Millennium Tower & Burnham Building

Notice of Project Change

Submitted Pursuant to Article 80 of the Boston Zoning Code

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

Submitted by:
MP Franklin, LLC
c/o Millennium Partners
172 Tremont Street, Suite 400
Boston, MA 02111-1001

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

In Association with:
Handel Architects LLP
DLA Piper LLP
Howard/Stein-Hudson Associates, Inc.
Nitsch Engineering
Haley & Aldrich
WSP Flack & Kurtz
RWDI
Suffolk Construction
MacRostie Historic Advisors, LLC

August 6, 2012

Epsilon
ASSOCIATES INC.

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Chapter 1.0

General Information and Project Description

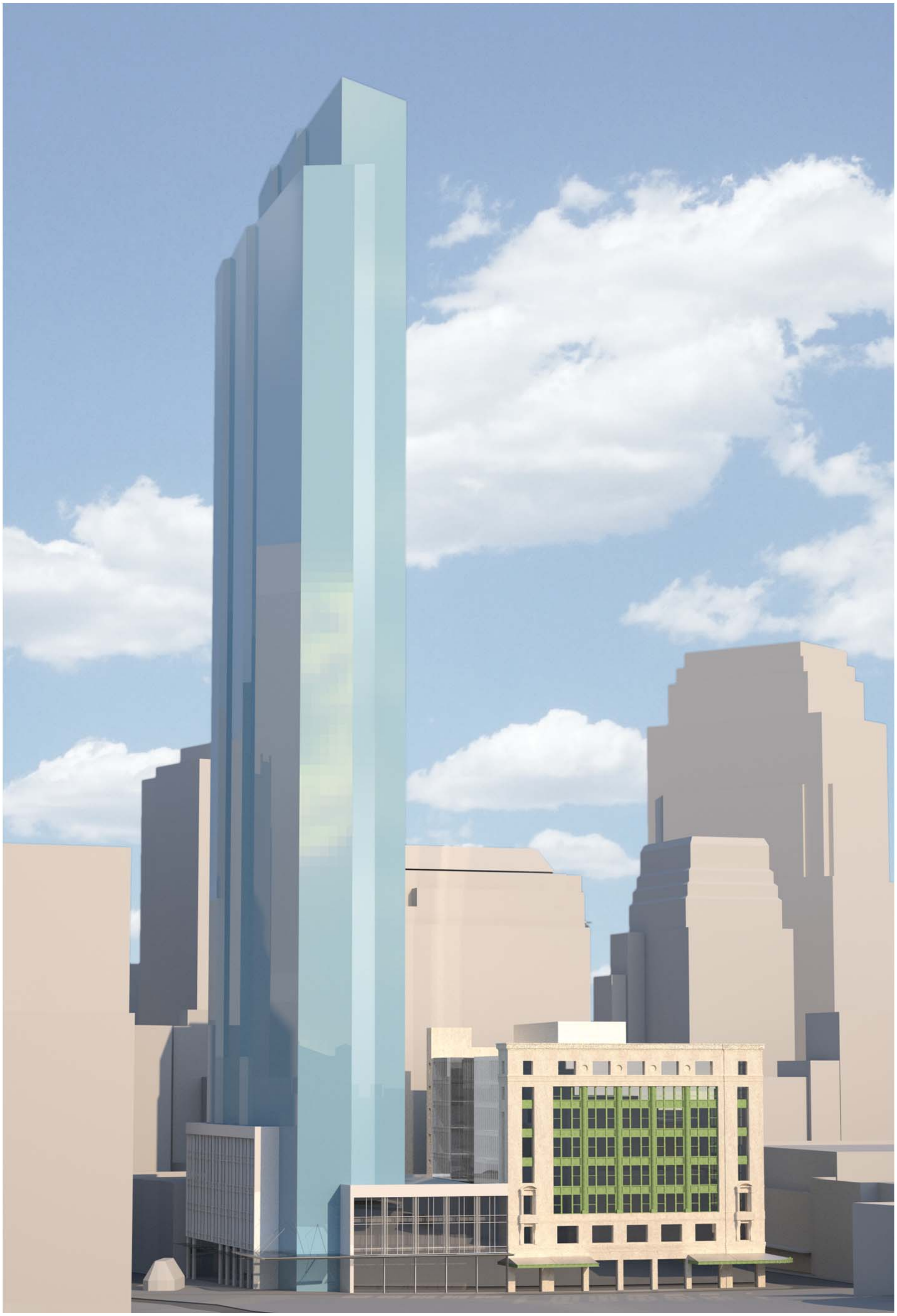
1.0 GENERAL INFORMATION AND PROJECT DESCRIPTION

1.1 Introduction

The Millennium Tower and Burnham Building project (the Project) as shown on Figure 1-1, proposed by MP Franklin, LLC (the Proponent), a Delaware limited liability company controlled by the principals of Millennium Partners, will be located at the partially vacant site of the former Filene's Department Store in the block surrounded by Washington, Franklin, Hawley and Summer Streets in the Downtown Crossing area of downtown Boston (the Project Site) as shown in Figure 1-2. A prior development project was previously approved for the site (the Previously Approved Project), which included the demolition of portions of the existing buildings on the Project Site and the construction of a building that cantilevered over the remaining portion of an existing building designed by the architect Daniel Burnham (the Burnham Building). Demolition and excavation at the Project Site for the Previously Approved Project was started in 2007, but stalled in 2008 leaving in place on the Project Site only the façade of the Jones McDuffee and Stratton Building (the 1905 Building) and the Burnham Building as the only structures on the Project Site. As shown on Figure 1-3, a temporary cover has been placed over one side of the Burnham Building by the Prior Proponent (defined below). Remobilizing the site work and development of the Project Site will significantly improve the vitality and character of the Project Site and the Downtown Crossing area.

The Project includes approximately 1,185,000 square feet (sf) of space for residential, office, retail, restaurant, health club/spa and accessory uses in the rehabilitated Burnham Building and a to-be-constructed tower element (the Tower), together with approximately 550 parking spaces in a below-grade garage. To more appropriately preserve the Burnham Building, the Tower component will be constructed adjacent to, rather than cantilevered over, the Burnham Building, and will occupy a smaller footprint than the tower element of the Previously Approved Project. The Tower component is anticipated to include retail, restaurant and health club space on the lower floors, and residential space above. The Burnham Building component of the Project will include the rehabilitation of the building for primarily office and retail uses.

The Project will restart the long stalled development at the Project Site, a delay that has left a hole in the urban fabric of Downtown Crossing. The Project will provide a number of benefits to the City, including construction and permanent jobs, tax revenue, new residents to this growing area, affordable housing, and preservation of a historic building, and will bring new vitality to the area. The preservation of the Burnham Building will highlight the history of Boston and the Downtown Crossing area, while the new Tower will showcase the future, a beacon on the city skyline.



Millennium Tower and Burnham Building

Figure 1-1
Millennium Tower and Burnham Building

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Millennium Tower and Burnham Building

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Figure 1-2
Aerial Locus

View looking North on Washington Street

View looking West on Summer Street

View looking North on Hawley Street

View looking South on Washington Street

1.2 Project Team

Proponent:	MP Franklin, LLC c/o Millennium Partners 172 Tremont Street, Suite 400 Boston, MA 02111-1001 (617) 451-0300 Anthony Pangaro Joseph Larkin Kathleen MacNeil
Architect:	Handel Architects LLP 150 Varick Street, 8th Floor New York, NY 10013 (212) 595-4112 Blake Middleton Stephen Matkovits
Legal Counsel:	DLA Piper LLP (US) 33 Arch Street, 26th Floor Boston, MA 02110 (617) 406-6000 John Rattigan Brian Awe
Permitting Consultants:	Epsilon Associates, Inc. 3 Clock Tower Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Cindy Schlessinger Geoff Starsiak Tyler Norod
Transportation and Parking Consultant:	Howard/Stein-Hudson Associates, Inc. 38 Chauncy Street Boston, MA 02111 (617) 482-7080 Guy Busa Elizabeth Peart
Civil Engineer:	Nitsch Engineering 186 Lincoln Street, Suite 200 Boston, MA 02111 (617) 338-0063 Gary Pease Jared Gentilucci

MEP Engineer:	WSP Flack + Kurtz 512 7th Avenue, 13th Floor New York, NY 10018 (212) 532-9600 Gary Pomerantz Albert Zirino
Geotechnical Consultant:	Haley & Aldrich 465 Medford Street, Suite 2200 Boston, MA 02129 (617) 886-7400 Steven Kraemer Damian Siebert
Wind Consultant	RWDI 650 Woodlawn Road West Guelph, Ontario Canada N1K 1B8 (519) 823-1311 Jordan Gilmour
Historic Consultant	MacRostie Historic Advisors, LLC 1400 16th Street, NW, Suite 420 Washington D.C. 20036 (202) 483-2020 Albert Rex
Construction Consultant	Suffolk Construction 65 Allerton Street Boston, MA 02119 (617) 445-3500

1.3 Project History

The Previously Approved Project was proposed for the Project Site by 426 Washington Street Owner LLC, a joint venture of Vornado Realty Trust and Gale International, LLC (the Prior Developer). The Previously Approved Project went through extensive review, including review of a Project Notification Form (PNF) and Draft Project Impact Report (DPIR), as well as approval of a Planned Development Area Development Plan and First Amended and Restated Planned Development Area Development Plan. The Boston Redevelopment Authority (BRA) Board voted on August 14, 2007 to approve the Previously Approved Project, and initial demolition began shortly thereafter. The subsequent collapse of the financial markets caused the Project to stop after foundation excavation had commenced. The new Proponent has altered the Project as described in the Notice of Project Change to make it viable in the current market conditions and to restart the transformation of Downtown Crossing.

1.4 Project Description

1.4.1 Project Site

The Project Site is located in the block bounded by Summer Street to the south, Franklin Street to the north, Washington Street to the west, and Hawley Street to the east in the Downtown Crossing area of downtown Boston. It consists of approximately 63,569 square feet of privately-owned land as well as adjacent sidewalks and certain public space located along Franklin Street commonly known as Shopper's Park (Shopper's Park). The Project Site is immediately adjacent to existing office, commercial and residential uses, and has excellent access to mass transit and vehicular transportation systems.

Since the Previously Approved Project stalled in 2008, measures have been in place to protect and monitor the Burnham Building which remains largely intact with the northeast void in the façade covered by a temporary cover. The Project Site also contains the remaining façade of the 1905 Building at the corner of Franklin and Hawley Streets and the partially excavated and shored foundation zone.

1.4.2 Previously Approved Project

The Previously Approved Project was a mixed-use project of up to 1,250,000 square feet of development of which 1,186,000 square feet comprised the previously studied building which included an up to 280 room hotel, an approximately 125-seat restaurant, office space, up to 176 residential units, retail space, and a health club/spa. The program also included a below-grade parking garage providing up to 299 spaces. Access to and egress from the parking garage was proposed to be from Hawley Street. All loading facilities were proposed to be located on Hawley Street.

As mentioned above, the Previously Approved Project included renovations to and preservation of the Burnham Building at the corner of Washington and Summer Streets, and the keeping of the street façades of the eight-story plus mezzanine 1905 Building.

1.4.3 Millennium Tower and Burnham Building

1.4.3.1 Project Description

The Project includes the preservation of, and renovations to, the Burnham Building and the development of a new mixed use residential building with a zoning height of up to 625 feet. A new, five-story podium containing residential, fitness, and retail functions is located along the property lines on Washington, Franklin, and Hawley Streets. Above the podium, the massing of the Tower is set close to the Franklin Street/Shopper's Park side of the Project

Site to create maximum separation from the Burnham Building. The Burnham Building will contain approximately 100,000 sf of retail space on the ground floor and first basement level, and at least one upper floor. Above the retail floors will be approximately 185,000 sf of office space. Retail entryways, coupled with display windows, will be located along at least three sides of the entire block: on Summer and Washington Streets in the Burnham Building, and in the new Tower podium along Washington Street and facing Shopper's Park on Franklin Street. The office lobby will be on Summer Street. The residential lobbies will be located on Franklin Street. Access to service entrances and vehicular access to below grade parking will be from Hawley Street. The parking garage will extend below the entire Project Site, including the use of two existing basement floors beneath the Burnham Building. The Tower will contain approximately 600 residential units. It is shaped roughly as a tapered "wedge" to 1) present a slender profile to the west, 2) emphasize the distinct and historic character of the restored Burnham Building, 3) increase daylight opportunities for Washington Street, and 4) maximize daylight to the office space in the Burnham Building and lower floors of the Tower.

The Burnham Building is comprised primarily of a warm white terracotta tile, with deep insets of green colored terracotta columnar façade framing "Chicago-type" windows in clear glass; warm blonde brick primarily on the Hawley Street façade; and glass store fronts on Summer and Washington Streets. Fiberglass castings of portions of the columns used in a previous renovation will be replaced to match the original terracotta color details. Other damaged terracotta wall panels will be repaired. In addition to a full façade restoration, the Project will remove the current canopy and replace it with replications of the historic canopies of the original 1912 design. A new glass curtain wall will enclose the north façade of the Burnham Building, with masonry returns at each corner facing Washington and Hawley Streets.

The Tower façades will have a mixture of opaque and transparent materials, with aluminum and glass as the primary material of the Tower portion. The glazing will use a mixture of clear, translucent, and opaque spandrel glass. The podium will contain lively lighting and signage commensurate with the retail activities inside. Portions of the retail floors may open to the skylights above and/or to the lower retail level in the Burnham Building.

The Project is currently undergoing an extensive review by the BRA, Boston Civic Design Commission (BCDC), Boston Landmarks Commission and other interested parties.

Figures 1-4 to 1-18 at the end of this chapter include a site plan, floor plans, and a Project section.

1.4.3.2 Development Program

The Project will be a vibrant, mixed-use development that will renovate and restore a proud historic building on the Project Site, construct a modern residential Tower and eliminate the current blight in Boston's downtown. As currently envisioned, the Project will include approximately 1,185,000 sf of gross floor area, including approximately 600 residential units, 125,000 to 218,000 sf of office space, 122,000 to 231,000 sf of retail space, a 35,000 sf health club/spa and 10,000 sf of restaurant use. Approximately 550 parking spaces will be located below-grade with up to 250 spaces available for public use. Similar to the Previously Approved Project, access and egress for the parking garage, as well as the loading areas, will be on Hawley Street. Table 1-1 shows the comparison between the Previously Approved Project and the currently proposed Project.

Table 1-1 Building Program Comparison

Project Element	Study Parameters of Previously Approved Project	Currently Proposed Project
Total Square Feet	1,186,000 sf	1,185,000 sf
Residential	166 units/231,500 sf	600 units/784,000-800,000 sf
Office	469,000 sf	125,000-218,000 sf
Retail	304,500 sf	122,000-231,000 sf
Health Club/Spa	Included within Retail	35,000 sf
Restaurant	Included within Retail	10,000 sf
Parking	299 spaces	550 spaces (up to 250 public)
Height (according to Boston Zoning Code)	495 feet	Up to 625 feet

The changes to the Project include:

- Increase of over 400 residential units, which will enliven the surrounding area and support its transformation to a vibrant 24-hour neighborhood;
- Decrease in commercial components;
- Increase in the availability of onsite parking to sufficiently support residential, office and retail uses;
- Preservation and rehabilitation of the Burnham Building as a stand-alone structure, with separation from the new Tower element;
- Creation of a new automobile drop-off turn around to maximize pedestrian access through the plaza between Hawley and Washington Streets, and promote the interaction of the public with the occupants of the building. The drop-off is envisioned as an integral part of the special activities of Shopper's Park. Paving, landscape materials, architectural canopies, signage, and lighting will be coordinated to unify the drop-off with the entire plaza;
- Use of a series of translucent canopies defining the storefronts along Washington Street, the base of the Tower as it opens to Shopper's Park, and the residential entrances along Franklin to the corner of Hawley Street;
- Use of translucent glazing on all storefront and lobbies to increase pedestrian visibility to activity within;

- Construction of a taller, narrower Tower more suitable for residential use; and
- The 1905 Building façade with no longer be a part of the Project.

1.4.4 Project Components

Retail

It is anticipated that the retail component of the Project will comprise approximately 122,000 to 231,000 sf across the Tower and Burnham Building components. By locating retail uses along the ground floor and reinforcing existing and planned retail and restaurant uses across Washington and Summer Streets, the proposed Project will encourage increased pedestrian activity and draw more visitors to this area of the City. The uses are being targeted to provide activity throughout the day and evening, and will act as a catalyst for the further revitalization of this central downtown neighborhood.

Residential

The residential portion of the Project is comprised of a mix of one, two, three and four-bedroom units located in the Tower, strengthening a residential presence and housing stock to the area and enhancing and weaving together the extended neighborhood from Government Center, the Financial District and Chinatown. The evening and nighttime presence of residents will further enliven the area and benefit the many neighborhood businesses. The Proponent will comply with the City's Inclusionary Development Policy in connection with its development of the Project.

Office

The Project will include approximately 125,000 to 218,000 sf of office space. The office portion will likely be located within the redeveloped Burnham Building.

Parking

The Project will include below-grade parking for approximately 550 cars, including up to 250 spaces available for public parking. The parking garage will extend below the entire site, including using two existing basement floors beneath the Burnham Building.

1.4.5 Site Access

Pedestrian Access

The residential lobby space will be accessed from Franklin Street. The office lobby will be located on Summer Street closer to primary access to public transit. Access to the retail spaces is proposed to be on all sides of the Project Site. Retail access will be refined as the design of the Project is advanced. Pedestrian access will be provided along the entire perimeter of the Project Site.

Vehicle Access

Vehicle access to the parking garage and loading areas will continue to be from Hawley Street.

1.5 Public Benefits

The Project will revitalize a critical block in downtown Boston by preserving and substantially rehabilitating the historic Burnham Building and providing a new graceful Tower in the heart of the City. Among its many other benefits, the Project will:

- ♦ Preserve and rehabilitate the Burnham Building allowing for its continued functional viability as both a retail building and an office building, without compromise far into the future.
- ♦ Restart construction on an important but currently blighted site in Downtown Crossing.
- ♦ Improve pedestrian and retail vitality, and enhance the urban design and architectural character of Downtown Crossing.
- ♦ Provide for the growth of economic activity and residential homes in an environmentally efficient way by constructing a high-density building consistent with the currently applicable energy codes and the City of Boston environmental codes in a location at the City's nexus of public transportation within walking distance of many daily activities and proximate to the growing public and private bike share and ride share infrastructure.
- ♦ Provide approximately 600 residential units which will continue the transformation of the neighborhood into a vibrant 24 hour mixed-use community.
- ♦ Create new and active retail space with onsite loading.
- ♦ Provide for the comprehensive redesign, renovation and ongoing routine day to day maintenance of Shopper's Park, making it an inviting place for workers, visitors and residents to enjoy.
- ♦ Provide for streetscapes and other measures to improve the pedestrian environment in the neighborhood for residents, workers and visitors alike.
- ♦ The Proponent has committed to an up to $2,800,000 contribution toward streetscape improvements which will be used to design, engineer and carry to completion certain prioritized projects to be reviewed and agreed with the BRA and BTD.
- ♦ Provide for the construction of a new Massachusetts Bay Transportation Authority (MBTA) headhouse and upgrades to the cladding of the existing MBTA elevator, each within Shopper's Park.

- Change the negative perception of the immediate environs by restarting the construction of a development critically important to the neighborhood.
- Generate approximately $2,240,000 to $2,365,000 in housing linkage funds and approximately $447,000 to $472,500 in jobs linkage funds to the City of Boston.
- Comply with the City's Inclusionary Development Policy.
- Evolve the design, in consultation with the BRA, the Boston Civic Design Commission (BCDC), the Boston Landmarks Commission and other interested parties, of an important beacon in the City of Boston.
- Generate up to approximately $5,500,000 annually in real estate taxes to the City of Boston. The Project will also generate substantial sales taxes, meals taxes, payroll taxes and transfer taxes to the appropriate governmental authorities.
- Become an active and contributing member of the Downtown Boston Business Improvement District.
- Create approximately 600 construction jobs.
- Create approximately 2,300 permanent jobs.
- Contribute to the Crossroads Initiative by enhancing the Summer Street experience between Washington Street and Hawley Street. Summer Street has been identified as an important street connecting Boston Common to the Rose Fitzgerald Greenway, and the proposed mixed-use program meets the intent of the 2004 Downtown Crossing Economic Improvement Initiatives by making the Project a major destination for residents, shoppers, employees, and visitors and enhancing the vibrancy and economic vitality of the surrounding area.

1.6 Legal Information

1.6.1 Legal Judgments or Actions Pending Concerning the Project

Two actions concerning the Previously Approved Project are currently pending in Suffolk County Superior Court. The actions were filed against the Prior Developer and Suffolk Construction Company Inc. (Suffolk Construction), the general contractor for the Previously Approved Project, by NASDI LLC, a subcontractor engaged in connection with the Previously Approved Project. The Proponent is not aware of any other legal judgments in effect or actions pending with respect to the Project or the Previously Approved Project.

1.6.2 History of Tax Arrears on Property Owned in Boston by Millennium Partners-Boston

The Proponent does not have a history of tax arrears on any property owned within the City of Boston.

