most appropriate type)				
	~~Wood Frame~~	~~Masonry~~	**Steel Frame**	**Concrete**
What are the principal building uses? (IBC definitions are below – select all appropriate that apply)				
	~~Residential – One - Three Unit~~	**Residential - Multi-unit, Four +**	~~Institutional~~	~~Educational~~
	~~Business~~	~~Mercantile~~	~~Factory~~	**Hospitality**
	~~Laboratory / Medical~~	**Storage, Utility and Other**	**Assembly**	
List street-level uses of the building:	*Assembly, Residential, Hospitality,*			

3. Assessment of Existing Infrastructure for Accessibility:

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

Provide a description of the neighborhood where this development is located and its identifying topographical characteristics:	The Project is located at the western edge of the Chinatown neighborhood of Boston, with close proximity to several of the City's most active neighborhoods including the Midtown Cultural District, Back Bay, and the Financial District. The surrounding area includes a mix of residential and commercial space, as well as ground floor retail and small plazas and open spaces. The topography is relatively level, with some areas of slight inclines. Many buildings within the vicinity contain elevators. The site is located within one-half mile of several MBTA stations providing service on the Orange, Green, Blue and Red Lines, including Tufts Medical Center Station, Chinatown Station, Boylston Street Station, Park Street Station, Downtown Crossing Station and Arlington Station. Several MBTA bus stops are also nearby, as well as the Silver Line. South Station also provides service on the Commuter Rail and Amtrak. This proximity to public transit makes the area an ideal location for the Project.
List the surrounding accessible MBTA transit lines and their proximity to development site: commuter rail / subway stations, bus stops:	Tufts Medical Center (226 ft); Chinatown Station (0.3-mile); Boylston Street Station (0.2-mile); Park Street Station (0.4-mile); Arlington Station (0.4-mile); Downtown Crossing Station (0.5-mile); South Station (0.7-mile); 285 MBTA Bus Stop (52 ft); Tremont @ Charles Street MBTA Bus Stop (482 ft); Tremont Street @ Stuart Streets MBTA Bus Stop (0.1-mile); Washington Street @ Tufts Medical Center MBTA Bus Stop (0.2-mile); Tremont @ Marginal Street MBTA Bus Stop (0.2-mile); Charles Street @ Park Plaza MBTA Bus Stop (0.2-mile).

List the surrounding institutions: hospitals, public housing, elderly and disabled housing developments, educational facilities, others:	Department of Veterans' Services, Boston Center for Adult Education, Action for Boston Community Development, Inc., Boston Center for Independent Living, Curtin Home Care, Tufts Medical Center; Boston University Affiliated Physicians in Copley Square, Boston Housing Authority, Boston Adult Technical Academy, Friedman School of Nutritional Science, Floating Hospital for Children.
List the surrounding government buildings: libraries, community centers, recreational facilities, and other related facilities:	Boston Common, Boston Public Garden, Eliot Norton Park, Statler Park, Lincoln Square, Chinatown Gate, Rose Kennedy Greenway Chinatown Park, Boston Chinatown Neighborhood Center, Boston Public Library, YMCA, South Cove Community Health Center, Chinese Progressive Association, Asian Community Development Corporation, Community Opportunities Group.

4. Surrounding Site Conditions – Existing:

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

Is the development site within a historic district? ***If yes,*** identify which district:	No
Are there sidewalks and pedestrian ramps existing at the development site? ***If yes***, list the existing sidewalk and pedestrian ramp dimensions, slopes, materials, and physical condition at the development site:	Yes, there is approximately 215 linear feet of sidewalk adjacent to the Project site. The existing sidewalk is approximately 14 feet wide. Most of the sidewalk is cement concrete with a 40-foot long section of red brick. The existing brick sidewalk is in fair condition. The existing cement concrete sidewalks range from fair to poor condition with areas of cracking and spalling, and a number of asphalt patches.
Are the sidewalks and pedestrian ramps existing-to-remain? ***If yes,*** have they been verified as ADA / MAAB compliant (with yellow composite detectable warning surfaces, cast in concrete)? ***If yes,*** provide description and photos:	No, sidewalks are proposed to be removed and replaced. There are no existing pedestrian ramps in the sidewalk adjacent to the building.

5. Surrounding Site Conditions – Proposed

This section identifies the proposed condition of the walkways and pedestrian ramps around the development site. Sidewalk width contributes to the degree of comfort walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may create dangerous conditions that force people to walk in the street. Wider sidewalks allow people to walk side by side and pass each other comfortably walking alone, walking in pairs, or using a wheelchair.

Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? ***If yes***, choose	Tremont Street is classified as a Downton Mixed-Use Street.

which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, or Boulevard.	
What are the total dimensions and slopes of the proposed sidewalks? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone:	Total sidewalk width is approximately 18.5'. Slopes will comply with ADA/MAAB requirements of <2% cross slopes and <5% running slopes. Sidewalk zone widths will consist of approximately 2' Frontage Zone, 10' Pedestrian Zone, and 6.5' Furnishing and Curb Zone.
List the proposed materials for each Zone. Will the proposed materials be on private property or will the proposed materials be on the City of Boston pedestrian right-of-way?	The main path of pedestrian travel along the public sidewalk will be City standard cement concrete. Other materials are TBD.
Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way? ***If yes,*** what are the proposed dimensions of the sidewalk café or furnishings and what will the remaining right-of-way clearance be?	No.
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the Public Improvement Commission (PIC)?	N/A
Will any portion of the Project be going through the PIC? ***If yes,*** identify PIC actions and provide details.	Yes. The Project will go through PIC for Specific Repairs relating to sidewalk improvements on Tremont Street.
6. Accessible Parking: *See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirement counts and the Massachusetts Office of Disability – Disabled Parking Regulations*.	
What is the total number of parking spaces provided at the development	The proposed open-air parking garage of up to 340 spaces is accessed only through an existing adjacent garage. The garage is not intended for the