1.6.3 Site Control / Legal Easements

Pursuant to the terms of a purchase and sale agreement (the Purchase Agreement) with the Prior Developer and related agreements, the Proponent will acquire title to the Project Site (either directly or indirectly) before commencing construction of the Project. Prior to that time, the Proponent has authority pursuant to the Purchase Agreement to obtain permits for the Project and otherwise advance the development of the Project Site.

The Proponent will own the site on which the Project will be constructed, except for several small volumes of space owned by the MBTA and located near and below the corner of Washington Street and Summer Street. The Project Site is also subject to several volumetric easements held by the MBTA, which are located along Washington Street, Summer Street and Franklin Street.

1.6.4 Zoning

The Project Site is located in Planned Development Area No. 72 within the Midtown Cultural District, which is governed by Article 38 of the City of Boston Zoning Code (the Code), and lies within the Restricted Parking Overlay District.

On November 16, 2006, the BRA approved a Planned Development Area Development Plan for the Previously Approved Project (the Original Development Plan). Following such approval, the BRA petitioned the Boston Zoning Commission (BZC) to approve the Original Development Plan and a related amendment to Article 38 to, among other things, permit a Planned Development Area (PDA) to be established at the Project Site (Zoning Amendment). On December 6, 2006, the BZC adopted the Zoning Amendment, approved the Original Development Plan and established Planned Development Area No. 72 under Article 80C of the Code.

On August 14, 2007, the BRA (i) authorized the Director of the BRA to issue a Preliminary Adequacy Determination under Section 80B-5.4(c)(iv) of the Code, waiving the requirement to file and review a Final Project Impact Report for the Previously Approved Project under Article 80B of the Code and (ii) approved an Amended and Restated Development Plan for the Previously Approved Project (the First Amended Development Plan), which presented additional details and certain refinements regarding the Previously Approved Project. On September 26, 2007, the Director of the BRA issued a Preliminary Adequacy Determination for the Previously Approved Project, waiving the requirement to file and review a Final Project Impact Report subject to further design review. On October 31, 2007, the BZC approved the First Amended Development Plan.

On July 27, 2012, the Proponent submitted a Second Amended and Restated Development Plan in connection with the Project (the Second Amended Development Plan). The Second Amended Development Plan must be approved by the BRA and then by the BZC before construction of the Project may commence.

1.7 Regulatory Controls and Permits

Table 1-2 below presents a preliminary list of federal, state and local agencies from which permits or other actions are expected to be required in connection with the Project.

Table 1-2 Anticipated Permit Requirements

Agency Name	Permit / Approval
FEDERAL	
United States Environmental Protection Agency	National Pollution Discharge Elimination System Permits/Notices
Federal Aviation Administration	Determination of No Hazard to Air Navigation
STATE	
Executive Office of Energy and Environmental Affairs	Massachusetts Environmental Policy Act Review / Approvals
Department of Environmental Protection	Sewer Connection and Extension Permit; Boiler Emissions Approval; Asbestos Notices; Emergency Generator Emissions Approvals; Air Plan Approval; Fossil Fuel Utilization Permit; Sewer Connection, Cross Connection and Extension Permits; Construction and Demolition Notices
LOCAL	
Massachusetts Water Resources Authority	Sewer Use Discharge Permit; Construction Dewatering Permit
Massachusetts Historical Commission	State Register Review Consultation Process
Massachusetts Bay Transportation Authority	Approval of Alterations and Improvements to MBTA facilities; Agreements and Approvals for Property Transactions
State Building Code Appeals Board	Variances from Building Code
Boston Redevelopment Authority/ City of Boston	Article 80 Large Project Review and Related Agreements and Disclosures; Certification of Compliance with Article 80 Large Project Review; Planned Development Area Amendment and Related Approvals; Amendments to Boston Zoning Code; Affordable Housing Agreement

Table 1-2 Anticipated Permit Requirements

Agency Name	Permit / Approval
LOCAL	
Boston Water and Sewer Commission	Site Plan Approval; Sewer Connection, Cross-Connection and Extension Permits; Sewer Use Discharge Permit; Construction Dewatering Permit; Site Stormwater and Groundwater Management Approvals
Boston Public Improvements Commission	Approvals for Curb Cuts, Line and Grade, Street Names, Tie Backs, Earth Retention, Marquees, Signs, Awnings, Canopies and/or Hoods; Street and Sidewalk Occupancy Permits; Specific Repair Plan; Discontinuances
Boston Air Pollution Control Commission	Parking Freeze Permit
Boston Transportation Department	Transportation Access Plan Agreement; Construction Management Plan
Boston Inspectional Services Department	Demolition Permit; Foundation Permit; Building Permit; Certificate of Occupancy
City of Boston Committee on Licenses	Flammable Storage Permit; Parking Garage Permit
Boston Landmarks Commission	Article 85 Approvals; Certificate of Design Approval and Appropriateness; Associated Agreements
Boston Fire Department	Approval of Fire Safety Equipment; Asbestos Permits; Fuel Storage Permit; Equipment and Access Permits

1.8 Massachusetts Environmental Policy Act

The Project will be subject to review under the Massachusetts Environmental Policy Act (MEPA). An Environmental Notification Form will be filed with the MEPA office.

1.9 Schedule

It is anticipated that the construction will commence in the spring of 2013. Once begun, construction is expected to last approximately 18 months for the Burnham Building and 36 months for the new Tower.

1.10 Public Participation

The Proponent is committed to effective community outreach and will continue to engage the community to ensure public input on the Project. In addition to public agencies and officials, the Proponent has met with or plans to meet with the following organizations. The Proponent will also meet with other organizations who express an interest in meeting.

Boston Preservation Alliance,

Friends of the Public Garden and Boston Common

Downtown Boston Business Improvement District

Old South Meeting House members

Midtown Park Plaza neighborhood Association

The Boston Redevelopment Authority, IAG

Boston Civic Design Commission

Walk Boston

Owners or managers of neighboring Buildings

Suffolk University

Members of the Ritz Carlton Towers community

Emerson College

Clarion ING

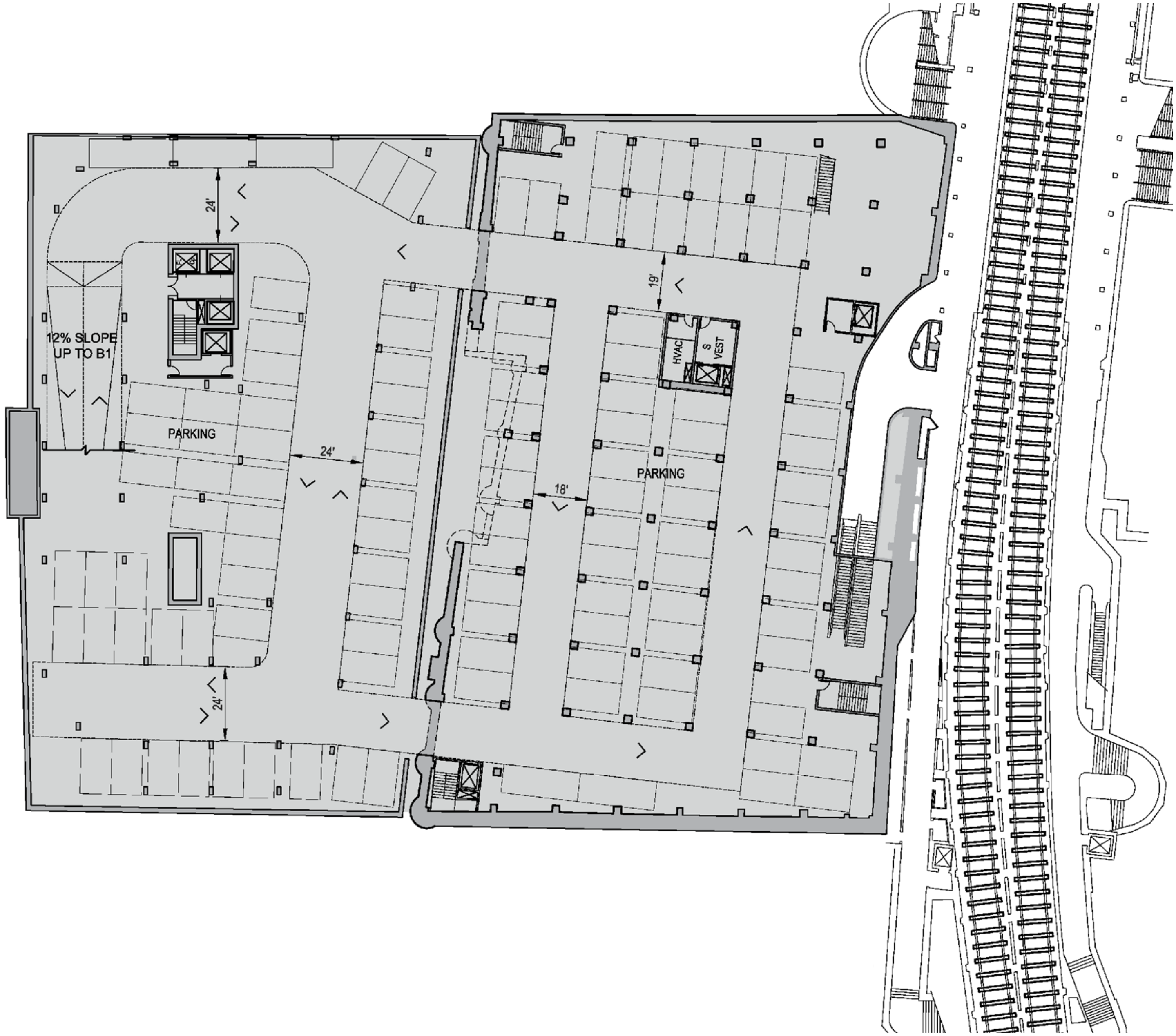
Impact Advisory Group for the Project

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 1-4

Site Plan



Millennium Tower and Burnham Building

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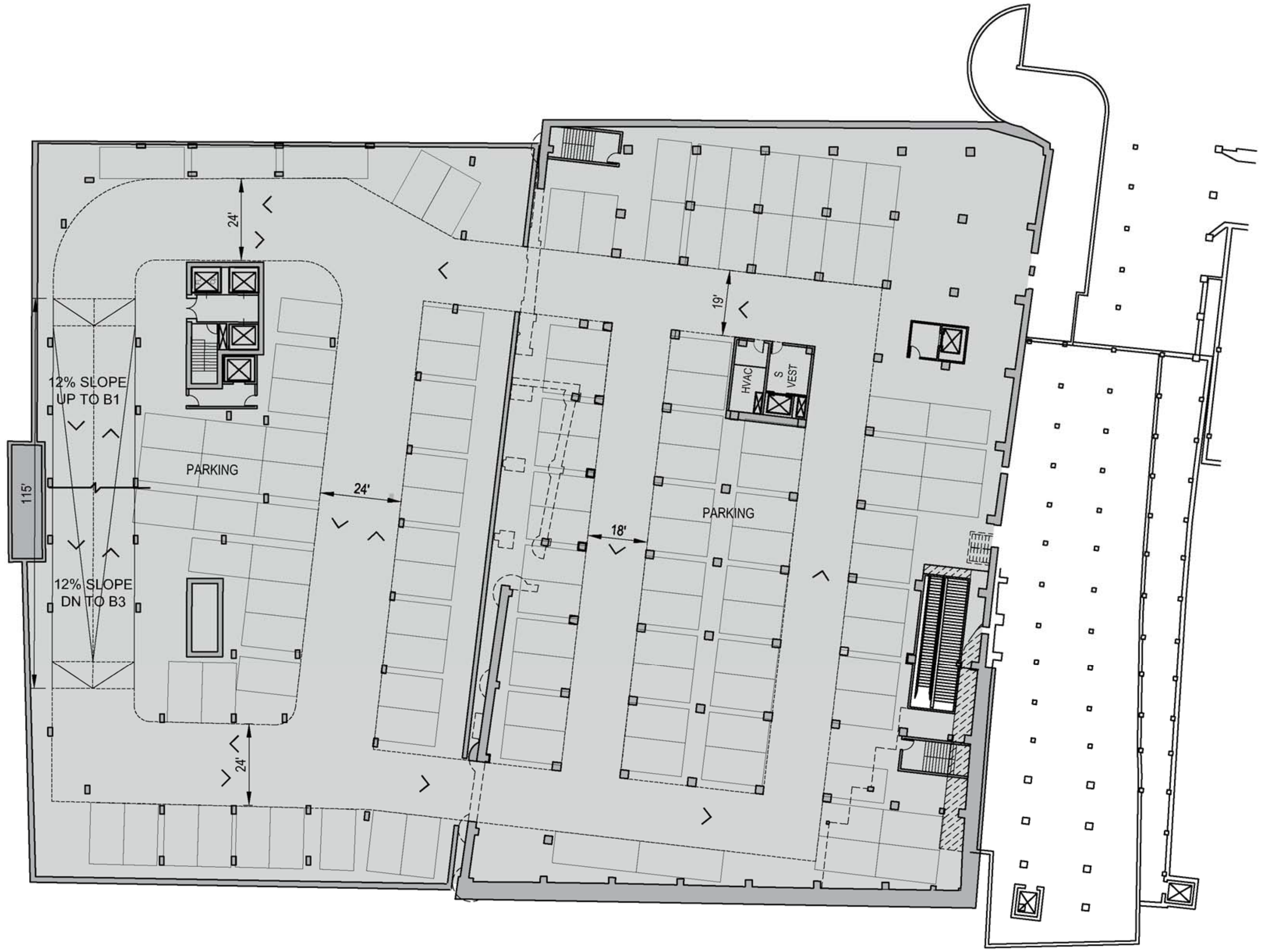
Figure 1-5

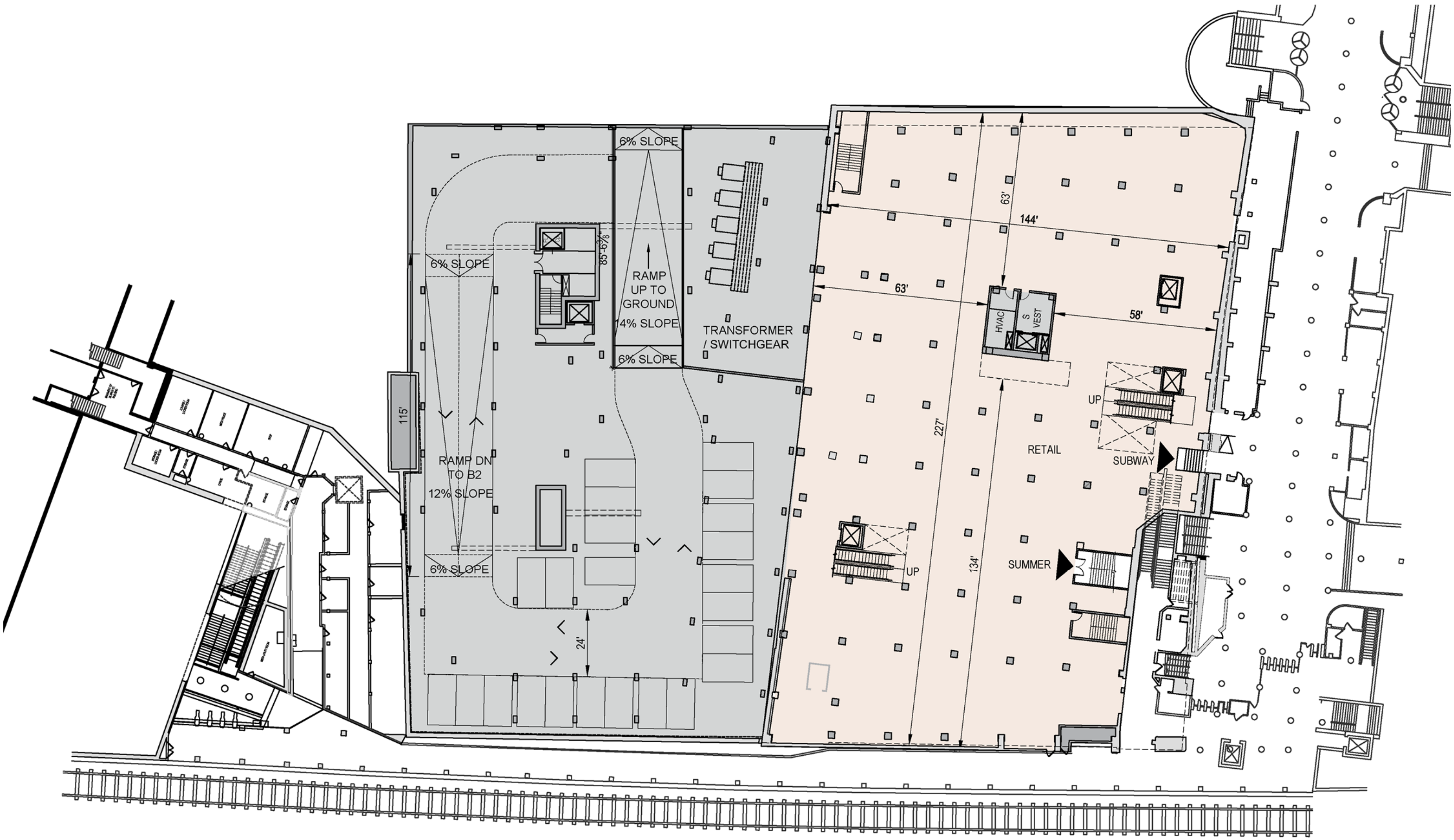
B3 Floor



Millennium Tower and Burnham Building

Figure 1-6

B2 Floor



Millennium Tower and Burnham Building

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Figure 1-7

B1 Floor

Millennium Tower and Burnham Building

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Figure 1-8
Ground Floor

Millennium Tower and Burnham Building

Figure 1-9

Second Floor

Millennium Tower and Burnham Building

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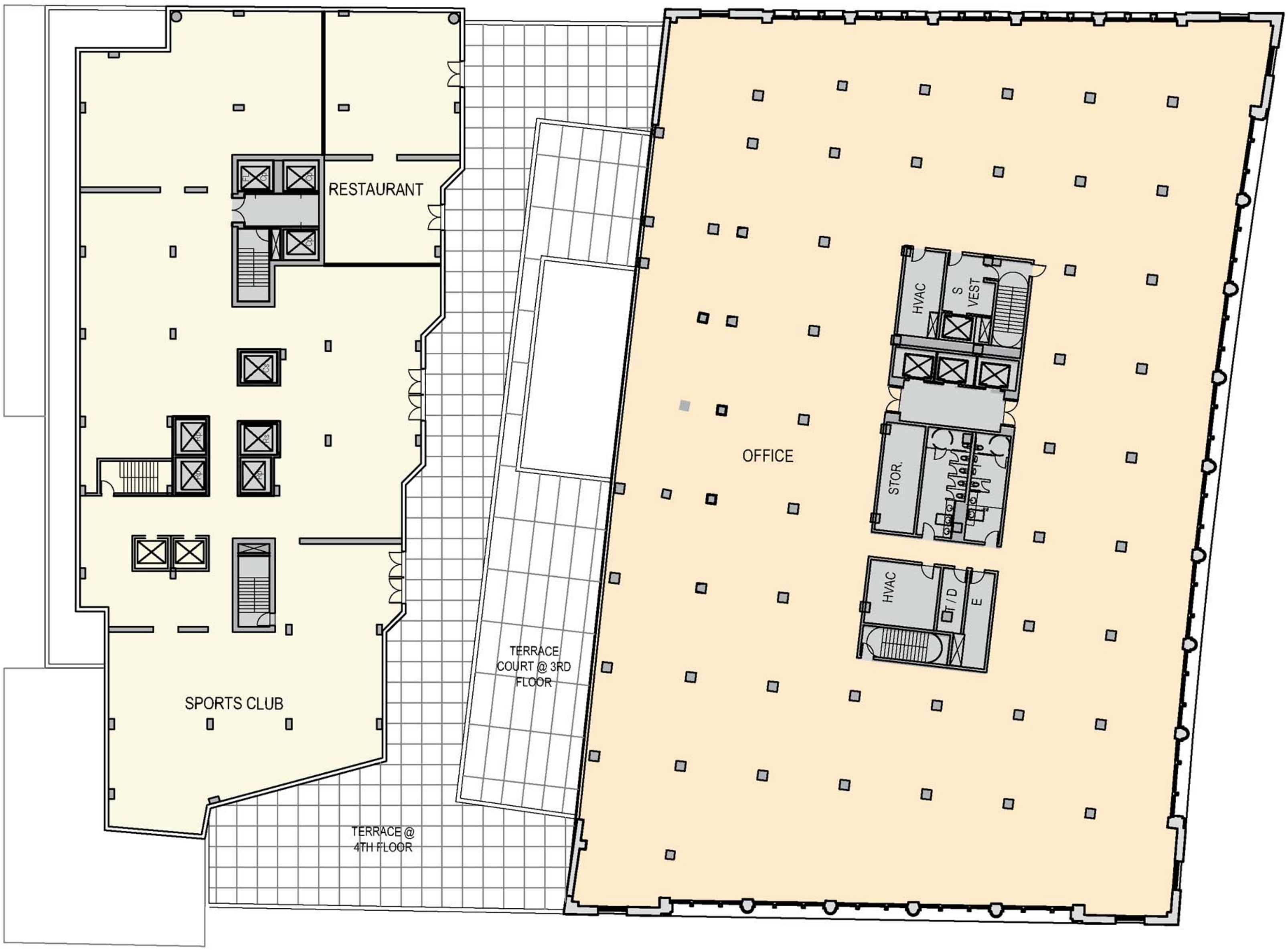
Figure 1-10

Third Floor



Millennium Tower and Burnham Building

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Figure 1-11

Fourth Floor

Millennium Tower and Burnham Building

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Figure 1-12

Fifth Floor

Millennium Tower and Burnham Building

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Figure 1-13

Sixth Floor

Millennium Tower and Burnham Building

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Figure 1-14

Seventh Floor

Millennium Tower and Burnham Building

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Figure 1-15

Eighth Floor

Millennium Tower and Burnham Building

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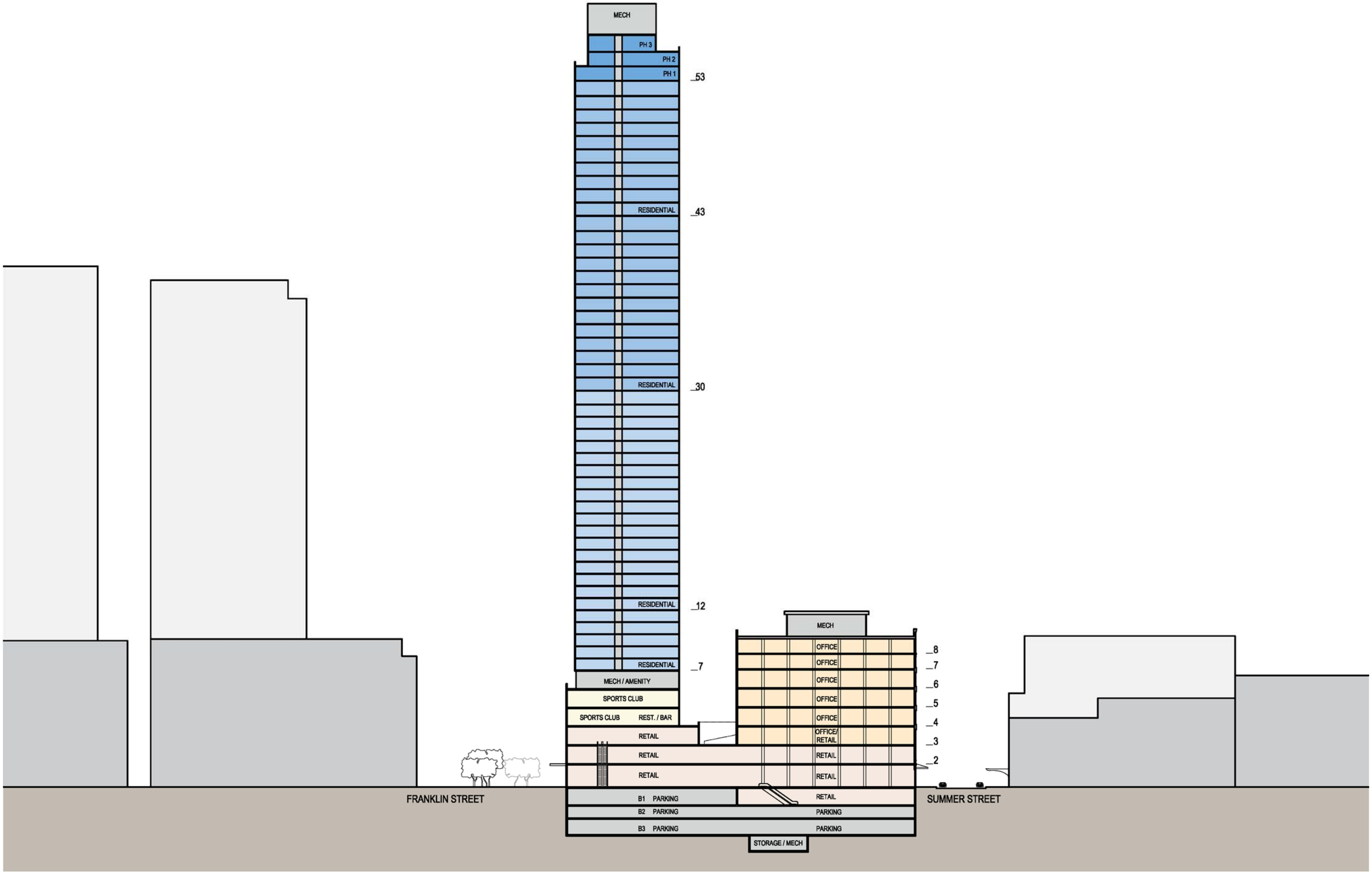
Figure 1-16

Ninth Floor

Millennium Tower and Burnham Building

Figure 1-17

Typical Residential Floor



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 1-18

Section

Chapter 2.0

Transportation

2.0 TRANSPORTATION

2.1 Introduction

This chapter addresses transportation issues related to the development of the Project. Topics addressed include trip generation, vehicular access, pedestrian access, parking, loading and service, travel demand management, Transportation Access Plan Agreement (TAPA), Construction Management Plan (CMP), and Public Improvements Commission (PIC).

The April 2007 DPIR for the Previously Approved Project proposed for the Project Site included a comprehensive transportation analysis. The report documented existing conditions in terms of traffic and pedestrian volumes, transit service, and parking availability. The study team conducted traffic counts and traffic operations and impact analysis at 13 intersections: Franklin Street/Devonshire Street, Franklin Street/Arch Street, Bromfield Street/Tremont Street, Summer Street/Chauncy Street/Arch Street, Summer Street/Kingston Street/Otis Street, Washington Street/Milk Street, Milk Street/Devonshire Street, Tremont Street/School Street/Beacon Street, Washington Street/School Street, Franklin Street/Hawley Street, Franklin Street/Washington Street/Bromfield Street, Summer Street/Hawley Street and Milk Street/Hawley Street.

At that time, an intersection operations analysis was conducted for Year 2007 existing conditions, Year 2012 No-Build conditions (including background growth and other planned developments), and Year 2012 Build conditions (including the completed DPIR Previously Approved Project). The study team used Institute of Transportation Engineers (ITE) rates, along with local survey data and other sources to develop trip generation, trip distribution, vehicle occupancy, and travel mode estimates for the proposed development program.

Because of the Project Site's location, close to multiple transit options and the pedestrian zone at Downtown Crossing, the Previously Approved Project had small impacts to traffic, transit, and pedestrian conditions in the vicinity. Minor traffic mitigation measures, including restriping of travel lanes and signal timing adjustments, were recommended for five intersections to improve both then current and projected future traffic operational conditions. The currently proposed Project, with fewer total trips and fewer vehicle trips, will have even less of an impact on transportation operations. As part of a city-wide program, the Boston Transportation Department (BTD) has recently upgraded traffic signal phasing and timing at many of the study area intersections, reducing traffic delays and enhancing pedestrian safety. Study area intersections are therefore operating better today than in 2007, when the Previously Approved Project was under consideration.

2.2 Trip Generation

Table 2-1 summarizes the building programs for the former uses, the Previously Approved Project, and the current Project.

Table 2-1 Building Program Comparisons

Program Description	A Former Use: Filene's and Filene's Basement (circa 2006)	B Previously Approved Project (as described in the DPIR)	C Current Project: Millennium Tower and Burnham Building (approximate)	D = C minus B Change: Current Project compared to Previously Approved Project
Residential	0	166 units	600 units	+434 units
Office	153,700 sf	469,000 sf	125,000 sf to 218,000 sf	-251,000 sf to -344,000 sf
Retail	506,300 sf	304,500 sf	122,000 sf to 231,000 sf	-182,500 sf to -73,500 sf
Hotel	0	226 rooms	0	-226 rooms
Restaurant	0	0	10,000 sf	+10,000 sf
Health Club	0	0	35,000 sf	+35,000 sf
Parking Spaces	0	299 spaces	550 spaces (up to 250 public)	+251 spaces

As previously described, trip generation estimates for the Previously Approved Project were based on rates derived from ITE's *Trip Generation* (7th edition, 2003) fitted curve equations and average trip rates for the following land use codes (LUC):

- LUC 230 — Residential Condominium,
- LUC 310 — Hotel,
- LUC 820 — Retail/Shopping Center,
- LUC 850 — Supermarket/Grocery,
- LUC 710 — General Office, and
- LUC 932 — Restaurant.

The ITE rates produce vehicle trip estimates, which are converted to person trips based on vehicle occupancy rates (VOR). Using appropriate mode split information for this specific study area, the total person trips are then allocated to vehicle, transit, and walk trips.

For the NPC, the updated *Trip Generation* manual, 8th edition, (2009) was used to estimate trips for the following land use codes:

- LUC 220 — Residential Apartment[1],
- LUC 492 — Health Club,
- LUC 710 — General Office,
- LUC 820 — Retail/Shopping Center, and
- LUC 932 — Restaurant.

A summary of the resulting adjusted[2] vehicle trip generation for the former use, the Previously Approved Project, and the currently proposed Project, are shown in Table 2-2. A detailed table of trip generation assumptions is shown in the Transportation Appendix.

Table 2-2 Adjusted Vehicle Trip Generation Comparison

	A	B	C	D = C minus B
Time Period	Former Use: Filene's and Filene's Basement (circa 2006)	Previously Approved Project (as described in the DPIR)	Current Project: Millennium Tower and Burnham Building (approximate)	Change: Current Project compared to Previously Approved Project
Daily				
In	1,719	2,047	1,055	-992
Out	1,719	2,047	1,055	-992
Total	3,438	4,094	2,110	-1,984
a.m. peak				
In	125	267	122	-145
Out	51	109	70	-39
Total	176	376	192	-184
p.m. peak				
In	163	211	112	-99
Out	200	294	148	-146
Total	363	505	260	-245
Saturday peak				
In	161	173	89	-84
Out	175	187	85	-102
Total	336	360	175	-185

1 The residential component of the Project may include a mix of condominium and apartment units. Because the trip rate for Apartments is slightly higher than Condominium, LUC 220 was chosen to be more conservative (higher estimate).

2 Adjusted vehicle trips are the result of applying travel mode shares and auto occupancy rates specific to the Downtown Crossing area of Boston.

As shown in Column D of Table 2-2, the Project will result in 1,984 fewer adjusted daily vehicle trips as compared to the previously approved program. During peak hours, there will be 184 fewer vehicle trips in the a.m. peak hour, 245 fewer vehicle trips in the p.m. peak hour, and 185 fewer vehicle trips during the Saturday midday peak hour.

Table 2-3 shows a similar comparison for transit trip generation. The Project will result in 5,334 fewer daily transit trips. During peak hours, there will be 474 fewer transit trips in the a.m. peak hour, 521 fewer transit trips in the p.m. peak hour, and 457 fewer transit trips during the Saturday midday peak.

Table 2-3 Transit Trip Generation Comparison

	A	B	C	D = C minus B
Time Period	Former Use: Filene's and Filene's Basement (circa 2006)	Previously Approved Project (as described in the DPIR)	Current Project: Millennium Tower and Burnham Building (approximate)	Change: Current Project compared to Previously Approved Project
Daily				
In	4,405	4,916	2,249	-2,667
Out	4,405	4,916	2,249	-2,667
Total	8,810	9,832	4,498	-5,334
a.m. peak				
In	356	692	301	-391
Out	122	166	83	-83
Total	478	858	384	-474
p.m. peak				
In	109	132	69	-63
Out	616	817	369	-448
Total	725	949	428	-521
Saturday peak				
In	318	338	160	-178
Out	456	481	203	-278
Total	774	820	363	-457

Table 2-4 shows the comparison of walk trip generation. The Project will result in 6,044 fewer daily walk trips. During peak hours, there will be 84 fewer walk trips in the a.m. peak hour, 231 fewer walk trips in the p.m. peak hour, and 795 fewer walk trips during the Saturday midday peak.

Table 2-4 Walk Trip Generation Comparison

Time Period	A Former Use: Filene's and Filene's Basement (circa 2006)	B Previously Approved Project (as described in the DPIR)	C Current Project: Millennium Tower and Burnham Building (approximate)	D = C minus B Change: Current Project compared to Previously Approved Project
Daily				
In	5,012	5,722	2,700	-3,022
Out	5,012	5,722	2,700	-3,022
Total	10,024	11,444	5,400	-6,044
a.m. peak				
In	28	70	26	-44
Out	19	116	86	-30
Total	47	186	102	-84
p.m. peak				
In	327	404	209	-195
Out	50	72	36	-36
Total	377	476	245	-231
Saturday peak				
In	838	892	423	-469
Out	534	564	238	-326
Total	1,372	1,456	661	-795

As shown in the above tables, trips for all travel modes (vehicle, transit, and walk) will be significantly lower with the Project, as compared to either the former use or the Previously Approved Project.

2.3 Vehicle Access and Distribution

As shown in Figure 1-4, vehicles arriving to the Project proceed either to the drop--off/pick-up driveway located on Franklin Street or to the underground parking garage, via the driveway on Hawley Street.

Vehicle access to and egress from the Project Site is currently hindered by the travel restrictions on three of the four streets surrounding the Project Site. Adjacent to the Project Site, both Summer Street and Washington Street are pedestrian only zones. Along with being one-way westbound, travel on Franklin Street between Hawley Street and Washington Street is restricted to taxicabs and buses. Commercial vehicles are allowed on these streets during designated hours. While Hawley Street is open to all traffic, travel is only allowed one-way southbound between Franklin Street and Summer Street. (The section of Hawley Street between Franklin Street and Milk Street is one-way northbound.)

2.3.1 Hawley Street

To enhance traffic flow near the Project Site, it is proposed that the section of Hawley Street between Franklin Street and the Project garage driveway be converted to two-way. This change would allow drivers exiting the garage the option of either turning left or right onto Hawley Street. Vehicles turning left out of the garage would continue northbound on Hawley Street, to Milk Street, with local connections to the north. Vehicles exiting the garage and turning right onto Hawley Street would turn left onto Summer Street. Such a change would also allow valet drivers to exit the garage, turn left onto Hawley Street, and left onto Franklin Street to access the Project's drop-off/pick-up driveway.

The proposed change to Hawley Street would not affect travel route options for vehicles entering the Project Site; vehicles would travel westbound on Franklin Street and either turn left onto Hawley Street or continue on Franklin Street and turn left into the drop-off/pick-up driveway for valet service.

At 26 feet in width, Hawley Street can sufficiently accommodate two-way travel. The Proponent will continue to work with BTD to evaluate this proposed circulation change.

Hawley Street also provides access/egress to Snow Place, a service alley for 101 Arch Street and Franklin Street buildings. The loading bays on Snow Place can be accessed from Hawley Street and Arch Street. A small (50 spaces) public parking garage is located underground at 101 Arch Street with the sole driveway onto Hawley Street, between Snow Place and Summer Street. The Proponent will ensure that the Project's loading operations and any changes to Hawley Street circulation do not adversely affect 101 Arch Street.

2.3.2 Drop-off/Pick-up Driveway

As shown in Figure 1-4, a drop-off/pick-up driveway will be located on Franklin Street and primarily serve residents arriving at the residential lobby. Residential valet service will be provided to the underground garage (access on Hawley Street) from the drop-off/pick-up driveway.

Vehicles will enter the drop-off/pick-up driveway by travelling westbound on Franklin Street. Currently, travel on Franklin Street between Hawley Street and Washington Street is restricted to taxicabs and buses. The Proponent will work with the BTD to design a drop-off/pick-up driveway on Franklin Street that allows adequate access for Project vehicles, while providing necessary accommodation for commercial vehicles. Vehicles exiting the drop-off/pick-up driveway would turn left or turn right onto Hawley Street.

Residential valet activity at the Franklin Street drop off/pick-up driveway is estimated to be approximately 25 vehicles during the a.m. peak hour and 27 vehicles during the p.m. peak hour. The valet activity is estimated from representative data collected at the Ritz Condominiums on Avery Street pro-rated for the number of units to be served at the Project.

Taxicab activity generated by the Project will also occur at the drop-off/pick-up driveway and is estimated to include 10 taxicabs during the a.m. peak hour and 12 taxicabs during the p.m. peak hour.

2.4 Traffic Operations

2.4.1 Financial District Signal Improvements

The BTD's Transportation Management Center (TMC) monitors, coordinates, and adjusts the City's traffic signals on a real-time basis to improve the flow of traffic on city streets. Since the April 2007 DPIR filing on the Previously Approved Project, the BTD has assessed and improved traffic signal operations in many areas of Boston, including the Financial District.

Recent Financial District signal improvements along Franklin Street, Washington Street, and Summer Street have included adjustments to signal phasing, signal timings, vehicle clearance times, walk timings, and pedestrian phasing. In addition to reducing vehicle delay and improving pedestrian safety, these enhancements will also result in fuel savings and emission reductions.

2.4.2 Background Growth

In the 2007 DPIR, the five-year planning horizon for future conditions was Year 2012. At that time, the estimate of Year 2012 No-Build traffic volumes included a background growth rate of 1% per year along with volumes expected from ten planned developments in the study area, including The Residences at Kensington Place, Lincoln Plaza, Hayward Place, 45 Province Street, Emerson (Paramount Theater), Ames Hotel (One Court Street), 179 Lincoln Street, 120 Kingston Street, Atlantic (Russia) Wharf, and the South Station Air Rights. While six of these projects are now complete, two are still under construction (Residences at Kensington Place and Hayward Place) and two have not yet started construction (120 Kingston Street and South Station Air Rights). Because of economic factors, the projected traffic growth associated with an aggressive 1% background growth rate and the ten planned projects has most likely not been realized over the last five years.

2.4.3 Traffic Impacts

With the area signal improvements and lower than expected growth discussed above, study area intersections are operating better today than in 2007, when the Previously Approved Project was under consideration. Because of these factors, and the current Project's development program that generates considerably fewer new vehicle trips (as shown in Table 2-2), traffic operations in the study area are not expected to be significantly impacted by the Project and would, in fact, be less than the impacts identified in the DPIR for the Previously Approved Project.

2.5 Pedestrian Access

As shown in Figure 1-4, the Project's ground floor retail stores will have multiple doorways located on Summer Street, Washington Street, and Franklin Street. The residential lobby, rental office, and health club/spa lobby will be adjacent spaces with separate doorways on Franklin Street. The office lobby doorways will be located on Summer Street.

Escalators, stairways and elevators will be located throughout the retail spaces to transport shoppers between the underground levels, ground level, and upper levels. The residential lobby, health club/spa lobby, and office lobby will each be equipped with elevators to the upper floors.

At the Project's underground B1 Floor level, a doorway will be provided between the retail space and the MBTA's Downtown Crossing Station concourse. Escalators serving the B1 Floor level and the ground floor will provide convenient connections between the MBTA concourse and the office lobby and Summer Street.

Elevators from the underground parking levels will serve the ground floor office lobby, the ground floor residential lobby, and the ground floor retail space.

2.6 Parking Management

The underground parking garage, with approximately 550 spaces for the Project, will have one access/egress driveway on Hawley Street, as shown in Figure 1-4. Figures 1-5 to 1-7 show the layout of the underground levels and parking space layout.

The allocation of parking spaces will evolve as the building is populated with residents and tenants. Of the 550 spaces, up to 60% of the spaces may eventually be assigned to residents, about 10% to office tenants, with the remaining spaces for public use. Some residential tenants will have the option of valet parking, while the remaining residents will use an access card and self-park. Office tenants and public users will also self-park. Initially, there could be up to 250 public spaces, but as the residential units are filled, some or all of the public spaces will become residential spaces.

BTD has set parking space goals and guidelines throughout the City to establish the amount of parking supply provided with new developments. BTD's maximum parking ratio guidelines for residential use in the downtown area is between 0.5–1.0 spaces per unit. The BTD guidelines do not distinguish between condominiums and apartments, although they do allow for lower ratios for such residential uses as elderly, lodging, transitional, and group housing. As the parking plan advances, the Proponent will provide at least 0.50 parking spaces per residential unit.

Local parking demand trends for apartment developments in downtown Boston are consistent with this ratio and are in the range of 0.38 to 0.74 parking spaces per unit, while condominium units tend to be about 1.0 space per unit. This lower parking demand for rental residential units is evidenced at several recent developments that have been permitted, constructed, and occupied in the past several years, as presented in Table 2-5.

Table 2-5 Downtown Rental (Apartment) Parking Ratios

Development	Location	Occupied Rental Units	Parking Demand (spaces)	Parking Demand Ratio (spaces per unit)
Archstone—Boston Common	Chinatown/Theater	352	135	0.38
Archstone—Avenir	Bulfinch Triangle	224	113	0.47
West End Asteria	West End	163	67	0.41
West End Vesta	West End	100	59	0.59
One Back Bay	Back Bay	140	64	0.46
1330 Boylston	Fenway	186	137	0.74
Trilogy Triangle	Fenway	357	203	0.57
Park Lane Seaport	South Boston Seaport	432	164	0.38
50 West Broadway	South Boston	111	65	0.59
Total/Average		2,032	1,007	0.50

Source: HSH Associates, 2010 Survey
The number of occupied rental units reflects market rate units only.