site? Will these be in a parking lot or garage?	proposed residential or hotel use.
What is the total number of accessible spaces provided at the development site? How many of these are "Van Accessible" spaces with an 8 foot access aisle?	The existing adjacent garage will accommodate the required number of accessible spaces, derived from the additional load of the new addition. Tufts Shared Services (owner of the existing garage) will continue its current practice to accommodate accessible vans for guests visiting the health services campus of Tufts Medical Center and Tufts University. Currently, and in the future after the delivery of the Project, accessible vehicles that do not fit in the parking garage (due to height constraints) will be serviced by the valet operation run by Tufts Shared Services, which is provided free of charge.
Will any on-street accessible parking spaces be required? ***If yes,*** has the proponent contacted the Commission for Persons with Disabilities regarding this need?	No.
Where is the accessible visitor parking located?	In addition to street parking, accessible parking is available inside the existing Tufts Shared Services garage. Van Accessible visitors will utilize the valet service on site, as mentioned above.
Has a drop-off area been identified? ***If yes,*** will it be accessible?	Yes, drop off areas have been indicated on the plans, both in front of the hotel entry, and in front of the residential entry. Yes, these drop off zones at grade will be accessible.
7. Circulation and Accessible Routes: *The primary objective in designing smooth and continuous paths of travel is to create universal access to entryways and common spaces, which accommodates persons of all abilities and allows for visitability with neighbors*.	
Describe accessibility at each entryway: Example: Flush Condition, Stairs, Ramp, Lift or Elevator:	All main entrances will be a flush condition, back of house entrances at loading areas will require a ramps and stairs.
Are the accessible entrances and standard entrance integrated? ***If yes,*** *describe.* ***If no,*** what is the reason?	Yes
If project is subject to Large Project Review/Institutional Master Plan, describe the accessible routes way-finding / signage package.	Yes, the Project is subject to Large Project Review. Refer to the accessibility plan for routing into the building. The signage package will comply with ADA & MAAB regulations.

8. Accessible Units (Group 2) and Guestrooms: (If applicable) *In order to facilitate access to housing and hospitality, this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing and hotel rooms.*	
What is the total number of proposed housing units or hotel rooms for the development?	Up to 171 Housing Units and up to 200 Hotel Keys
If a residential development, how many units are for sale? How many are for rent? What is the breakdown of market value units vs. IDP (Inclusionary Development Policy) units?	Approximately 105 Rental Units, approximately 63 Ownership Units Approximately 110 IDP units, 100% affordable units.
If a residential development, how many accessible Group 2 units are being proposed?	10% of rental units are proposed as accessible.
If a residential development, how many accessible Group 2 units will also be IDP units? *If none*, describe reason.	All 10% of accessible rental units will be affordable rentals.
If a hospitality development, how many accessible units will feature a wheel-in shower? Will accessible equipment be provided as well? *If yes,* provide amount and location of equipment.	Per 521 CMR Architectural Access Board Regulations, 5% of the hotel rooms/suites will be *accessible* and a minimum of two rooms/suites will have wheel-in showers.
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs / thresholds at entry, step to balcony, others. *If yes*, provide reason.	No
Are there interior elevators, ramps or lifts located in the development for access around architectural barriers and/or to separate floors? *If yes*, describe:	Yes, the Project proposes elevators that serve every floor.
9. Community Impact:	

Accessibility and inclusion extend past required compliance with building codes. Providing an overall scheme that allows full and equal participation of persons with disabilities makes the development an asset to the surrounding community.	
Is this project providing any funding or improvements to the surrounding neighborhood? Examples: adding extra street trees, building or refurbishing a local park, or supporting other community-based initiatives?	A community space is being planned for the ground floor and an existing parking lot will become a courtyard for public use, in addition to sidewalk improvements along Tremont Street.
What inclusion elements does this development provide for persons with disabilities in common social and open spaces? Example: Indoor seating and TVs in common rooms; outdoor seating and barbeque grills in yard. Will all of these spaces and features provide accessibility?	There will be public hotel amenities and residential amenities that will be accessible.
Are any restrooms planned in common public spaces? ***If yes,*** will any be single-stall, ADA compliant and designated as "Family"/ "Companion" restrooms? ***If no***, explain why not.	Yes, Yes
Has the proponent reviewed the proposed plan with the City of Boston Disability Commissioner or with their Architectural Access staff? ***If yes,*** did they approve? ***If no,*** what were their comments?	No, the Project has not yet been reviewed.
Has the proponent presented the proposed plan to the Disability Advisory Board at one of their monthly meetings? Did the Advisory Board vote to support this project? ***If no,*** what recommendations did the Advisory Board give to make this project more accessible?	No, the Project has not yet been reviewed.
10. Attachments	

Include a list of all documents you are submitting with this Checklist. This may include drawings, diagrams, photos, or any other material that describes the accessible and inclusive elements of this project.
Provide a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations, including route distances. Please note the proposed parking garage is for Tufts Medical Center and Tufts University. It is not intended to serve the hotel and residential tower Refer to the accessibility diagrams for drop-off area locations and route distances.
Provide a diagram of the accessible route connections through the site, including distances.
Provide a diagram the accessible route to any roof decks or outdoor courtyard space? (if applicable)
Provide a plan and diagram of the accessible Group 2 units, including locations and route from accessible entry.
Provide any additional drawings, diagrams, photos, or any other material that describes the inclusive and accessible elements of this project. • • • •