2.7 Bicycle Accommodations

BTD has established guidelines that buildings with more than nine residential units must provide secure and protected bicycle parking/storage at the rate of one bicycle space for every residential unit. Accordingly, the Project will provide secure on-site bicycle storage in compliance with BTD Guidelines. Public bicycle racks will be provided on the sidewalks near each public building entrance for use by visitors. Bicycle racks, signs, and parking areas will conform to BTD standards and be sited in safe, secure locations.

2.8 Loading and Service Access

Loading and service for the Project will be provided by two loading docks located along Hawley Street, with access from Franklin Street and egress to Summer Street.

The loading dock closer to Franklin Street will have two bays and serve the residential units, health club/spa, and some of the retail stores. The loading area closer to Summer Street will have four bays and serve the office space and some of the retail stores. Although the majority of deliveries to the Project Site will be by smaller vehicles, the Project Site is being planned to accommodate at least one truck of up to WB-50 in size.

The access route to the loading/service areas will be via Franklin Street northbound and left onto Hawley Street. Trucks will back into the loading bays as they did when the former Filene's store was open. The egress route from the loading/service area will be south onto Hawley Street and then left onto Summer Street eastbound. These access/egress truck routes are the same as those previously used for Filene's. Whenever possible, loading and service activities will occur during off-peak hours, although some activity will occur during the peak as discussed below. Loading/service areas will include permanent "no idling" signs. An on-site loading dock manager will manage all service and loading operations. Trash compactors and containers are located in the loading/service areas and do not block access to the loading docks.

Delivery trip estimates were based on National Cooperative Highway Research Program (NCHRP) data for Boston[3]. The Project will generate approximately 33 deliveries per day. It is anticipated that 90% of these deliveries will occur between 7:00 a.m. and 1:00 p.m., or, on average, about five deliveries per hour during this period. Based on observations of deliveries at other Boston mixed-use developments, the average duration of a delivery is about 15 minutes. Therefore, the six loading bays and their allocation to different uses are sufficient to meet the loading demands of the Project.

Note that trash truck trips are not included in these numbers. In downtown Boston for this type of development, trash truck trips generally occur between 5:00 a.m. and 7:00 a.m. and do not coincide with the regular delivery activity at the loading docks.

2.9 Travel Demand Management

The Proponent is committed to implementing Transportation Demand Management (TDM) measures to reduce dependence on autos. TDM will be facilitated by the Project's proximity to available transit services at nearby MBTA transit stations at Downtown Crossing, State Street, and Park Street.

The Proponent intends to emphasize the Project's excellent pedestrian and transit access in its marketing, sales, and leasing efforts. On-site management will provide transit information (e.g., schedules, maps, fare information) in the building lobbies for residents and tenants. On-site management will also work with tenants as they move in to raise awareness of public transportation options.

Because the Project is primarily residential, its trip generation is already lower than that of an office or retail use project. TDM will be facilitated by the nature and location of the proposed Project. The Project Site's proximity to workplaces, shopping, and transit will help reduce auto use by visitors and residents alike. The Proponent is committed to

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3 "Truck Trip Generation Data –Synthesis 298", NCHRP, Transportation Research Board, Washington D.C. 2001.

implementing a TDM program that supports the City's efforts to reduce dependency on the automobile by encouraging travelers to use alternatives to driving alone, especially during peak time periods through the following TDM commitments listed below:

- Orientation Packets: The Proponent will provide orientation packets to new residents containing information on the available transportation choices, including transit routes and schedules.

- Transportation Coordinator: The Proponent will designate a transportation coordinator to manage loading and service activities and provide alternative transportation materials to residents and building tenants.

- Shared Car Service: The Proponent will work with a car-sharing service provider to determine the applicability of parking spaces for car-share programs within the parking area or adding more Zipcars to existing locations near Downtown Crossing.

- Provide electric vehicle charging at up to six vehicles in the garage and sufficient infrastructure capacity for future accommodation of additional electric vehicle charging stations.

- Bicycle Accommodation: The Proponent will provide bicycle racks in secure, sheltered areas for residents. Secure bicycle storage will be made available to tenants and visitors to encourage bicycling as an alternative mode of transportation. Bicycle racks will be placed near public entrances to the building, particularly near retail spaces, for visitors.

2.10 Transportation Access Plan Agreement

A Transportation Access Plan Agreement (TAPA) will be entered into between the Proponent and BTD. The TAPA will codify the specific measures, mitigations, and agreements between the Proponent and the City of Boston.

2.11 Construction Management Plan

The Proponent will 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.

2.12 Public Improvement Commission

Certain streetscape improvements surrounding the Project Site on Washington Street, Franklin Street, Summer Street and Hawley Street will require Public Improvement Commission (PIC) review and approval. As standard practice, the Proponent will work with the City in continuing to develop these improvements.

Chapter 3.0

Development Review Component

3.0 DEVELOPMENT REVIEW COMPONENT

3.1 Environmental Component

3.1.1 Wind

A pedestrian wind study was conducted for the Project to assess the effect of the Project on local conditions in pedestrian areas around the study site. The Project meets the BRA's long established criteria for annual gust wind speeds at all locations. In addition, the study shows that 62 of the 65 locations studied were considered comfortable for annual mean wind speeds and there were no dangerous wind conditions. Similar to the Previously Approved Project, the wind conditions for the proposed Project are generally considered appropriate.

3.1.1.1 Overview

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

The consideration of wind in planning outdoor activity areas is important since high winds in an area tend to deter pedestrian use. For example, winds should be light or relatively light in areas where people would be sitting, such as outdoor cafes or playgrounds. For bus stops and other locations where people would be standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable. For infrequently used areas, the wind comfort criteria can be relaxed even further.

3.1.1.2 Methodology

The study involved wind simulations on a 1:400 scale model of the Project and surroundings. These simulations were conducted in a boundary-layer wind tunnel for the purpose of quantifying local wind speed conditions and comparing to appropriate criteria for gauging wind comfort in pedestrian areas. The criteria recommended by the Boston Redevelopment Authority were used in this study. This section includes a description of the methods and presents the results of the wind tunnel simulations.

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

No Build Configuration: included the previously existing site and surrounding buildings as of the time the Previously Approved Project was studied ; and,

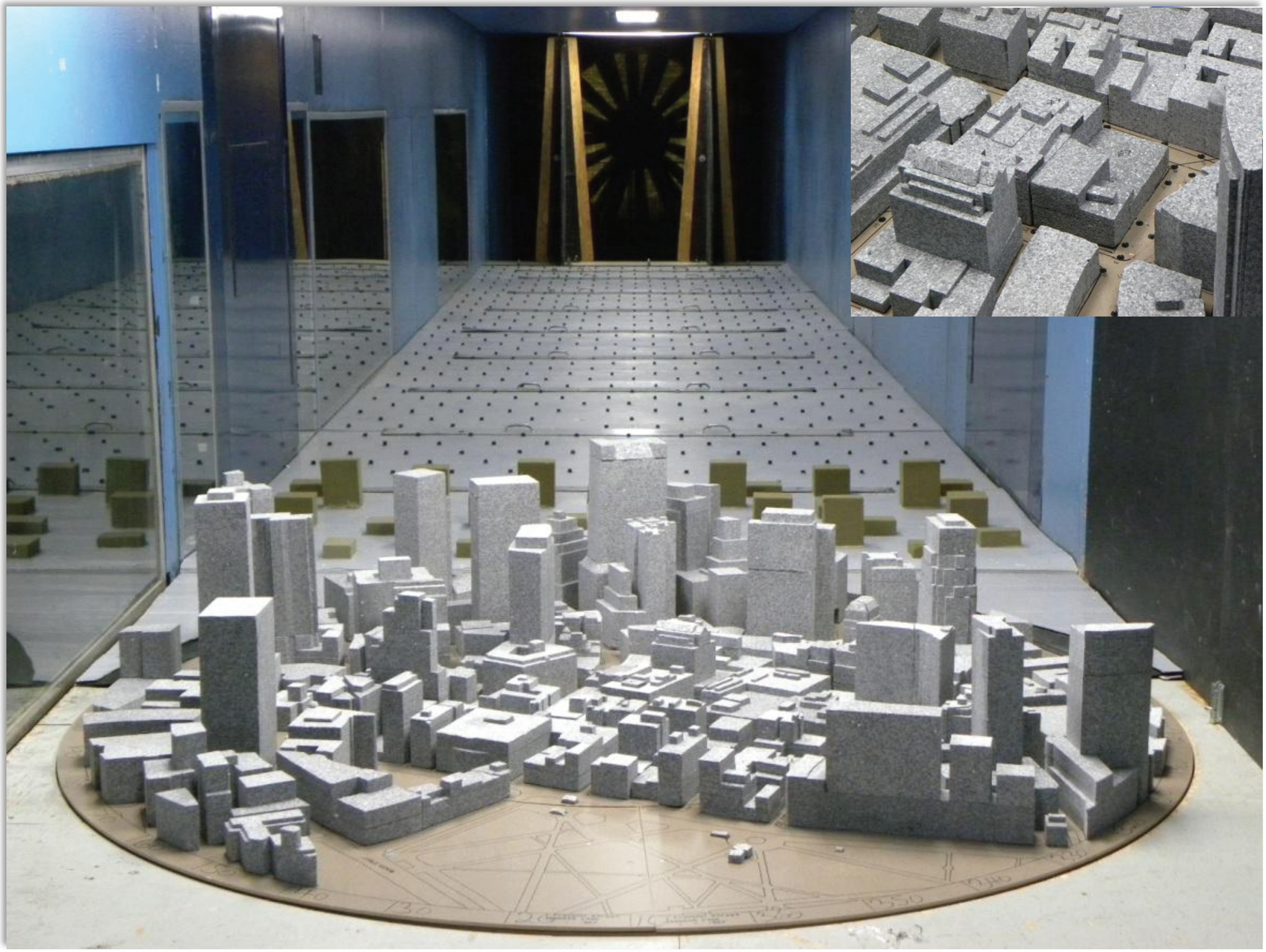
Build Configuration: included the Project, landscaping at the plaza north of the Tower, wind screens on the podium south of the Tower and on the adjacent Burnham Building, as well as all existing surroundings.

As shown in Figures 3-1 and 3-2, the wind tunnel model included the Project and all relevant surrounding buildings and topography within a 1600 foot radius of the study site. The mean speed profile and turbulence of the natural wind approaching the modeled area were also simulated in RWDI's boundary layer wind tunnel. The scale model was equipped with 65 specially designed wind speed sensors that were connected to the wind tunnel's data acquisition system to record the mean and fluctuating components of wind speed at a full-scale height of five feet above grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 wind directions, in 10 degree increments, starting from true north. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the reference wind speed in the free stream above the model. The results were then combined with long-term meteorological data, recorded during the years 1973 through 2008 at Boston's Logan International Airport, in order to predict full scale wind conditions. The analysis was performed separately for each of the four seasons and for the entire year.

Figures 3-3 and 3-4 present "wind roses", summarizing the annual and seasonal wind climates in the Boston area, based on the data from Logan International Airport. The wind roses are based on all observed wind readings for the given season. The left wind rose in 3-3 for example, summarizes the spring (March, April, and May) wind data. In general, the prevailing winds at this time of year are from the west-northwest, northwest, west, southwest and east. In the case of strong winds, however, the most common wind direction is northeast and west.

On an annual basis (Figure 3-5) the most common wind directions are those between southwest and northwest. Winds from the east and east-southeast are also relatively common. In the case of strong winds, northeast and west-northwest are the dominant wind directions.

This study involved state-of-the-art measurement and analysis techniques to predict wind conditions at the study site. However, some uncertainty remains in predicting wind comfort. For example, the sensation of comfort among individuals can be quite variable.



Millennium Tower and Burnham Building

RWDI

Figure 3-1

Wind Tunnel Study Model, Configuration - No Build

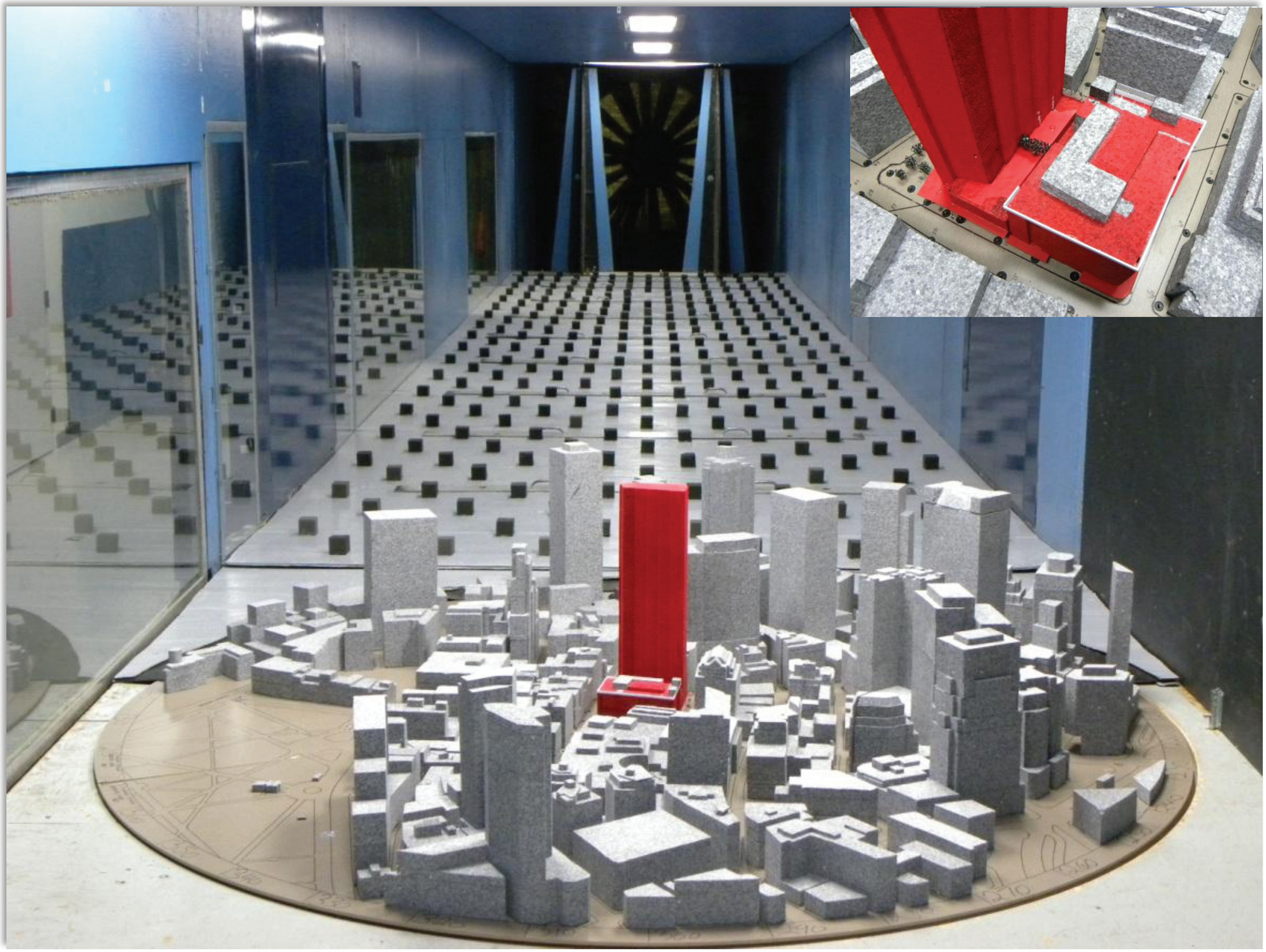
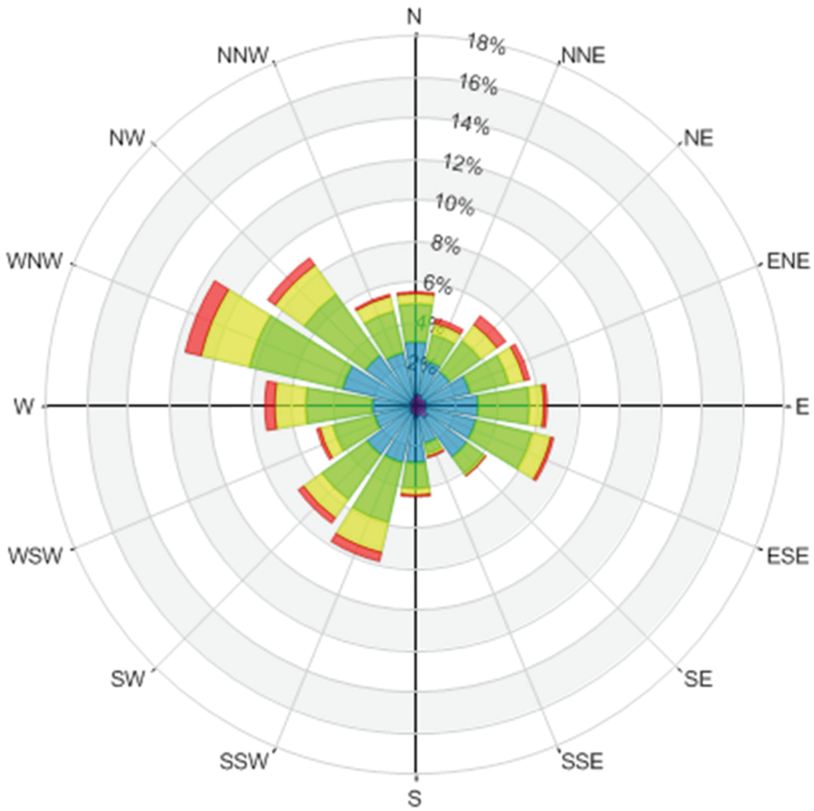
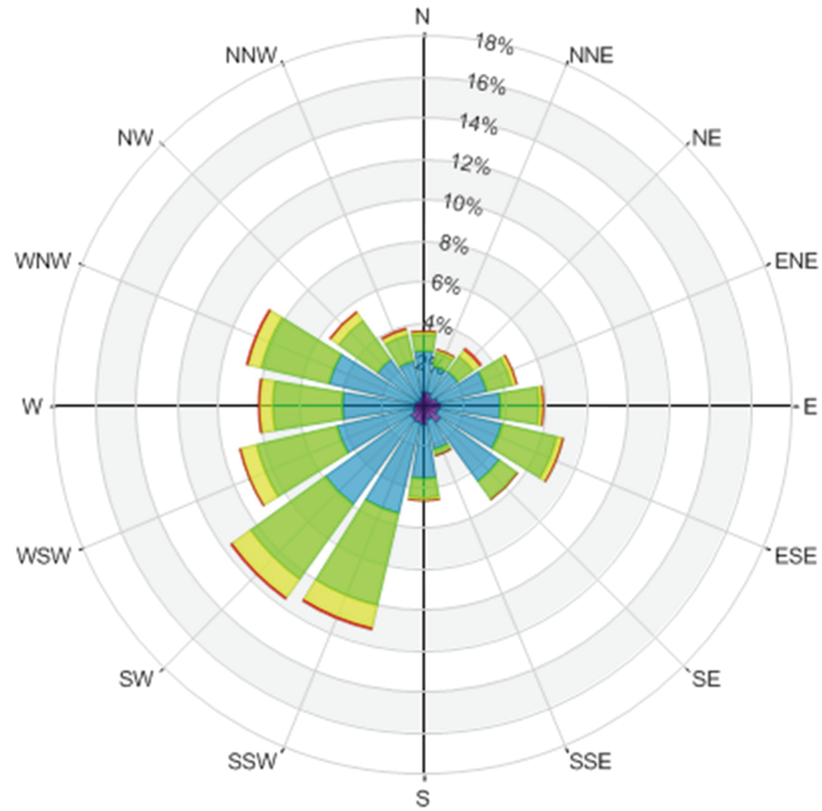


Figure 3-2

Wind Tunnel Study Model, Configuration - Build



Spring Winds
(March - May)

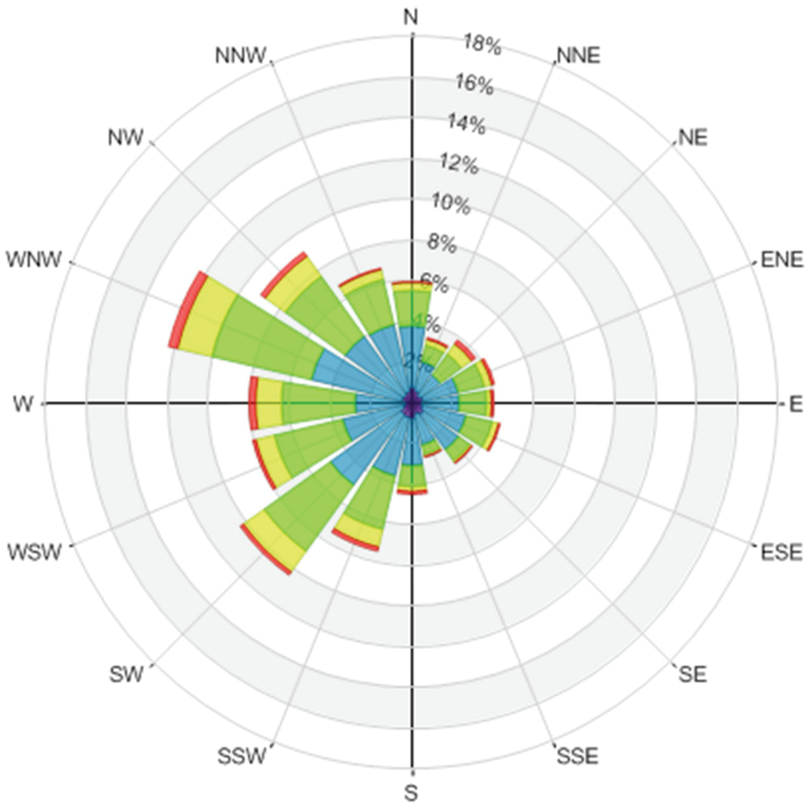


Summer Winds
(June - August)

Speed (mi/h)	Probability (%) Spring	Summer
Calm	1.3	1.3
1-6	7.3	10.5
7-12	35.9	46.7
13-18	36.4	34.1
19-24	14.7	6.8
>24	4.3	0.6

Figure 3-3

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1973 - 2008)



Fall Winds
(September - November)

Winter Winds
(December - February)

Speed (mi/h)	Probability (%) Fall	Winter
Calm	1.3	1.1
1-6	9.0	6.9
7-12	42.0	33.4
13-18	34.7	36.8
19-24	10.4	16.2
>24	2.6	5.7

Figure 3-4

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1973 - 2008)

Annual Winds

Speed (mi/h)	Probability (%)
Calm	1.3
1-6	8.4
7-12	39.5
13-18	35.5
19-24	12.0
>24	3.3

Figure 3-5

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1973 - 2008)

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 and are based on the BRA approved Melbourne criteria. Also, unforeseen changes in the project area, such as the construction or removal of buildings, can affect the conditions experienced at the Project Site. Finally, the prediction of wind speeds is necessarily a statistical procedure. The wind speeds reported are for the frequency of occurrence stated (one percent of the time). Higher wind speeds will occur but on a less frequent basis.

3.1.1.3 Pedestrian Wind Comfort Criteria

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root-mean-square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second set of criteria used by the BRA to determine the acceptability of specific locations is based on the work of Melbourne[1]. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the one-hour mean wind speed exceeded 1% of the time (i.e., the 99-percentile mean wind speed).

BRA Mean Wind Criteria*

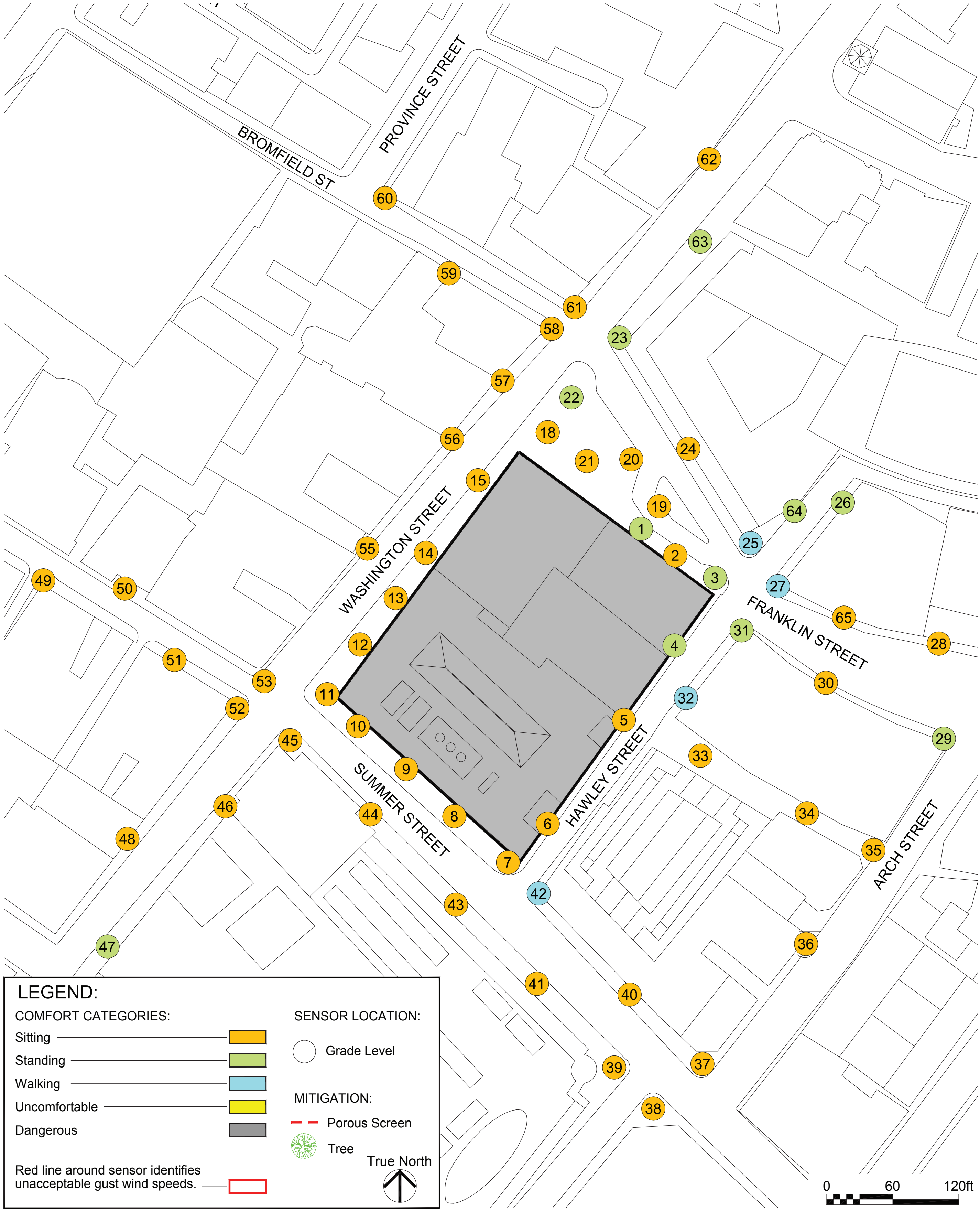
Dangerous	> 27 mph
Uncomfortable for Walking	> 19 and ≤ 27 mph
Comfortable for Walking	> 15 and ≤ 19 mph
Comfortable for Standing	> 12 and ≤ 15 mph
Comfortable for Sitting	< 12 mph

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

3.1.1.4 Test Results

Table 1 in Appendix A presents the mean and effective gust wind speeds for each season as well as annually. Figures 3-6 and 3-7 graphically depict the wind comfort conditions at each wind measurement location based on the annual winds. Typically the summer and

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



Millennium Tower and Burnham Building

RWDI

Figure 3-6

Pedestrian Wind Comfort Conditions - No Build (Annual)

Millennium Tower and Burnham Building

RWDI

Figure 3-7

Pedestrian Wind Comfort Conditions - Build (Annual) fall winds tend to be more comfortable than the annual winds while the winter and spring winds are less comfortable than the annual winds. The following summary of pedestrian wind comfort is based on the annual winds for each configuration tested, except where noted below in the text.

In general, a wind comfort categorization of walking is considered appropriate for sidewalks. Lower wind speeds conducive to standing are preferred at building entrances and plazas.

3.1.1.4.1 On-Site Entrances, Sidewalks and Plaza (Locations 1 through 22)

No Build Configuration

As shown on Figure 3-6 and Table 1 in Appendix A, wind conditions at all on-site locations were suitable for standing or sitting annually and seasonally. The effective gust criterion was also met seasonally and annually at all locations.

Build Configuration

With the Project in place, most of the locations studied had comfortable wind speeds and all had acceptable effective gust speeds. No dangerous mean wind speeds were detected at any on-site location for any season. Wind conditions around the adjacent Burnham Building were unchanged from the No Build condition described above. Wind conditions on Shopper's Park were generally comfortable for standing and thus are considered appropriate. Increased wind speeds were found at the base of the Tower (Figure 3-7). On an annual basis, wind conditions around the building entrances (Locations 1, 2, 15, 16 and 17) were comfortable for walking or sitting annually and for each season. Uncomfortable wind conditions were detected on Hawley Street annually (Location 4) as well as in the spring and winter. The wind conditions along Hawley Street at Locations 5, 15 and 16 were comfortable annually but uncomfortable wind conditions were found in the winter.

3.1.1.4.2 Off-Site Sidewalks (Locations 23 through 65)

No Build Configuration

Wind conditions for No Build Configuration were generally comfortable for sitting or standing on an annual basis. Exceptions were observed along Hawley Street (Locations 25, 27, 32 and 42), where wind conditions were comfortable for walking (Figure 3-6).

No uncomfortable or unacceptable wind conditions were detected at any location for any season.

Build Configuration

For the Build Condition, the effective gust criterion was met at all locations on an annual basis and no dangerous mean wind speeds were detected at any location for any season.

When the wind conditions for the No Build and Build Configurations are compared, they are generally similar (see Figures 3-6 and 3-7). Most locations were found to have wind conditions comfortable for sitting or standing on an annual basis (see Figure 3-7). The Tower induced increased wind activity on Hawley Street and at the intersection with Franklin Street, resulting in uncomfortable wind conditions at Locations 25 and 32 annually and seasonally (except in the summer). The effective gust speeds at these two locations also marginally exceeded the 31 mph criterion in the winter season.

3.1.1.5 Conclusions

The Project includes several positive design features for wind control (e.g., canopies, wind screens and landscaping). Suitable wind conditions were found at the vast majority of the areas on and around the Project and they are appropriate for the intended use. Additional mitigation measures will be considered as the design progresses.

3.1.2 Shadow

3.1.2.1 Introduction

A shadow impact analysis was conducted to investigate shadow impacts from the Project, in comparison to the Previously Approved Project, during three time periods (9:00 a.m., 12:00 p.m., and 3:00 p.m.) during the summer solstice (June 21), autumnal equinox (September 21), vernal equinox (March 21), and the 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. Since the analysis for the Previously Approved Project was completed, the date for the daylight saving time change in March has moved. This analysis includes the updated time period for both the Previously Approved Project and the proposed Project.

The shadow analysis presents the existing shadow, the new shadow that would have been created by the Previously Approved Project, and the net new shadow that will be created by the proposed Project. The analysis focuses on nearby open spaces, sidewalks and bus stops adjacent to and in the vicinity of the Project Site. Shadows have been determined using the applicable Altitude and Azimuth data for Boston. Figures showing the net new shadow from the Project are provided in Figures 3-8 to 3-21 at the end of this section. A discussion of shadow impacts on historic resources is included in Chapter 5.

The Project will be located in one of the densest areas of Boston. As a result, most new shadow associated with the Project will fall on rooftops of existing buildings and on streets. Shadow impacts from the Project are anticipated to be generally similar to those of the

Previously Approved Project. Additional shadow beyond the shadow cast by the Previously Approved Project will generally fall across rooftops in the surrounding area.

3.1.2.2 Compliance with Article 38 and Chapter 362 of the Acts of 1990

In addition to the shadow study for each of the study periods identified above, an analysis was conducted to evaluate compliance with Article 38 of the Boston Zoning Code (Article 38) and Chapter 362 of the Acts of 1990 and Chapter 384 of the Acts of 1992.

Article 38 requires that proposed projects within PDA's in Boston's Midtown Cultural District be in substantial accord with certain environmental impact standards. With regard to shadow, the criterion is that "[e]ach Proposed Project shall be arranged and designed in a way to assure that it does not cast shadow for more than two hours from 8:00 a.m. through 2:30 p.m., on any day from March 21 through October 21, in any calendar year, on any single Shadow Impact Area....that either (a) is not cast in shadow during such period on such days by structures existing as of the effective date of this article; or (b) would not be cast in shadow during such period on such days by structures built to the as-of-right limits allowed by this article, whichever structures cast greater shadow…".

Chapter 362 of the Acts of 1990 prohibits in relevant part, the taking of any action which would authorize the construction of any structure which casts a "new shadow" upon the Boston Common, but contains exceptions for structures that cast only a limited amount of shadow or cast shadow for only limited periods of time. With respect to the Midtown Cultural District, structures are permitted if they cast no new shadow for more than two hours from 8:00 in the morning through 2:30 in the afternoon on any day from March 21 through October 21, inclusive, in any calendar year, on any area of the Boston Common.

Appendix B includes the shadow studies related to compliance with Article 38 and Chapter 362 of the Act of 1990. The study looks at March, June and October as March and October demonstrate the greatest impact during the year and June demonstrates the least impact of the year. As demonstrated, similar to the Previously Approved Project, the new shadow from the Project complies with the Boston Common shadow legislation. The results of the study also show that like the Previously Approved Project, the Project will not have substantial effects on the Shadow Impact Areas referenced in Article 38. The new shadow from the Project also complies with the Boston Public Garden shadow legislation, Chapter 384 of the Acts of 1992.

3.1.2.3 Results

Vernal Equinox (March 21)

During the vernal equinox, most of the net new shadow from the Project will be similar to the net new shadow that would have been cast by the Previously Approved Project.

At 9:00 a.m., shadow impacts from the Project and the Previously Approved Project are similar from Washington Street to Tremont Street. Net new shadow on surrounding buildings from the Project will be similar or less than that from the Previously Approved Project. Net new shadow from the Project will be cast to the west and extend further across the Boston Common and onto a minor portion of the State House lawn and across Beacon Street.

At 12:00 p.m., net new shadow will be cast to the north. Minor net new shadow beyond that cast by the Previously Approved Project will be cast onto nearby rooftops. The Project will cast less net new shadow onto Washington Street than the Previously Approved Project.

At 3:00 p.m., net new shadow from the Project will be cast to the northeast onto small areas of rooftop between Milk and Water Streets beyond areas of net new shadow created by the Previously Approved Project. The Project will also cast a minimal amount of additional net new shadow onto Washington Street beyond that created by the Previously Approved Project.

Summer Solstice (June 21)

During the summer solstice, most of the net new shadow from the Project will be similar to that of the Previously Approved Project.

At 9:00 a.m., net new shadow from the Project will be cast to the west and will be similar to the net new shadow from the Previously Approved Project, except for additional net new shadow on some nearby rooftops on Winter Street.

At 12:00 p.m., net new shadow from the Project will be cast to the northwest and will be similar to the shadow from the Previously Approved Project, except for minor additional net new shadow on some nearby rooftops.

At 3:00 p.m., net new shadow from the Project will be cast to the northeast and will be similar to the net new shadow cast by the Previously Approved Project, except for additional net new shadow on some nearby rooftops.

At 6:00 p.m., net new shadow will be cast to the east and will be less than the net new shadow cast by the Previously Approved Project near Franklin Street.

Autumnal Equinox (September 21)

During the autumnal equinox, most of the net new shadow from the Project will be similar to the net new shadow cast by the Previously Approved Project.

At 9:00 a.m., net new shadow from the Project will be cast to the west and be similar from Washington Street to Tremont Street. Net new shadow on surrounding buildings will be similar or less than from the Previously Approved Project. Net new shadow will extend further than the Previously Approved Project across the Boston Common and onto a small portion of the State House lawn and across Beacon Street.

At 12:00 p.m., new shadow will be cast to the north. Some net new rooftop shadow near Washington Street from the Previously Approved Project will be eliminated with the Project, and some net new shadow beyond that cast by the Previously Approved Project will be cast onto nearby rooftops near Province Street.

At 3:00 p.m., net new shadow from the Project will be cast to the northeast onto small areas of rooftop near Washington Street beyond areas under shadow from the Previously Approved Project. The Project will also cast less net new shadow onto Washington Street than the Previously Approved Project.

At 6:00 p.m., most of the area will be under existing shadow, and net new shadow from the Project will be cast to the east. Net new shadow will be cast across a similar sized area as the Previously Approved Project, and will be limited to the rooftops of nearby buildings.

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 to elongate and creating considerable shadow in the area.

During the winter solstice, most of the net new shadow from the Project will be similar to the net new shadow cast by the Previously Approved Project.

At 9:00 a.m., much of the surrounding area will be under existing shadow. New shadow will be cast to the northwest and net new shadow from the Project will extend beyond the shadow of the Previously Approved Project across rooftops towards Cambridge Street. The Project will cast shadow on some small additional areas, including rooftops and a portion of State House Park.

At 12:00 p.m., net new shadow will be cast to the north. Net new shadow beyond that cast by the Previously Approved Project will be cast onto rooftops.

At 3:00 p.m., much of the area will be under existing shadow. Net new shadow from the Project will be similar to the shadow cast by the Previously Approved Project. Net new shadow from the Project will be cast onto small areas of rooftop beyond the shadow cast by the Previously Approved Project.

Conclusion

During the time periods studied, the net new shadow from the Project will be similar to the net new shadows that would have been cast by the Previously Approved Project. Due to the density of the surrounding districts, the majority of the net new shadow cast by the Project beyond the Previously Approved Project will be on rooftops in the surrounding area. During 12 of the 14 time periods studied, no net new additional shadow will be cast onto the Boston Common, and no net new shadow will be cast onto the State House Lawn and Beacon Street. During the vernal and autumnal equinoxes, net new shadow beyond the shadow cast by the Previously Approved Project will be cast onto a minor portion of the State House lawn, portions of the Boston Common and Beacon Street during the morning. During 13 of the 14 time periods studied, no net new shadow will be cast onto State House Park. During the morning of the winter solstice, net new shadow from the Project beyond the shadow from the Previously Approved Project will be cast onto a portion of State House Park.

3.1.2.4 Boston Common Shadow Study

As described above, Chapter 362 of the Acts of 1990 prohibits the authorization of any structure which casts a "new shadow" upon the Boston Common, but contains exceptions for structures that cast only a limited amount of shadow or cast shadow for only limited periods of time. With respect to the Midtown Cultural District, structures are permitted if they cast no new shadow for more than two hours from 8:00 in the morning through 2:30 in the afternoon on any day from March 21 through October 21, inclusive, in any calendar year, on any area of the Boston Common. Accordingly, the Project will be in compliance with Chapter 362 of the Acts of 1990 because, as described above, it will not create any new shadow on the Boston Common that lasts more than two hours between the hours of 8:00 a.m. and 2:30 p.m. See Appendix B.

3.1.2.5 Article 38 Shadow Study

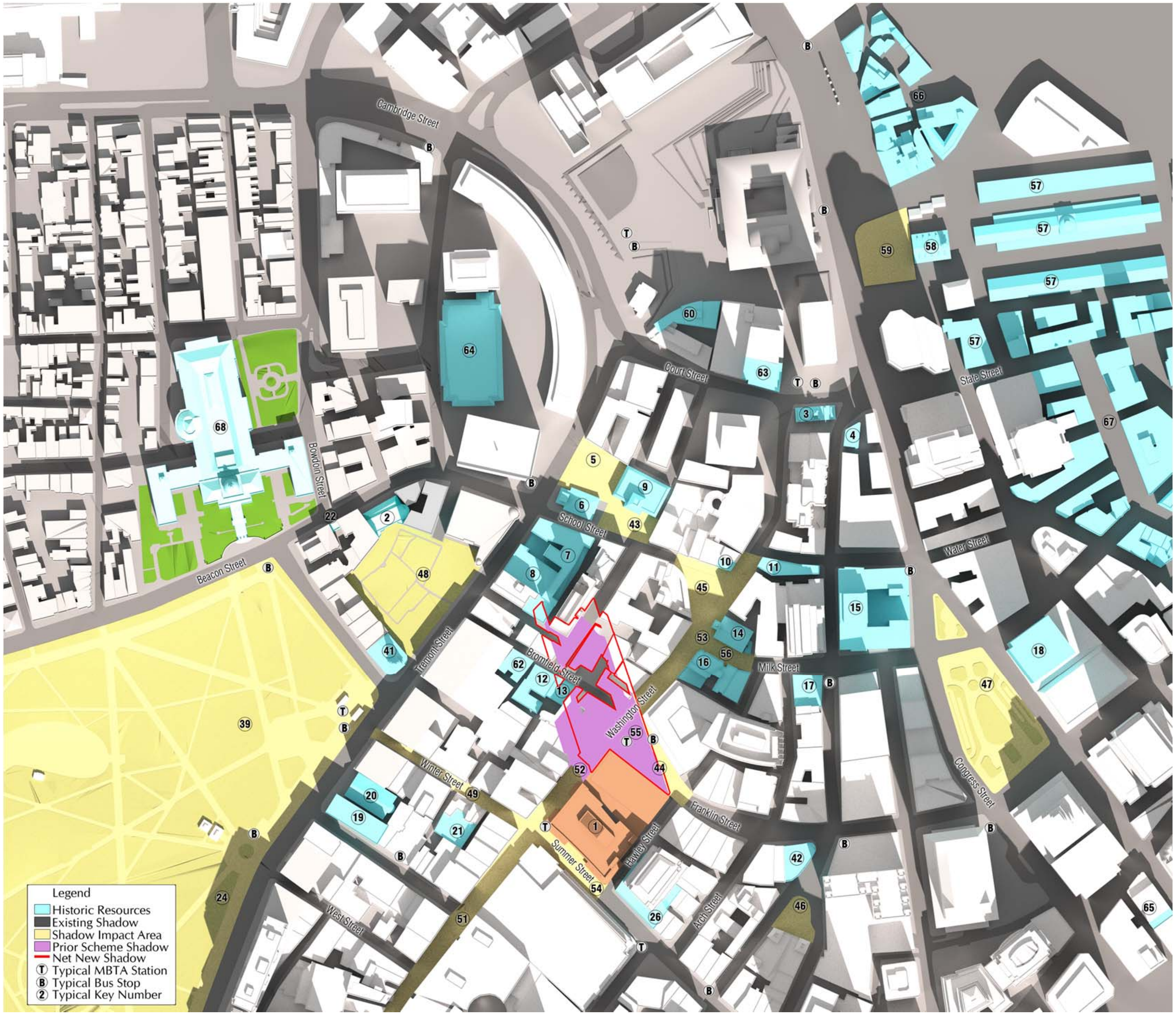
The Project has been designed in a way that manages to cast new net shadow for more than two hours on only two small portions of the 17 Shadow Impact Areas studied during limited portions of the year: (i) Shopper's Park and adjacent portions of Franklin Street and Washington Street and (ii) a portion of the sidewalk in front of 350 Washington Street, and will create similar net new shadow on the Shadow Impact Areas as did the Previously Approved Project. (Appendix B).