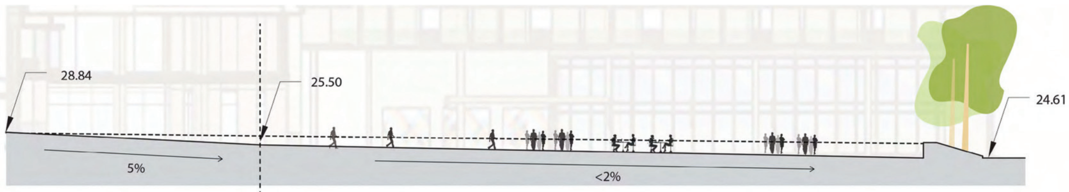
This completes the Article 80 Accessibility Checklist required for your project. Prior to and during the review process, Commission staff are able to provide technical assistance and design review, in order to help achieve ideal accessibility and to ensure that all buildings, sidewalks, parks, and open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

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

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

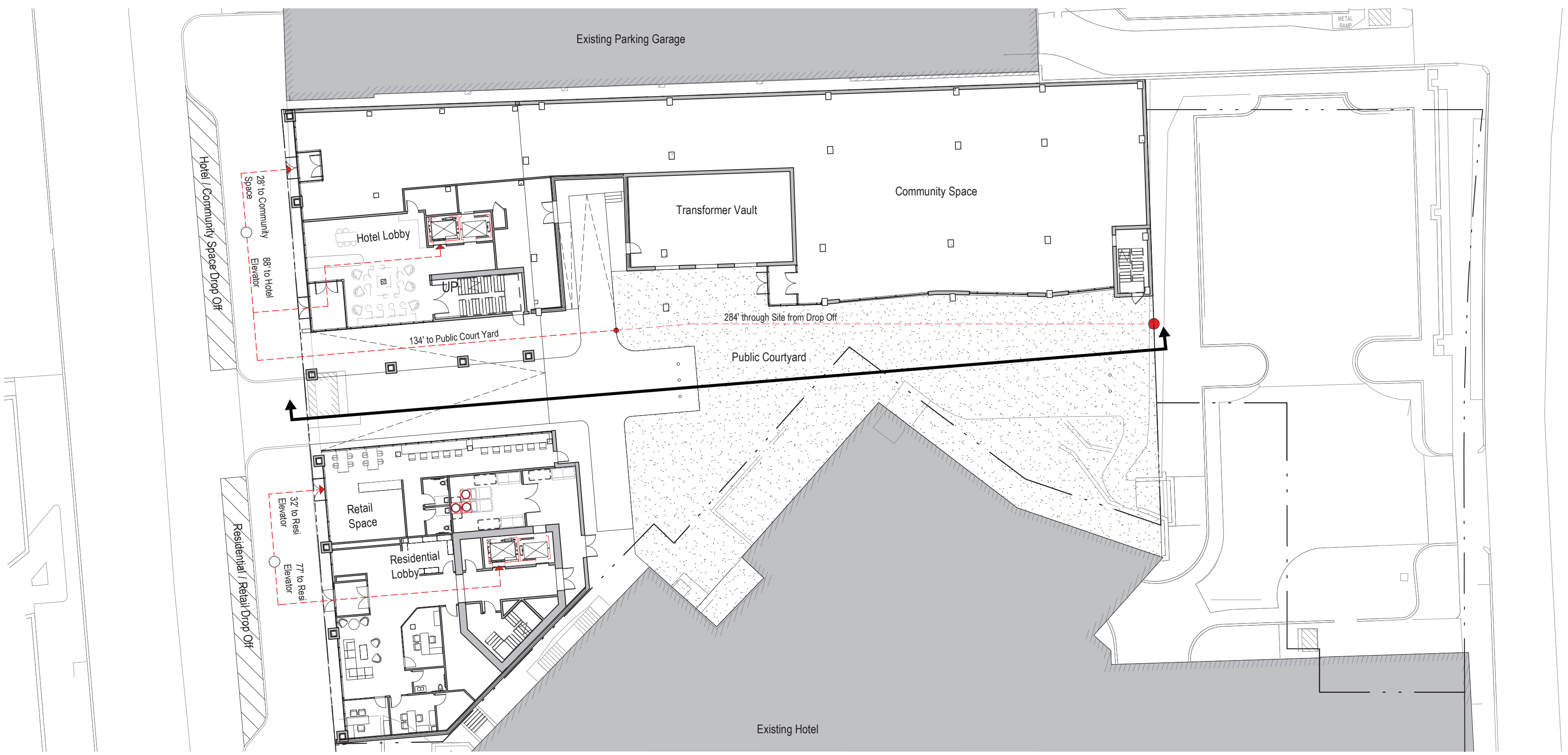
Architectural Access staff can be reached at:

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



Public Court Yard Section

NTS



1" = 30'-0"

Accessibility Plan - Ground Floor

1" = 30'-0"

0 8' 16' 32'