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 3-8

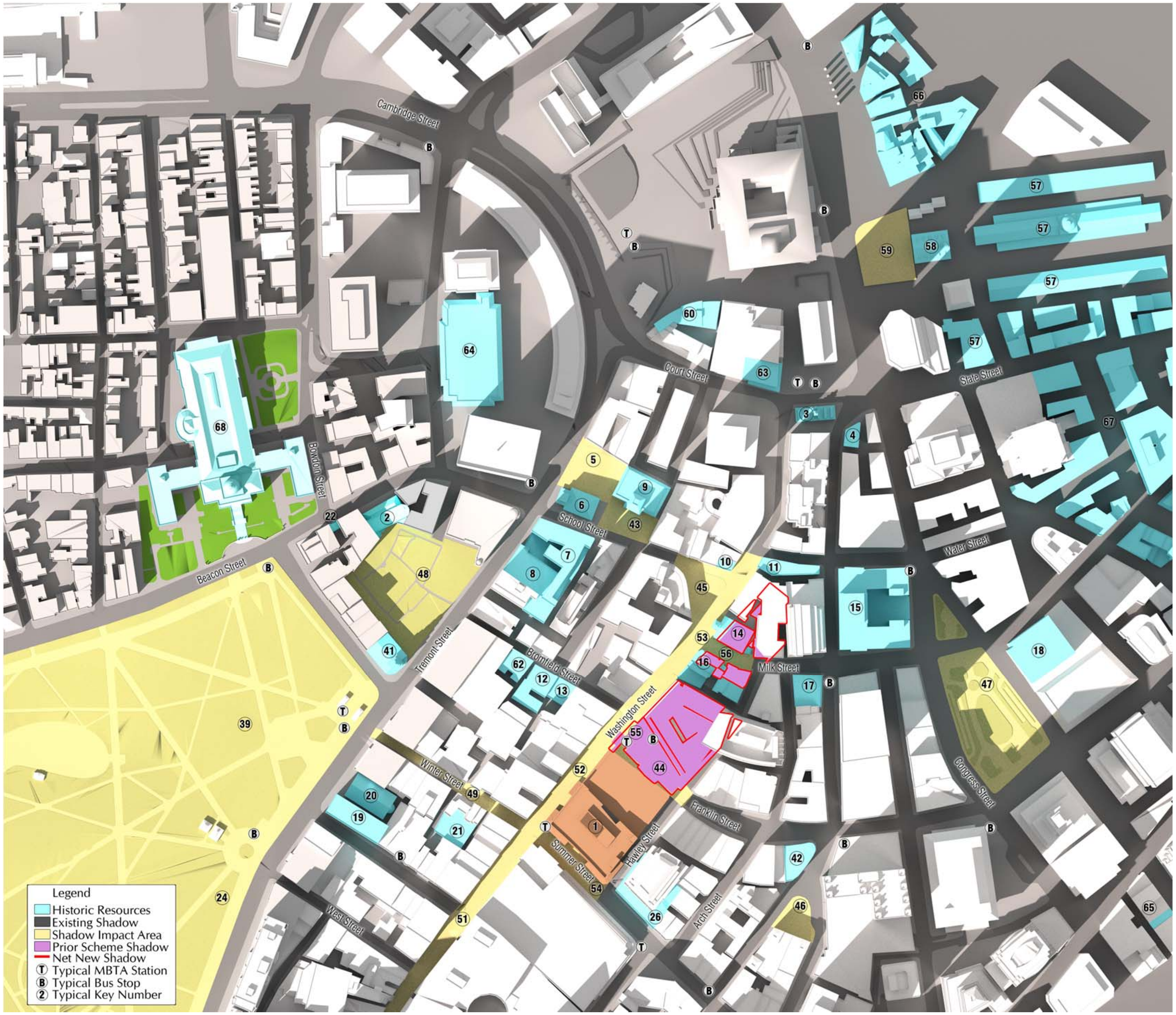
March 21, 9:00 am



Millennium Tower and Burnham Building

Figure 3-9

March 21, 12:00 pm

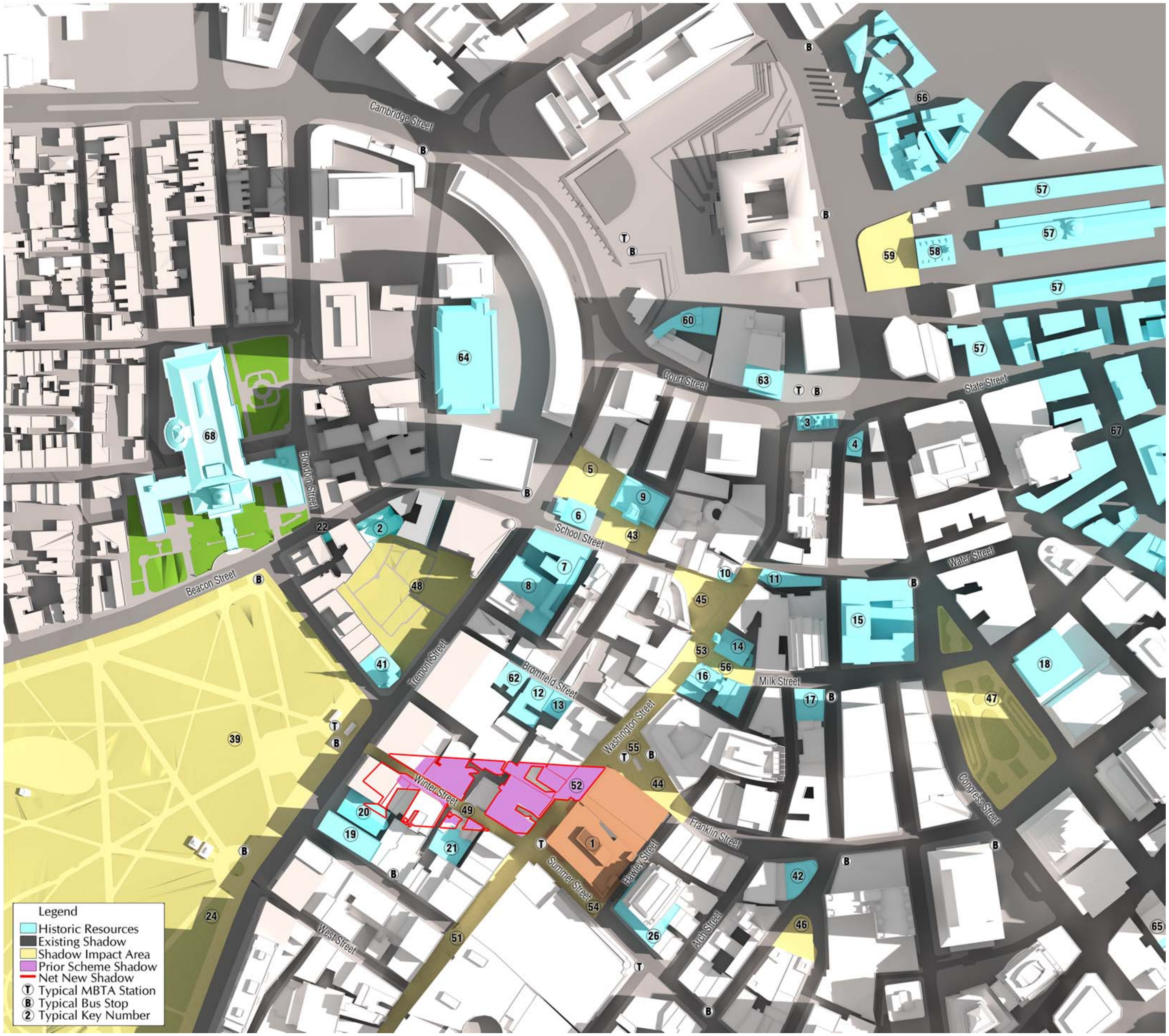


Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 3-10

March 21, 3:00 pm

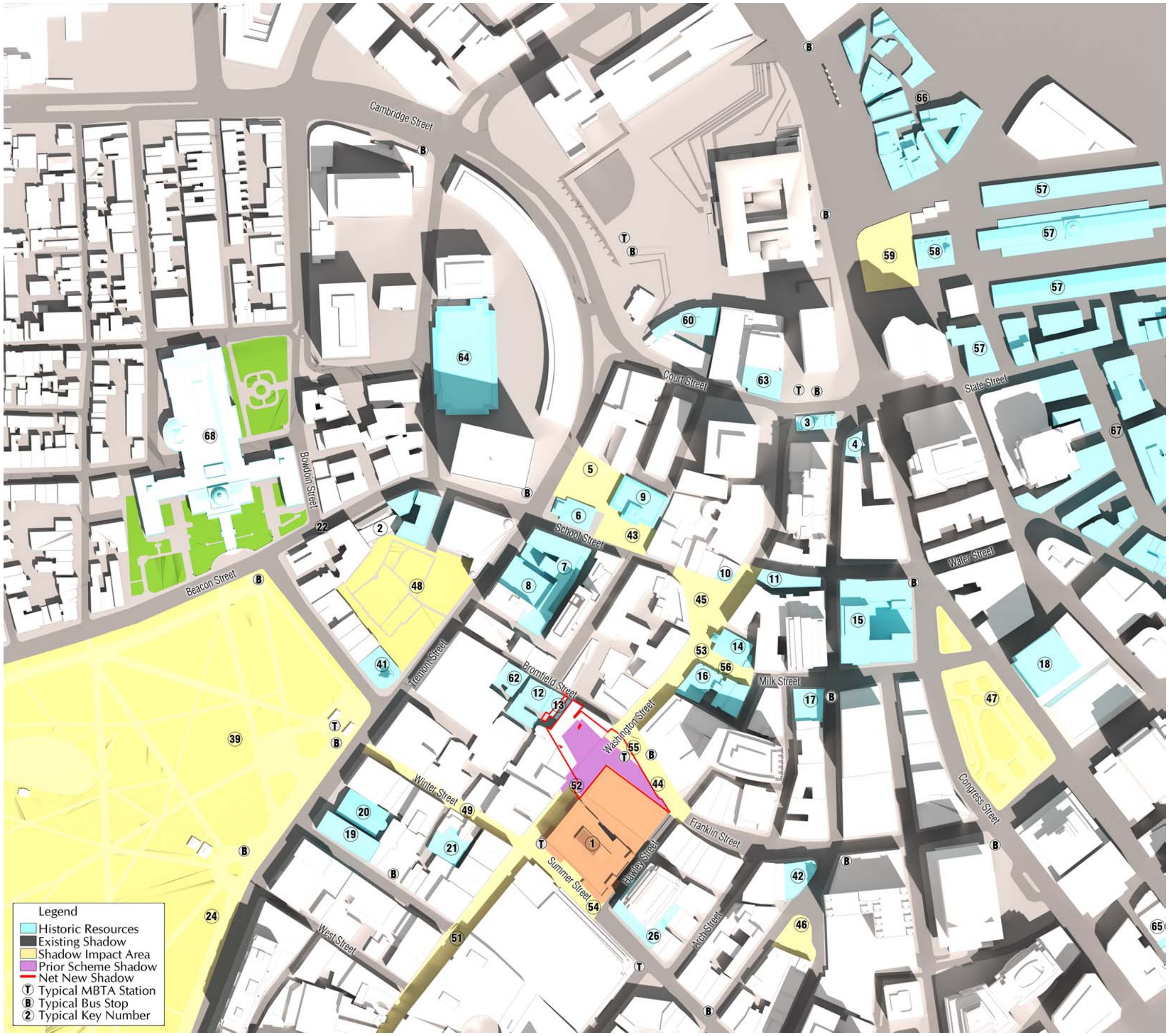


Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 3-11

June 21, 9:00 am

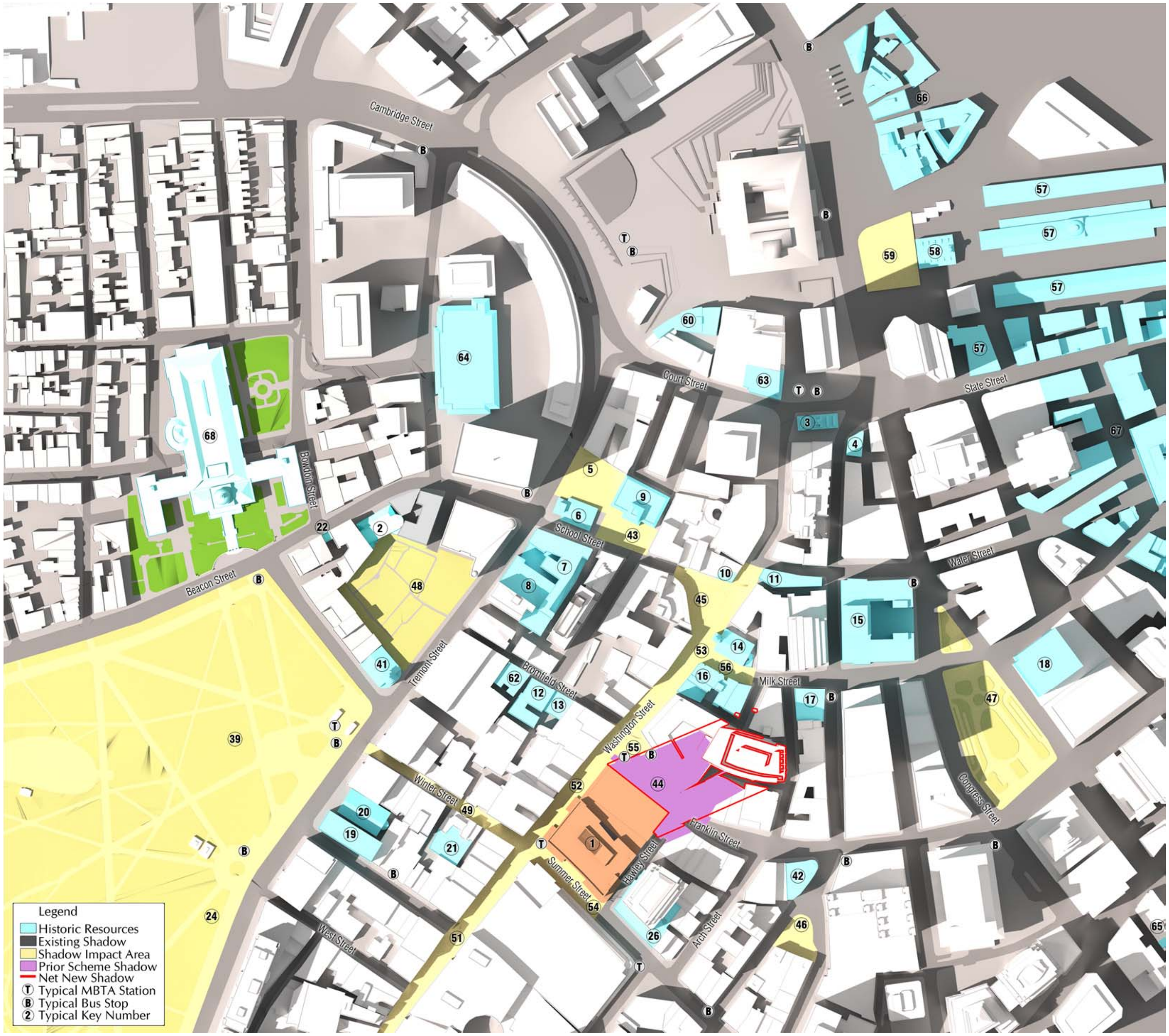


Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 3-12

June 21, 12:00 pm



Millennium Tower and Burnham Building

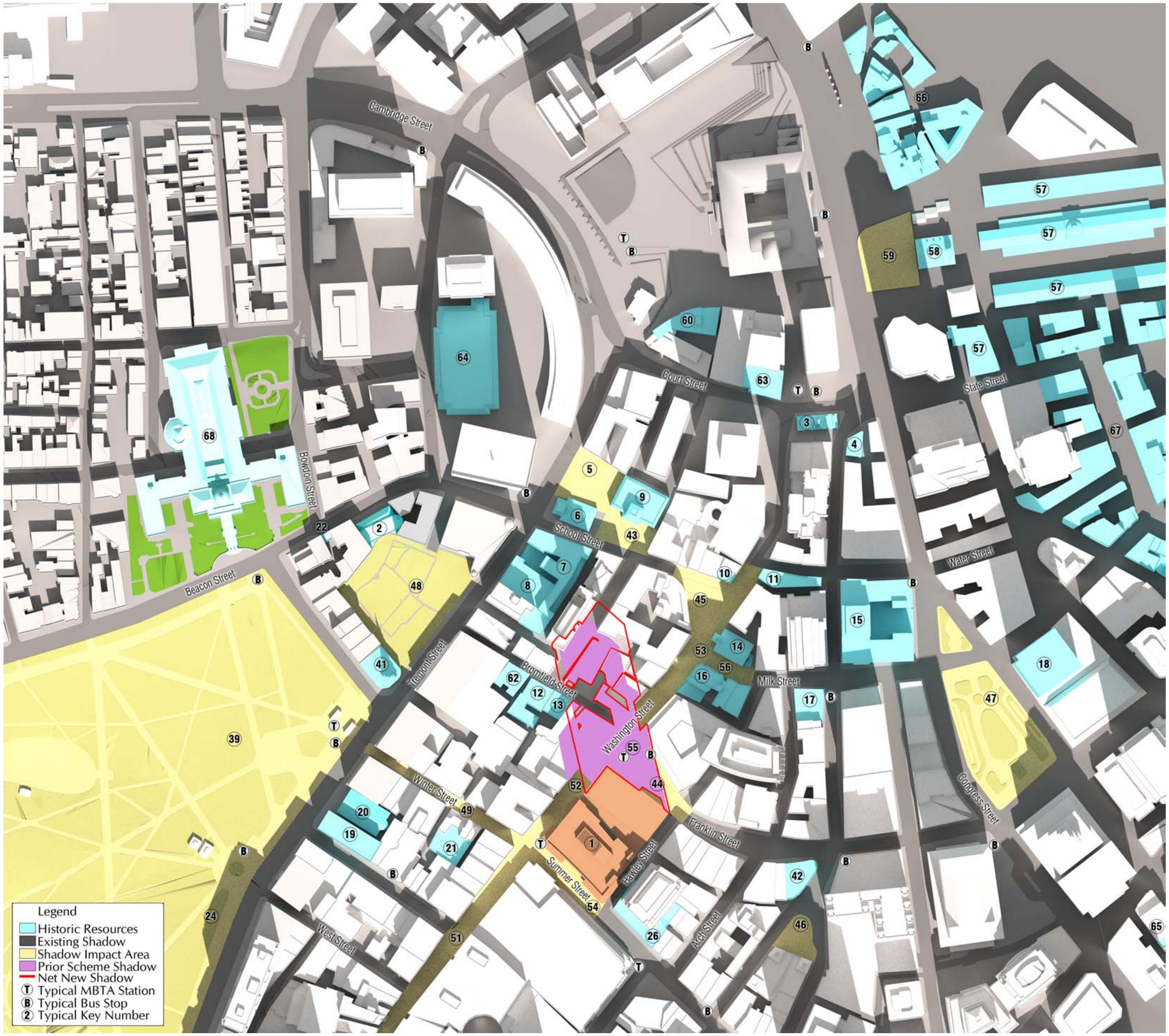
Millennium Tower and Burnham Building

Figure 3-14
June 21, 6:00 pm

Millennium Tower and Burnham Building

Figure 3-15

September 21, 9:00 am



Millennium Tower and Burnham Building

Figure 3-16

September 21, 12:00 pm

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 3-17

September 21, 3:00 pm

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 3-18

September 21, 6:00 pm

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 3-19

December 21, 9:00 am

Millennium Tower and Burnham Building

Figure 3-20

December 21, 12:00 pm

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 3-21

December 21, 3:00 pm

3.1.3 Daylight

3.1.3.1 Introduction and Summary of Analysis

The purpose of the daylight analysis is to estimate the extent to which a proposed project will affect the amount of daylight reaching the streets and the sidewalks in the immediate vicinity of a project site. A daylight analysis was prepared for the Previously Approved Project which included an analysis from the streets surrounding the Project Site and conditions in the surrounding area. Due to the proposed changes from the Previously Approved Project, the daylight conditions for the proposed Project have been analyzed.