Stantec

Ground Floor Accessibility Diagrams

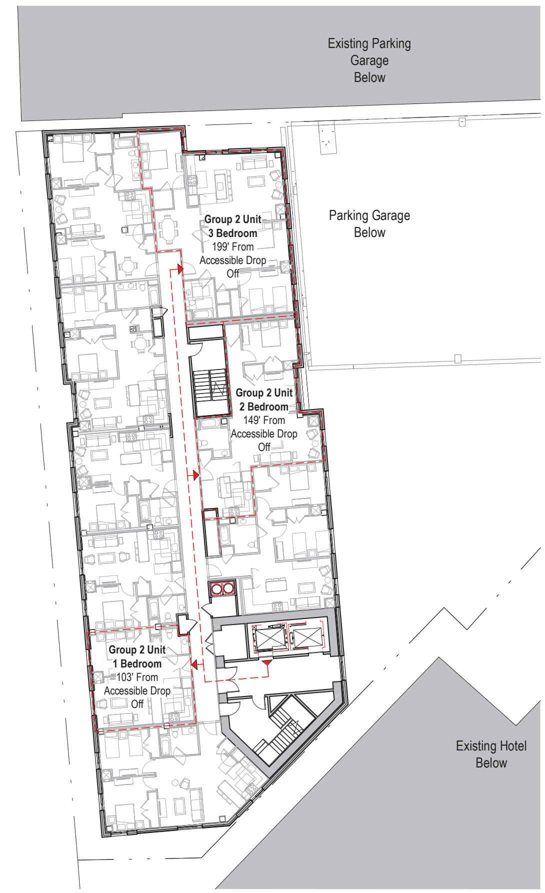
Parcel P12C

09/06/19

Stantec

Accessibility Plan - Typical Hotel Floor

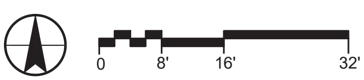
1" = 30'-0"



Accessibility Plan - Typical Residential Floor

1" = 30'-0"

Please Note: All Distances provided are horizontal distances only. All floor will be accessible by Elevator



1" = 30'-0"

Accessibility Diagrams

Parcel P12C

09/06/19

Attachment I

Boston Smart Utilities Checklist

Boston Smart Utilities Checklist

Date Submitted:	10/15/2019 13:40:27
Submitted by:	fvardy@epsilonassociates.com

Background

The Smart Utilities Checklist will facilitate the Boston Smart Utilities Steering Committee's review of:

a) compliance with the Smart Utilities Policy for Article 80 Development Review, which calls for the integration of five (5) Smart Utility Technologies (SUTs) into Article 80 developments

b) integration of the Smart Utility Standards

More information about the Boston Smart Utilities Vision project, including the Smart Utilities Policy and Smart Utility Standards, is available at:
www.http://bostonplans.org/smart-utilities

Note: Any documents submitted via email to manuel.esquivel@boston.gov will not be attached to the pdf form generated after submission, but are available upon request.

Part 1 - General Project Information

1.1 Project Name	Parcel P-12C
1.2 Project Address	286-290 Tremont Street
1.3 Building Size (square feet) **For a multi-building development, enter total development size (square feet)*	426500
1.4 Filing Stage	Initial Filing (i.e., PNF)

1.5 Filing Contact Information

1.5a Name	Fiona Vardy

Boston Smart Utilities Checklist

1.5b Company	Epsilon Associates, Inc.
1.5c E-mail	fvardy@epsilonassociates.com
1.5d Phone Number	9784616243

1.6 Project Team

1.6a Project Owner/Developer	288 Tremont Street Partners, LLC, a Partnership between Asian Community Development Corporation, Corcoran Jennison Company, Inc., MPB Tremont LLC (an affiliate of MP Boston) and Tufts Shared Services, Inc., c/o MP Boston
1.6b Architect	Stantec
1.6c Permitting	Epsilon Associates, Inc.
1.6d Construction Management	TBD

Part 2 - District Energy Microgrids

Fill out this section if the proposed project's total development size is equal to or greater than 1.5 million square feet.

Note on submission requirements timeline:

Feasibility Assessment Part A should be submitted with PNF or any other initial filing.

Feasibility Assessment Part B should be submitted with any major filing during the Development Review stage (i.e., DPIR)

District Energy Microgrid Master Plan Part A should be submitted before submission of the Draft Board Memorandum by the BPDA Project Manager (Note: Draft Board Memorandums are due one month ahead of the BPDA Board meetings)

District Energy Microgrid Master Plan Part B should be submitted before applying for a Building Permit

Please email submission to manuel.esquivel@boston.gov

Boston Smart Utilities Checklist

2.1 Consultant Assessing/Designing District Energy Microgrid (if applicable)	
2.2 Latest document submitted	
2.3 Date of latest submission	
2.4 Which of the following have you had engagement/review meetings with regarding District Energy Microgrids? (select all that apply)	
2.5 What engagement meetings have you had with utilities and/or other agencies (i.e., MA DOER, MassCEC) regarding District Energy Microgrids? (Optional: include dates)	
2.6 Additional Information	

Part 3 - Telecommunications Utilidor

Fill out this section if the proposed project's total development size is equal to or greater than 1.5 million square feet OR if the project will include the construction of roadways equal to or greater than 0.5 miles in length.

Please submit a map/diagram highlighting the sections of the roads on the development area where a Telecom Utilidor will be installed, including access points to the Telcom Utilidor (i.e., manholes)

Please email submission to manuel.esquivel@boston.gov

3.1 Consultant Assessing/Designing Telecom Utilidor (if applicable)	

Boston Smart Utilities Checklist

3.2 Date Telecom Utilidor Map/Diagram was submitted	
3.3 Dimensions of Telecom Utilidor (include units)	
3.3a Cross-section (i.e., diameter, width X height)	
3.3b Length	
3.4 Capacity of Telecom Utilidor (i.e., number of interducts, 2 inch (ID) pipes, etc.)	
3.5 Which of the following have you had engagement/review meetings with regarding the Telecom Utilidor? (select all that apply)	
3.6 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding the Telecom Utilidor? (Optional: include dates)	
3.7 Additional Information	

Part 4 - Green Infrastructure

Fill out this section if the proposed project's total development size is equal to or greater than 100,000 square feet.