The results of the daylight analysis presented for the currently proposed Project indicate that development of the Project as currently proposed will result in improved daylight obstruction levels at the Project Site over the previously approved conditions. Additionally, the resulting conditions will be within the range of existing daylight obstruction values in the Project vicinity, and therefore, consistent with daylight conditions of the nearby area.

Overall, daylight conditions from the Project are typical of a densely developed area and are similar to daylight obstruction values associated with other buildings in the vicinity of the Project.

3.1.3.2 Methodology

The daylight analysis was performed utilizing the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program[2]. This program measures the percentage of "sky-dome" that is obstructed by a project and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

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

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

As mentioned, the analysis treats the following elements as controls for data comparison:

- Previously Approved Project;
- Proposed conditions; and
- The context of the area.

Viewpoints were the same as for the Previously Approved Project: along Washington Street (Viewpoint 1), Hawley Street (Viewpoint 2), Franklin Street (Viewpoint 3), and Summer Street (Viewpoint 4). The daylight analysis examined daylight obstruction from the four locations for the currently proposed Project and compared the results to those found for the Previously Approved Project and the area context. The area context points used for comparison are Washington Street (AC1 and AC7); Arch Street (AC2); New Hawley Place (AC3); Summer Street (AC4); Hawley Street (AC5); and Avery Street (AC6). These viewpoints are all illustrated on Figure 3-22.

3.1.3.3 Daylight Analysis Results

The results for each viewpoint under each alternative condition are described in Table 3-1. Figures 3-23 through 3-24 illustrate the BRADA results for each analysis.

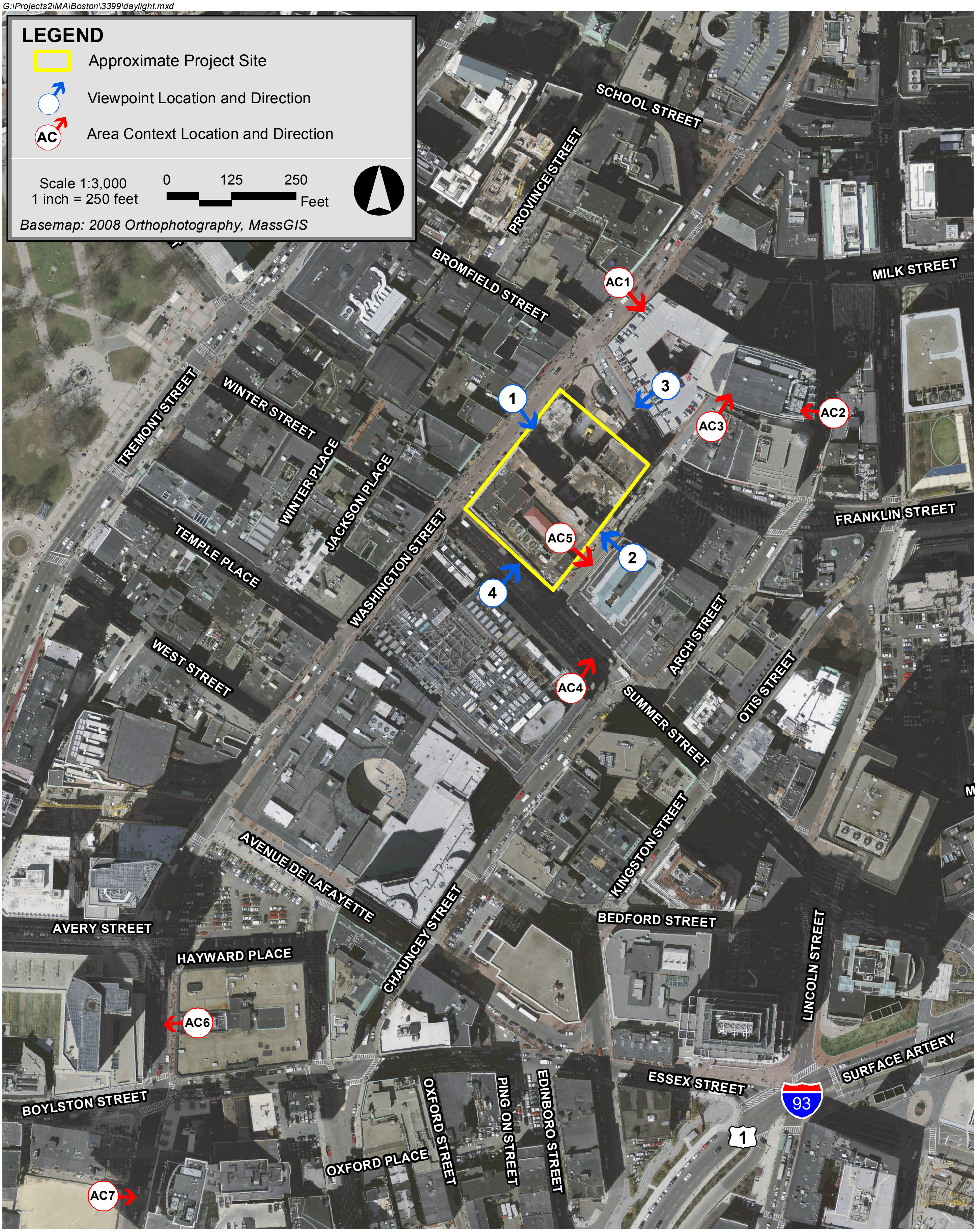
Table 3-1 Daylight Obstruction Values

Viewpoint Locations		Previously Approved	Proposed
Viewpoint 1	Washington Street	83.2%	72.7%
Viewpoint 2	Hawley Street	91.2%	90.1%
Viewpoint 3	Franklin Street	87.2%	72.3%
Viewpoint 4	Summer Street	87.2%	84.5%

Area Context Points		
AC1*	Washington Street looking east at 33 Arch Street	83.6%
AC2*	Arch Street looking west at 33 Arch Street	86.2%
AC3*	New Hawley Place looking north at 33 Arch Street	90.8%
AC4	Summer Street looking northeast at 101 Summer Street	76.1%
AC5	Hawley Street looking east at 101 Summer Street	92.7%
AC6*	Avery Street looking west at 2 Avery Street (Millennium South Tower)	82.6%
AC7*	Washington Street looking east at 660 Washington Street (Liberty Place)	84.0%

* AC1 through AC3 are based on a daylight analysis prepared by Epsilon Associates for the 33 Arch Street FEIR/FPIR from August, 1998; AC6 is based on a daylight analysis prepared by Epsilon Associates for the Residences at Kensington Place DPIR from July, 2002; and AC7 is based on a daylight analysis prepared by Epsilon Associates for the Liberty Place DPIR from December, 2001.

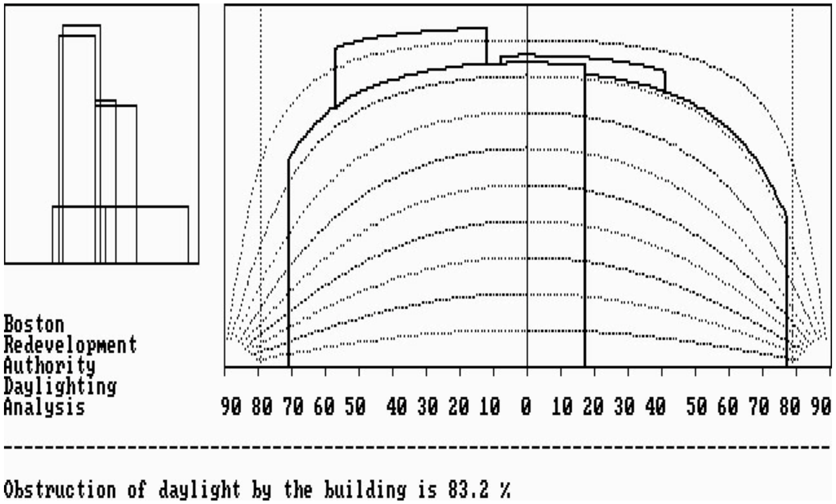
G:\Projects2\MA\Boston\3399\daylight.mxd



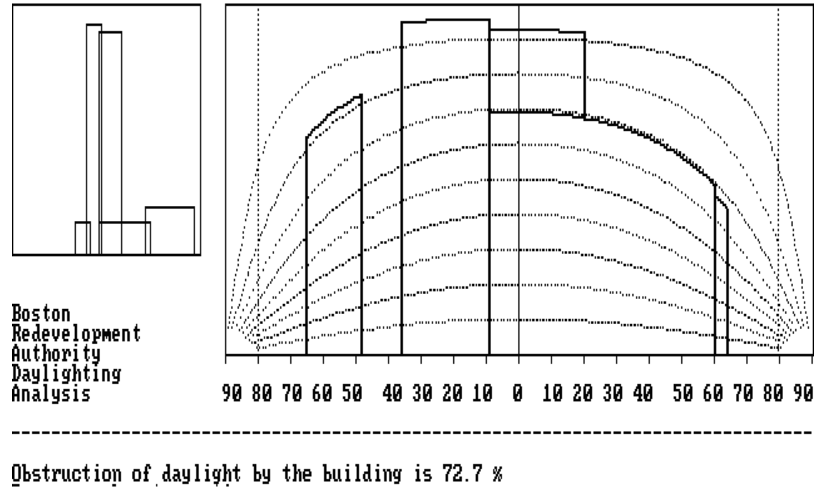
Millennium Tower and Burnham Building

Epsilon
ASSOCIATES INC.

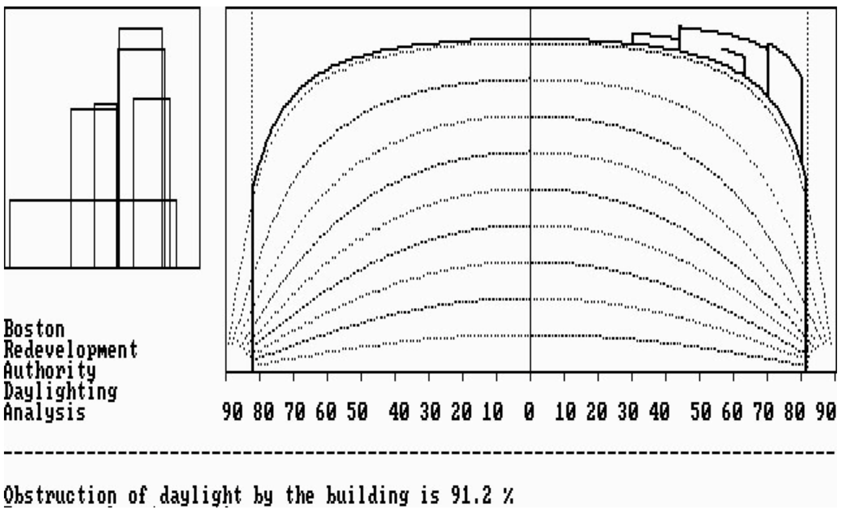
Figure 3-22
Daylight Analysis



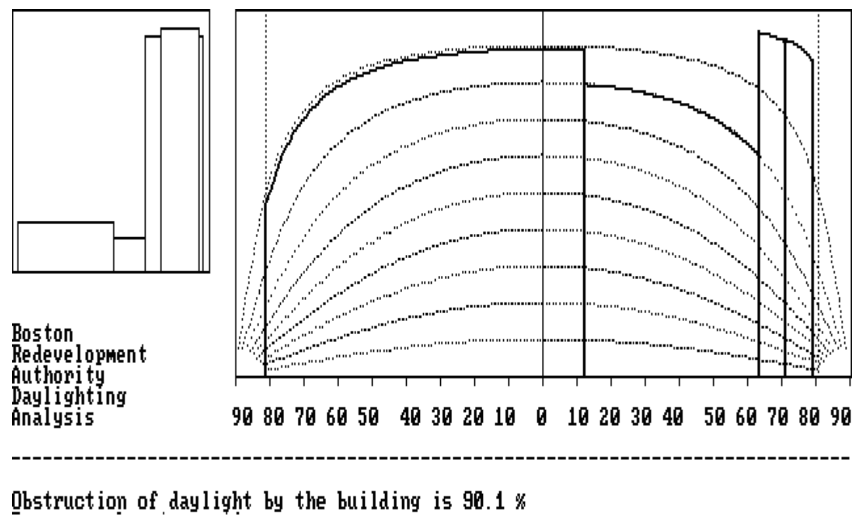
Viewpoint 1: Previously approved project from Washington Street



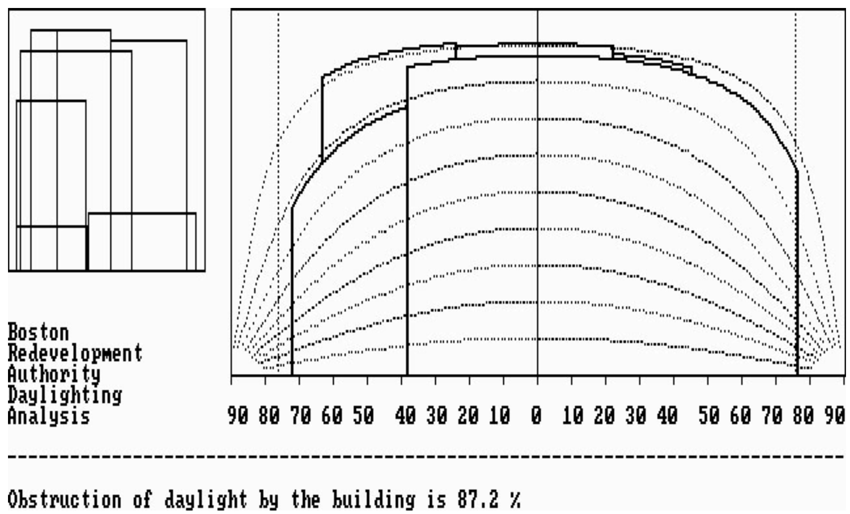
Viewpoint 1: Proposed project from Washington Street



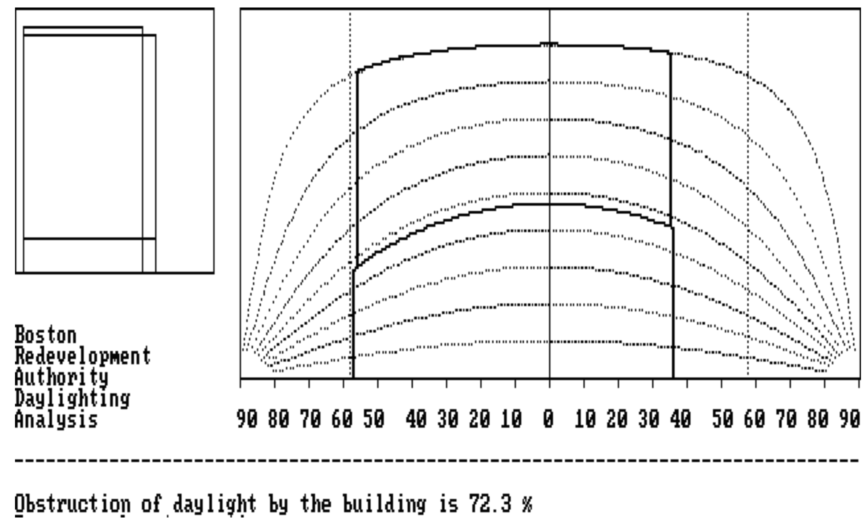
Viewpoint 2: Previously approved project from Hawley Street



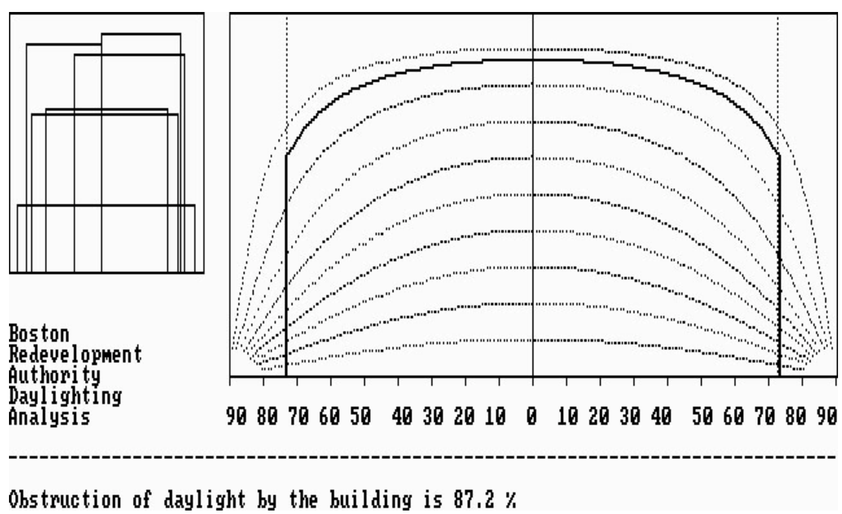
Viewpoint 2: Proposed project from Hawley Street



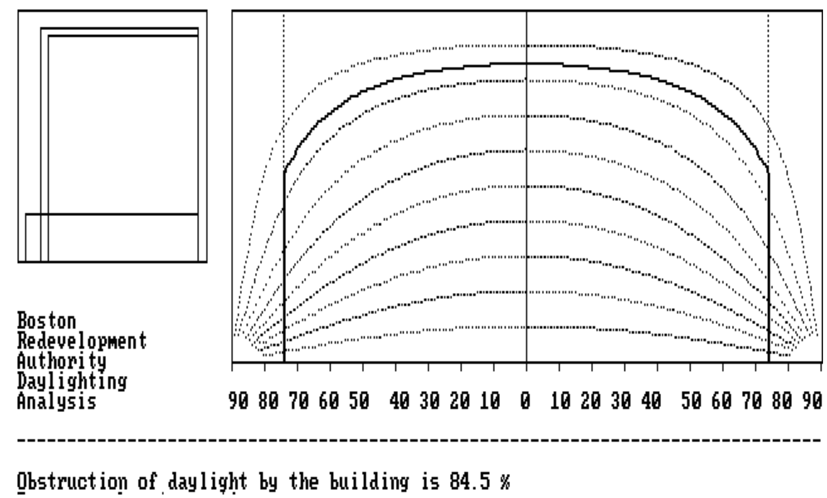
Viewpoint 3: Previously approved project from Franklin Street



Viewpoint 3: Proposed project from Franklin Street



Viewpoint 4: Previously approved project from Summer Street



Viewpoint 4: Proposed Project from Summer Street

Washington Street – Viewpoint 1

Washington Street runs along the western edge of the Project Site. Viewpoint 1 was taken from the center of Washington Street, looking southeast at the Project Site. The development of the Project will improve daylight obstruction values from this location in comparison to the Previously Approved Project from 83.2% to 72.7%.

Hawley Street – Viewpoint 2

Hawley Street runs along the eastern edge of the Project Site. Viewpoint 2 was taken from the center of Hawley Street, looking northwest at the Project Site. The daylight obstruction value from this location is similar to the Previously Approved Project with a change from 91.2% to 90.1%, and is consistent with other points on Hawley Street currently.

Franklin Street – Viewpoint 3

Franklin Street runs along the northern edge of the Project Site. Viewpoint 3 was taken from the center of Franklin Street looking southwest at the Project Site. The development of the Project will improve the daylight obstruction value, when compared to the daylight obstruction value from the Previously Approved Project, from 87.2% to 72.3%, due to the setback of the Tower portion of the building from Franklin Street. The daylight obstruction value will be similar to that found in the surrounding area.

Summer Street – Viewpoint 4

Summer Street runs along the southern edge of the Project Site. Viewpoint 4 was taken from the center of the street, looking northeast at the Project Site. The proposed Project will improve the daylight obstruction value, when compared to the Previously Approved Project, from 87.2% to 84.5%, since the Project does not propose to cantilever over the Burnham Building like the Previously Approved Project.

Area Context Views

The proposed Project will be located in a dense downtown neighborhood. The area is characterized by tall high-rise buildings such as 33 Arch Street, 101 Arch Street, Liberty Place at 660 Washington Street, and the Millennium Place towers on Avery Street, as well as some lower rise buildings, mostly to the west of the Project Site, toward the Boston Common. The Project's daylight obstruction values fit within the range of daylight obstruction values of these surrounding buildings. The daylight conditions adjacent to the Project Site range from 76.1% and 92.7% on Washington Street, Summer Street, Hawley Street, New Hawley Place and Arch Street (AC1 through AC5) to 82.6% at the southern tower of Millennium Place at 2 Avery Street (AC6) and 84.0% at Liberty Place (AC7).