Please submit a map/diagram highlighting where on the development Green Infrastructure will be installed.

Please email submission to manuel.esquivel@boston.gov

Boston Smart Utilities Checklist

4.1 Consultant Assessing/Designing Green Infrastructure (if applicable)	Nitsch Engineering
4.2 Date Green Infrastructure Map/Diagram was submitted	10/15/2019
4.3 Types of Green Infrastructure included in the project (select all that apply)	Stormwater Infiltration System
4.4 Total impervious area of the development (in square inches)	4235904
4.5 Volume of stormwater that will be retained (in cubic inches)*	5296320

**Note: Should equal to at least "Total impervious area (entered in section 4.4)" times "1.25 inches"*

4.6 Which of the following have you had engagement/review meetings with regarding Green Infrastructure? (select all that apply)	No meetings to date.
4.7 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding Green Infrastructure? (Optional: include dates)	No meetings to date.
4.8 Additional Information	

Part 5 - Adaptive Signal Technology (AST)

Fill out this section if as part of your project BTD will require you to install new traffic signals or make significant improvements to the existing signal system.

Boston Smart Utilities Checklist

Please submit a map/diagram highlighting the context of AST around the proposed development area, as well as any areas within the development where new traffic signals will be installed or where significant improvements to traffic signals will be made.

Please email submission to manuel.esquivel@boston.gov

5.1 Consultant Assessing/Designing Adaptive Signal Technology (if applicable)	
5.2 Date AST Map/Diagram was submitted	
5.3 Describe how the AST system will benefit/impact the following transportation modes	
5.3a Pedestrians	
5.3b Bicycles	
5.3c Buses and other Public Transportation	
5.3d Other Motorized Vehicles	
5.4 Describe the components of the AST system (including system design and components)	
5.5 Which of the following have you had engagement/review meetings with regarding AST? (select all that apply)	
5.6 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding AST? (Optional: include dates)	
5.7 Additional Information	

Boston Smart Utilities Checklist

Part 6 - Smart Street Lights

Fill out this section if as part of your project PWD and PIC will require you to install new street lights or make significant improvements to the existing street light system.

Please submit a map/diagram highlighting where new street lights will be installed or where improvements to street lights will be made.

Please email submission to manuel.esquivel@boston.gov

6.1 Consultant Assessing/Designing Smart Street Lights (if applicable)	
6.2 Date Smart Street Lights Map/Diagram was submitted	
6.3 Which of the following have you had engagement/review meetings with regarding Smart Street Lights? (select all that apply)	
6.4 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding Smart Street Lights? (Optional: include dates)	
6.5 Additional Information	

Part 7 - Smart Utility Standards

The Smart Utility Standards set forth guidelines for planning and integration of SUTs with existing utility infrastructure in existing or new streets, including cross-section, lateral, and intersection diagrams. The Smart Utility Standards are intended to serve as guidelines for developers, architects, engineers, and utility providers for planning, designing, and locating utilities. The Smart Utility Standards will serve as the baseline for discussions on any deviations from the standards needed/proposed for any given utility infrastructure.

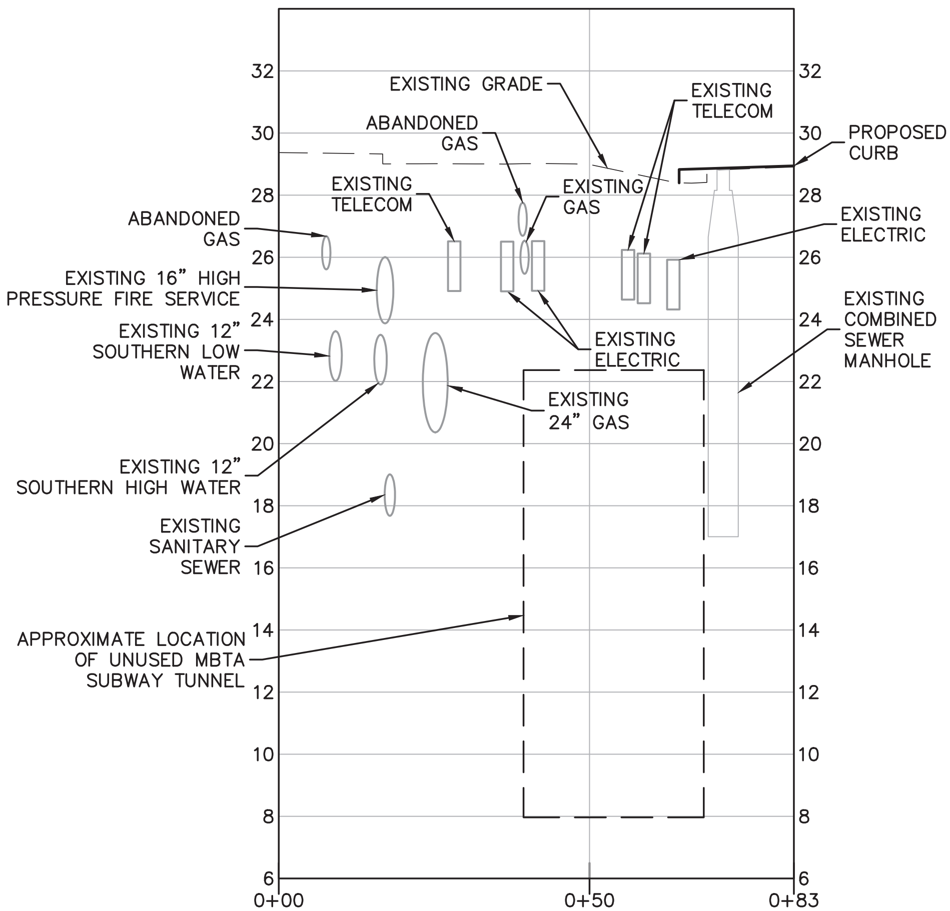
Boston Smart Utilities Checklist

Please submit typical below and above grade cross section diagrams of all utility infrastructure in the proposed development area (including infrastructure related to the applicable SUTs).

Please submit typical below and above grade lateral diagrams of all utility infrastructure in the proposed development area (including infrastructure related to the applicable SUTs).

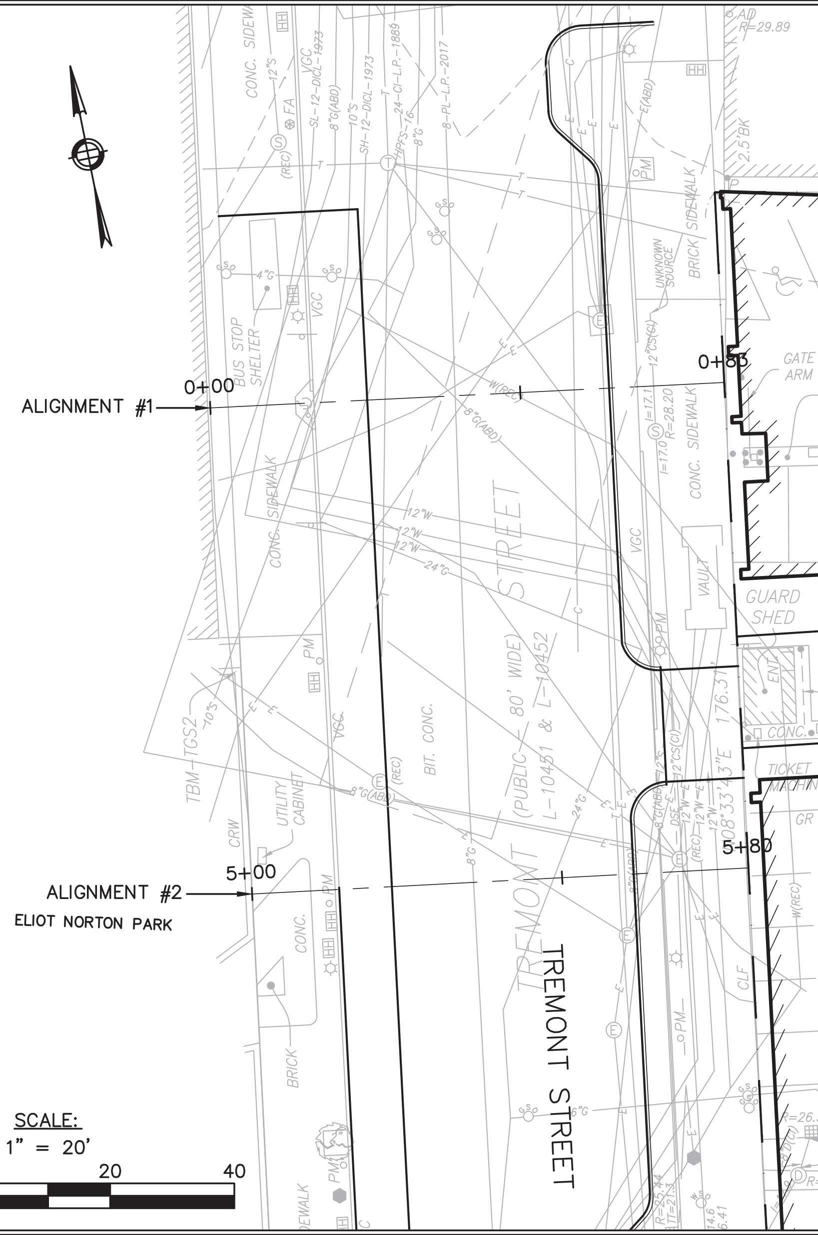
Please email submission to manuel.esquivel@boston.gov

7.1 Date Cross Section Diagram(s) was submitted	10/15/2019
7.2 Date Lateral Diagram(s) was submitted	10/15/2019
7.3 Additional Information	



UTILITY PROFILE #1 VIEW

HORIZONTAL SCALE SCALE: 1"=20'
VERTICAL SCALE SCALE: 1"=4'



SCALE:
1" = 20'
20 10 0 20 40

Nitsch Engineering

www.nitscheng.com
2 Center Plaza, Suite 430
Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472

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

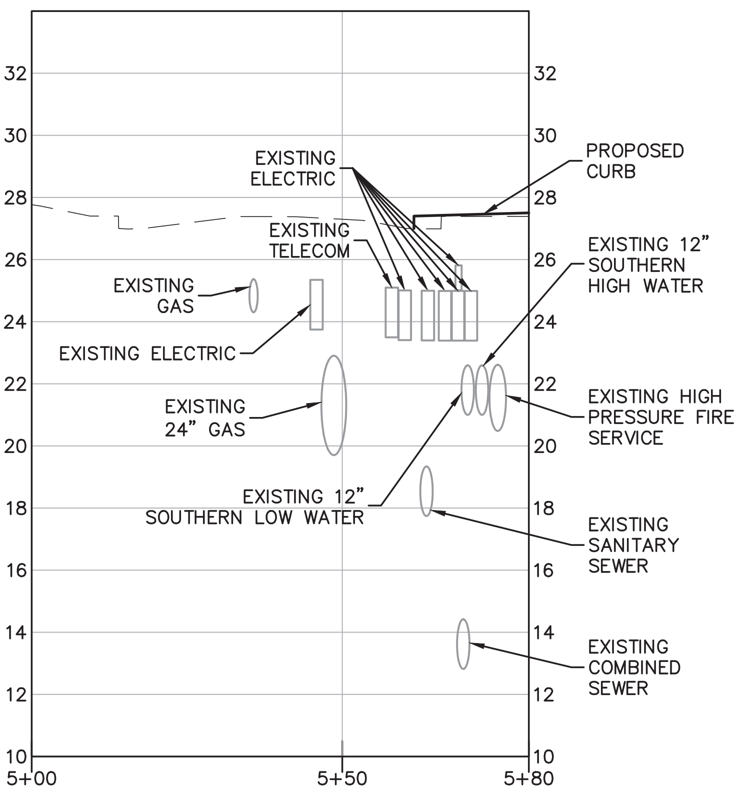
PARCEL 12C REDEVELOPMENT PROJECT
UTILITY PROFILE – TREMONT STREET
290 TREMONT STREET, BOSTON, MA 02116

PREPARED FOR
288 TREMONT STREET PARTNERS, LLC
33 ARCH STREET SUITE 2520
BOSTON, MA

PROJECT #	#12618
FILE:	12618cut.dwg
SCALE:	AS NOTED
DATE:	9/17/2019
PROJECT MGR:	CH
SURVEYOR:	
DRAFTED BY:	JR
CHECKED BY:	

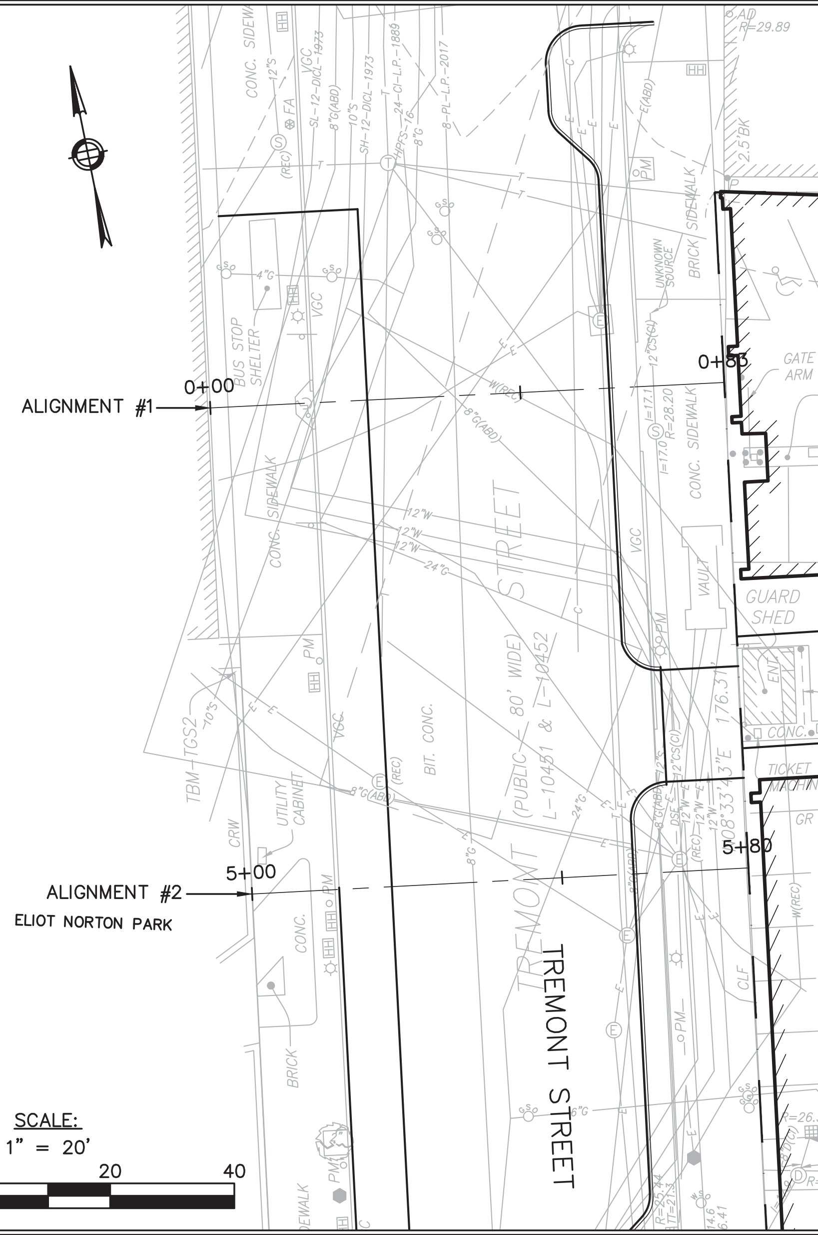
C-1

9/17/2019 2:40 PM
g:\12618 parcel 12c\civil\cad\12618cut.dwg



UTILITY PROFILE #2 VIEW

HORIZONTAL SCALE SCALE: 1"=20'
VERTICAL SCALE SCALE: 1"=4'



SCALE:
1" = 20'
20 10 0 20 40

Nitsch Engineering
www.nitscheng.com
2 Center Plaza, Suite 430
Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472

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

PARCEL 12C REDEVELOPMENT PROJECT
UTILITY PROFILE – TREMONT STREET
290 TREMONT STREET, BOSTON, MA 02116

PREPARED FOR:
288 TREMONT STREET PARTNERS, LLC
33 ARCH STREET SUITE 2520
BOSTON, MA

PROJECT #	#12618
FILE:	12618cut.dwg
SCALE:	AS NOTED
DATE:	9/17/2019
PROJECT MGR:	CH
SURVEYOR:	
DRAFTED BY:	JR
CHECKED BY:	

C-2

Attachment J

Circulation List

ATTACHMENT J CIRCULATION LIST

Kathleen A. Theoharides, Secretary
Executive Office of Energy and
Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Massachusetts Department of Transportation
Public/Private Development Unit
10 Park Plaza
Boston, MA 02116

Massachusetts Department of Transportation
District #6
Attn: MEPA Coordinator
185 Kneeland Street
Boston, MA 02111

Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

Division of Energy Resources
Attn: MEPA Coordinator
100 Cambridge Street, 10th Floor
Boston, MA 02114

Massachusetts Water Resource Authority
Attn: MEPA Coordinator
100 First Avenue, Building 39
Charlestown Navy Yard
Boston, MA 02129

Boston Water and Sewer Commission
John Sullivan, P.E.
980 Harrison Avenue
Boston, MA 02119

Boston Planning & Development Agency
Attn: Brian Golden, Director
1 City Hall Square
Boston, MA 02201

Boston Public Library, Chinatown Branch
2 Boylston Street
Boston, MA 02116

Massachusetts Architectural Access Board
1000 Washington Street, Suite 710
Boston, MA 02118

MA Board of Building Regulations & Standards
Attn: Patty Berry
1000 Washington Street, Suite 710
Boston, MA 02118

Attachment K

Broadband Ready Buildings Questionnaire

19				10/15/2019 9:56:49
		Form Publisher Template		
10/15/2019				

This is a simple template document automatically generated by Form Publisher.
Feel free to personalize it like any other Google Spreadsheet.

FormPublisher

Questions list:	
Project Name::	
Project Address Primary: :	
Project Address Additional: :	
Project Contact (name / Title / Company / email / phone): :	
Expected completion date:	
Owner / Developer:	288 Tremont Street Partners, LLC, a Partnership between Asian Community Development Corporation, Corcoran Jennison Company, Inc., MPB Tremont LLC (an affiliate of MP Boston) and Tufts Shared Services, Inc. c/o MP Boston
Architect:	Stantec
Engineer (building systems)::	Cosentini
Permitting::	Epsilon Associates, Inc.
Construction Management:	TBD
Number of Points of Entry:	Unknown
Locations of Points of Entry:	Unknown
Quantity and size of conduits:	Unknown
Location where conduits connect (e.g. building-owned manhole, carrier-specific manhole or stubbed at property line) :	Unknown
Other information/comments:	
Do you plan to conduct a utility site assessment to identify where cabling is located within the street? This information can be helpful in determining the locations of POEs and telco rooms. Please enter ‘unknown’ if these decisions have not yet been made or you are presently unsure.:	Unknown
Number of risers:	Unknown
Distance between risers (if more than one):	Unknown
Dimensions of riser closets:	4’x2’+/-
Riser or conduit will reach to top floor :	Unknown
Number and size of conduits or sleeves within each riser:	Unknown
Proximity to other utilities (e.g. electrical, heating):	Unknown
Other information/comments:	
What is the size of the telecom room?:	10’x19’+/-

Describe the electrical capacity of the telecom room (i.e. # and size of electrical circuits):	Unknown			
Will the telecom room be located in an area of the building containing one or more load bearing walls?:	No			
Will the telecom room be climate controlled? :	Unknown			
If the building is within a flood-prone geographic area, will the telecom equipment will be located above the floodplain?:	Yes			
Will the telecom room be located on a floor where water or other liquid storage is present?:	Yes			
Will the telecom room contain a flood drain?:	Unknown			
Will the telecom room be single use (telecom only) or shared with other utilities?:	Unknown			
Other information/comments:				
Will building/developer supply common inside wiring to all floors of the building? :	Unknown			
If yes, what transmission medium (e.g. coax, fiber)? Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.:				
Is the building/developer providing wiring within each unit? :	Unknown			
If yes, what transmission medium (e.g. coax, fiber)? Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.:				
Will the building conduct any RF benchmark testing to assess cellular coverage?:	Unknown			
Will the building allocate any floor space for future in-building wireless solutions (DAS/small cell/booster equipment)?:	Unknown			
Will the building be providing an in-building solution (DAS/ Small cell/ booster)? :	Unknown			
If so, are you partnering with a carrier, neutral host provider, or self-installing?:				
Will you allow cellular providers to place equipment on the roof?:	Unknown			
Will you allow broadband providers (fixed wireless) to install equipment on the roof? :	Unknown			
Will you allow broadband providers (fixed wireless) to install equipment on the roof? :	Unknown			
Date contacted:				
Does Comcast intend to serve the building?:	Unknown			
Transmission Medium:	Unknown			
If no or unknown, why?:				

Date contacted:				
Does RCN intend to serve the building?:	Unknown			
Transmission Medium:	Unknown			
If no or unknown, why?:				
Date contacted:				
Does Verizon intend to serve the building?:	Unknown			
Transmission Medium:	Unknown			
If no or unknown, why?:				
Date contacted:				
Does netBlazr intend to serve the building?:	Unknown			
Transmission Medium:	Unknown			
If no or unknown, why?:				
Date contacted:				
Does WebPass intend to serve the building?:				
Transmission Medium:	Unknown			
If no or unknown, why?:				
Date contacted:				
Does Starry intend to serve the building?:	Unknown			
Transmission Medium:	Unknown			
If no or unknown, why?:				
Do you plan to abstain from exclusivity agreements with broadband and cable providers? :	Unknown			
Do you plan to make public to tenants and prospective tenants the list of broadband/cable providers who serve the building?:	Unknown			