3.1.3.4 Conclusions

The daylight analysis conducted for the Project describes the daylight obstruction values for the proposed Project and compares those values to those found for the Previously Approved Project and the surrounding area. The results of the BRADA analysis indicate that the development of the Project will result in improved daylight obstruction at the Project Site in comparison to the previously approved design. The resulting conditions will be similar to or better than much of the daylight obstruction values within the surrounding area as shown by the area context viewpoints.

3.1.4 Solar Glare

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

3.1.5 Air Quality

The proposed Project is anticipated to utilize updated mechanical equipment (including the number, size, and type) than that proposed for the Previously Approved Project. Although the mechanical systems have not been finalized, it is anticipated that the systems described below will be similar to the final systems design. With these changes, however, it is anticipated that the air quality impacts from the Project will be similar to or less than the impacts from the Previously Approved Project. In addition, the reduction in vehicle trips will also result in a decreased impact on air quality from the Project.

3.1.5.1 Emergency Generators

Emergency generators provide life-safety power for lighting and other emergency systems in case of a utility power failure. The Previously Approved Project called for a single 2000 kilowatt (kW) emergency diesel generator located in a mechanical penthouse atop the Burnham Building. The current Project includes two smaller 750 kW emergency diesel generators, with one located on each building. The combined output of the units is smaller than the Previously Approved Project and, therefore, assuming a similar annual use, the total emissions are smaller. Furthermore, one of the generators will be placed atop the roof of the Tower, and therefore, ground-level impacts from the revised design units are also expected to be lower than the anticipated impacts from the Previously Approved Project. It is expected that the Project's change in emergency generators will provide a net air quality benefit over the Previously Approved Project. At this time, the mechanical equipment is conceptual in nature. During the final design phase of the Project, mechanical equipment will be specified and designed to meet applicable regulations.

3.1.5.2 Heating Boilers

The Previously Approved Project called for a total of six 2 million British thermal units per hour (MMBtu/hr) natural gas-fired heating boilers to be installed. The current design calls for a total of eight 6 MMBtu/hr boilers, of which six boilers will be active and two boilers will function as standby. Although the Project includes more and larger boilers, they are still small natural gas-fired boilers which are all very clean-burning, producing low pollutant emissions. Furthermore, the new boilers will be high-efficiency condensing boilers which require less natural gas per unit of heat output, reducing emissions per unit of output.

3.1.5.3 Cooling Towers

Cooling towers are used to remove the excess heat generated by the building's mechanical equipment. The Previously Approved Project included a total of six single-cell cooling towers, while the current design proposes eight single-cell units. All units will be located on the roofs of the buildings. Because the size of the units are identical, the current design is expected to increase emissions from the cooling towers by 25% over the previously approved design. However, cooling towers only emit very small quantities of particulate matter (PM). The increase is expected to be negligible in the context of the entire Project.

3.1.5.4 Loading Docks

Loading docks with mechanical ventilation will be part of the Project. Carbon monoxide (CO) monitors will be installed within enclosed areas where idling vehicles may reside to ensure that levels of CO do not exceed health standards. These monitors control abatement ventilation when necessary.

It is expected that the number and use of loading docks will remain unchanged from the Previously Approved Project. Thus, there would likely be no change in the air quality impacts from emissions from vehicles idling at loading docks.

3.1.5.5 Underground Garage

An underground parking garage with up to 550 spaces is proposed as part of the Project. CO monitors will be installed within the garage to ensure that levels of CO do not exceed health standards, and will be used to control abatement ventilation when necessary. The Previously Approved Project included up to 299 spaces. Although the revised garage allows for more spaces, the overall fleet wide vehicular emission rate has decreased substantially since 2007. Therefore, even with the increase in garage spaces, it can be expected that ambient impacts of CO emitted from garage ventilation systems would be equal to or lower than those impacts shown in the 2007 analysis.

3.1.5.6 Microscale (Intersection) Impacts

A microscale analysis is used to determine the effect on air quality of the increase in traffic generated by a project. The Proponent is required to analyze local effects of the potential increase in traffic on ambient air quality near specific intersections. This "microscale" analysis is required for the Project at intersections where 1) Project traffic would impact intersections or roadway links currently operating at Level of Service (LOS) D, E, or F or would cause LOS to decline to D, E, or F; 2) Project traffic would increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or, 3) the Project will generate 3,000 or more new average daily trips on roadways providing access to a single location.[3]

Since average daily vehicle trips are reduced by approximately 48% (4,094 to 2,110), it is anticipated that traffic flow at the analyzed intersections would also be improved from the 2007 analysis. Therefore, vehicle induced ambient impacts of CO at analyzed intersections are anticipated to be lower than those shown for the Previously Approved Project.

3.1.5.7 Air Quality Conclusions

The significant reduction in vehicle trips, the change in the emergency diesel generator setup, and the increase in efficiency of the boilers is anticipated to offset any emissions increase due to the increase in the size and number of the natural gas boilers and cooling towers. In general, air quality may be expected to improve, or at a minimum, not degrade, as compared to the Previously Approved Project.

3.1.6 Noise

3.1.6.1 Introduction

This section summarizes an analysis performed to assess potential noise impacts associated with changes to the layout and equipment list for the Project from the Previously Approved Project. A full noise impact assessment at the time of the DPIR submission for the Previously Approved Project, including a noise-monitoring program and an estimate of future Project noise levels, concluded that the major sources of outdoor mechanical equipment would not introduce significant noise from the Project into the surrounding community, according to applicable state and local regulations (see Section 3.1.6.6 for references). Based on the analysis, it is anticipated that the Project will not introduce significant outdoor mechanical equipment into the surrounding community. The results indicate that noise levels due to the Project at the various receptor locations will be similar to those found for the Previously Approved Project, and are below the most stringent City of

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3 BRA, Development Review Guidelines, 2006.

Boston Noise Zoning requirements for a nighttime residential zone for street level receptors. The results of the analysis indicate that the proposed Project can operate without significant impact on the existing acoustical environment.

3.1.6.2 Overview of Potential Project Noise Sources

The primary source of sound exterior to the Project will be the cooling towers, make-up air fans, and air handling units located on the rooftops of the Burnham Building and Millennium Tower, as well as the garage exhaust fan vents expected to be located along Hawley Street and Washington Street. All sources will be at elevations of approximately 90 and 625 feet above ground level (AGL), except the garage fan vents which are about 25 feet AGL. Secondary sources of mechanical equipment, including boilers and pumps are expected to be contained within the Burnham Building mechanical penthouse, and will provide only minimal noise. Other small retail fans will not contribute significantly to the noise levels. Two emergency generators, one located on the Burnham Building rooftop and another on the Millenium Tower rooftop, will be controlled using exhaust silencers as well as acoustical enclosures providing at least 20 dB of attenuation. Given that periodic routine testing will occur during daytime hours when background sound levels are highest, noise from these sources is not anticipated to be an issue. A summary of the major mechanical equipment currently proposed for the Project is presented below in Table 3-2.

Table 3-2 Expected Primary Noise Sources

Noise Source	Quantity	Location	Size/ Capacity
Cooling Towers	8	Tower Rooftop (4) (625' AGL); Burnham Rooftop (4) (90' AGL)	NA
Make-up Air Fans (MAU)	2	Tower Rooftop (625' AGL)	20,000 CFM
Make-up Air Fans (MAU)	1	Tower Rooftop (625' AGL)	10,000 CFM
Air Handling Units (AHU)	2	Burnham Rooftop (90' AGL);	10,000 CFM
Garage Exhaust Fans	2	3rd Floor Hawley St. Side (2) (25' AGL) 3rd Floor Washington St. Side (2) (25' AGL)	12,500 CFM
Emergency Generator (EGen)	2	Tower Rooftop (1) (625' AGL) Burnham Rooftop (1) (90' AGL)	750 KW

A summary of noise emissions from the cooling towers, make-up air and garage fans, air handling unit, and generator, as provided, is presented in Table 3-3, and includes broadband (dBA) sound power levels, as well as octave band sound levels. Sound levels were furnished by the Proponent.

Table 3-3 Reference Equipment Noise Levels – Total for all units

Noise Source	Form of Data	Ref. Distance (feet)	Overall (dBA)	Octave Band Center Frequency (Hz)							
				63	125	250	500	1000	2000	4000	8000
Cooling Tower	Sound power	NA	96	100	100	99	99	94	89	83	78
MAU (20,000 cfm)	Sound power	NA	102	103	103	101	103	101	94	92	89
MAU (10,000 cfm)	Sound power	NA	93	88	88	86	91	90	87	85	82
AHU (10,000 cfm)	Sound power	NA	93	88	88	86	91	90	87	85	82
Garage Exhaust	Sound power	NA	92	84	84	91	87	93	84	79	71
EGen (Mechanical)	Sound pressure	164	70	NA	NA	NA	NA	NA	NA	NA	NA
EGen (Exhaust)	Sound pressure	50	67	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not Applicable to sound power data.

3.1.6.3 Modeling Methodology

Anticipated noise impacts associated with the Project were predicted at the nearest residences around the Project Site using the CadnaA noise calculation model created during the previous noise impact assessment (2007). This model uses the ISO 9613-2 industrial noise calculation methodology which allows for octave band calculation of noise from multiple noise sources, as well as for computation of diffraction around building edges and multiple reflections off parallel buildings and solid ground areas. In this manner, all significant noise sources and geometric propagation effects are accounted for in the noise modeling. Since the time of the initial DPIR filing, the building layout for the proposed Project has changed, with Tower increasing in height from approximately 500 to 625 feet above ground level. The current noise model is conservative given that the rooftop sources are now proposed to be more elevated than for the Previously Approved Project, and thus farther from any sensitive receptors.

3.1.6.4 Future Sound Level of Project

The predicted exterior sound levels due to Project operation are expected to range from 39 dBA to 58 dBA at street level near the property line and nearby residential buildings. All sound levels from the Project will be below the United States Department of Housing and Urban Development (HUD) Acceptable DNL level of 65 dBA and the Boston Nighttime Limits of 65 dBA and 50 dBA for business and residential zoning districts, respectively. The predicted sound levels are compared to the criteria in Tables 3-4 and 3-5.

Table 3-4 Comparison of Future Predicted Nighttime Sound Levels Incorporating Appropriate Mitigation with Existing Background – MassDEP Criteria

Location	Lowest Existing L_{90} – Nighttime (dBA)	Future L_{90} – Project (dBA)[1]	Future L_{90} – Nighttime Total (dBA)	Increase (dBA)
Near Location 1, Franklin Street, street level	52	39	52	0
Near Location 2, Hawley Street, street level	57	58	61	4
Near Location 3, Summer Street, street level	60	48	60	0
Near Location 4, Washington Street, street level	54	42	54	0
Near Location 5, 43 Winter Street, street level	57	43	57	0
Near Location 5, 43 Winter Street, 50 feet AGL	N.A.[2]	39	N.A.[2]	N.A.[2]

1. Assumes equipment operates continuously.
2. Not currently measurable.

Table 3-5 Comparison of Future Predicted Nighttime Sound Levels Incorporating Appropriate Mitigation to City of Boston and HUD Criteria

Location	Future L_{90} - -Project (dBA)[1]	Boston Nighttime Limit (dBA)	Future DNL - Project (dBA)[1]	HUD DNL (dBA)
Near Location 1, Franklin Street, street level	39	65	45	N.A. [2]
Near Location 2, Hawley Street, street level	58	65	64	N.A. [2]
Near Location 3, Summer Street, street level	48	65	54	N.A.[2]
Near Location 4, Washington Street, street level	42	65	48	N.A. [2]
Near Location 5, 43 Winter Street, street level	43	50	49	65
Near Location 5, 43 Winter street, 50 feet AGL	39	50	45	65

1. Assumes equipment operates continuously.
2. Not applicable to a commercial building.

Sound levels from the emergency generators running during the day, as will occur under routine testing conditions, were calculated at the same receptors as the mechanical equipment. The generators are assumed to be contained in appropriate enclosures, and to have standard mufflers installed. The results are shown in Table 3-6. The sound level contribution from the emergency generators was added to the mechanical equipment. Expected worst-case sound levels will be well below the City of Boston daytime noise limit of 60 dBA at nearby residential receptors.

Table 3-6 Proposed Rooftop Equipment and Predicted Emergency Generator Noise Levels Incorporating Appropriate Mitigation

Receptor ID	Mechanical Equipment and Two 750 kW Generators
Near Location 1, Franklin Street, street level	44[1]
Near Location 2, Hawley Street, street level	59[1]
Near Location 3, Summer Street, street level	54[1]
Near Location 4, Washington Street, street level	48[1]
Near Location 5, 43 Winter Street, street level	47
Near Location 5, 43 Winter Street, 50 feet AGL	44
City of Boston Residential Zoning Criteria	60 dBA (day)

1. Commercial use with a limit of 65 dBA anytime.

Sound levels from the emergency generators running alone were calculated at the same receptors as the mechanical equipment, and the results are shown in Table 3-7. Expected worst-case sound levels will be below the City of Boston daytime noise limit of 60 dBA, and the nighttime noise limit of 50 dBA at all residential locations. The sound level contribution from the emergency generators was not added to the mechanical equipment because the emergency generators will only operate during an interruption of the electrical grid when rooftop mechanical equipment will not be operating.

Table 3-7 Predicted Emergency Generator Noise Levels Incorporating Appropriate Mitigation

Receptor ID	Two 750 KW Generators
Near Location 1, Franklin Street, street level	42[1]
Near Location 2, Hawley Street, street level	51[1]
Near Location 3, Summer Street, street level	53[1]
Near Location 4, Washington Street, street level	46[1]
Near Location 5, 43 Winter Street, street level	45
Near Location 5, 43 Winter Street, 50 feet AGL	42
City of Boston Residential Zoning Criteria	60 dBA (day) 50 dBA (night)

1. Commercial use with a limit of 65 dBA anytime.

3.1.6.5 Conclusions

This Project will not introduce significant outdoor mechanical equipment into the surrounding community. The above results indicate that noise levels due to the Project at the various receptor locations will be similar to those found for the Previously Approved

Project, and are below the most stringent City of Boston Noise Zoning requirements for a nighttime residential zone for street level receptors. The results of the analysis indicate that the proposed Project can operate without significant impact on the existing acoustical environment. At this time, the mechanical equipment and noise controls are 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 City of Boston broadband noise limit and the corresponding octave band limits, as well as the MassDEP noise criteria. Additional attenuation measures may include the selection of quieter units, acoustical louvers, screening walls, mufflers, or equipment enclosures, as needed.

3.1.6.6 References

1. Massachusetts DEP Noise Policy (DAQC policy 90-001) 10-dBA increase in the ambient measured noise level (L90) at the Project property line and at the nearest residences

2. City of Boston Zoning District Noise Standards (City of Boston Code – Ordinances: Section 16–26 Unreasonable Noise and City of Boston Air Pollution Control Commission Regulations for the Control of Noise in the City of Boston) maximum allowable sound pressure levels

3. HUD Environmental Criteria and Standards (24 CFR Part 51), Subpart B – "Noise Abatement and Control" day-night average sound level (Ldn) of 65 dBA or less

3.1.7 Solid Waste and Hazardous Waste

3.1.7.1 Soil and Groundwater Hazardous Material

The hazardous waste conditions are the same as that described in the DPIR for the Previously Approved Project.

Roux Associates of Boston completed an ASTM Phase I Environmental Site Assessment (Phase I) for the site, dated January 24, 2007. The Phase I study identified one Recognized Environmental Condition (REC) that may potentially impact soil and groundwater conditions at the Site. However, the study also indicated that the required response actions related to the REC had been completed.

The REC consisted of the release of hydraulic oil in the vicinity of Freight Elevator 18 on basement level B4 in the Burnham Building. Oily water and hydraulic oil was discovered seeping through cracks and openings in the foundation walls adjacent to the elevator in 1999. A recovery system was implemented as part of a Release Abatement Measure (RAM) Plan until the presence of oil was reduced to a level judged acceptable. Some residual contamination may be present. No known additional abatement measures have been employed since the dismantling of the recovery system in 2004.

Excavation for the new below-grade parking garage will generate surplus soil and material requiring off-site disposal. Excavated soil is anticipated to primarily consist of naturally deposited marine sand and clays and glacial soils. In general, significant contaminated soil or groundwater is not anticipated within the limits of the proposed excavation.

A preliminary chemical testing program was performed by Haley & Aldrich, Inc. in August 2007 to characterize soils for off-site disposition. Results of the testing indicated that tested soils did not exceed applicable Massachusetts Contingency Plan (MCP) RCS-1 Reportable Concentrations for Soil. During excavation, all soils will be managed for off-site disposal in accordance with the current regulations and policies of the MassDEP. Contract documents will contain procedures for field screening, additional testing and management of contaminated soils should contamination be discovered. Surplus excavated material will be disposed off-site by the selected contractor at approved facilities in accordance with applicable local, state, and federal laws and regulations.

Foundations of former structures, asphalt, brick, concrete, wood or other construction materials, if encountered, will be excavated and recycled or disposed offsite in accordance with regulatory requirements.

3.1.7.2 Solid Waste Generation during Operation

The Project will generate solid waste similar to other mixed-use projects. The amount of solid waste is estimated to be similar or less than what was estimated for the Previously Approved Project—the Project is estimated to generate approximately 1,964.9 to 2,685.3 tons per year of solid waste depending on the final program (see Table 3-8), while the Previously Approved Project was estimated to generate approximately 2,655 tons per year.

Table 3-8 Solid Waste Generation

Use	Program	Generation Rate	Solid Waste (tons per year)
Residential	1,212 bedrooms	4 lbs/bedroom/day	884.8
Office	125,000-218,000 sf	1.3 tons/1,000 sf/year	162.5-283.4
Health Club	35,000 sf	3 lbs/100 sf/day	191.6
Retail/Restaurant	132,000-241,000 sf	5.5 tons/1,000 sf/year	726.0-1,325.5
Total Solid Waste Generation			**1,964.9-2,685.3**

Solid waste will include wastepaper, cardboard, glass, bottles, and food waste. A portion of the waste will be recycled as described below. The remainder of the waste will be compacted and removed by a waste hauler contracted by building management. With the exception of "household hazardous wastes" typical of residential uses (for example, cleaning fluids and paint), the Project uses will not generate hazardous waste.

All trash collection will occur on site. A main trash room is located on the ground floor adjacent to the loading dock. Each floor within the residential portion will include a trash room.

3.1.7.3 Recycling During Operation

Each floor of the residential portion of the Project will have a trash room for solid waste and recycling. Recycling will be collected in a central location and picked up on a regular basis. Typical recyclable materials will include cardboard, paper, aluminum cans and plastics.

3.1.7.4 Solid Waste Generation During Construction

Similar to the Previously Approved Project, solid waste generated during construction will consist primarily of packaging and scrap materials (such as corrugated cardboard, glass, miscellaneous lumber aluminum, scrap metal, and cable/wire).

Construction waste material from demolition and new construction will be recycled when possible (see below). For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per MassDEP's Regulations for Solid Waste Facilities, 310 CMR 16.00. This requirement will be specified in the disposal contract.

3.1.7.5 Recycling During Construction

As described for the Previously Approved Project, the Proponent will take an active role with regard to the reprocessing and recycling of construction waste. The Project will target the use of regional materials with renewable characteristics and high recycled content. An evaluation of the potential for recycling will occur before the construction commences. Construction will be conducted so that some materials that may be recycled are segregated from those materials not recyclable to enable disposal at an approved solid waste facility. A comprehensive recycling program will be included in the final Construction Management Plan.

3.1.8 Geotechnical/Groundwater

This section discusses site soil and groundwater conditions, foundation excavation work and below-grade construction methodology anticipated for the Project.

3.1.8.1 Site Subsurface Conditions

The Site is located within the original Boston colonial shoreline, and is generally characterized by favorable ground conditions. Available information on subsurface conditions includes data presented on drawings for Filene's Department Store dating back to 1912 through construction of the more recent 1972 addition. Data from surrounding developments including MBTA station improvements and nearby commercial developments are also available. In 2007, Haley & Aldrich, Inc. performed a subsurface exploration and laboratory soil and bedrock testing program for the Previously Approved Project under design at that time.

Table 3-9 below indicates the Site subsurface profile anticipated based on the available subsurface information. As the Project Site is currently excavated to approximately El. 7 (Boston City Base, BCB) the depths indicated on Table 3-9 refer to depth below existing second basement level.

Table 3-9 Anticipated Subsurface Profile

Generalized Strata	Depth to Top of Stratum (ft)	Elevation of Top of Stratum (ft)	Thickness of Stratum (ft)
Fill (very loose to very dense sand)	0	7	0 to 7
Marine Deposits (interbedded dense sand to stiff clay)	0 to 7	7 to 0	3 to 6
Glacial Deposit (very dense sand, silt, clay and gravel)	5 to 14	0 to -7	23 to 40
Bedrock (Argillite)	35 to 45	-28 to -38	NA

The Site is occupied by existing structures typically with two to three below-grade levels and an open excavation at approximately El. 7. A fourth basement level mechanical room is present below a portion of the Burnham Building. Street grades are typically at El. 35 along Washington Street. The excavated portion of the Site is bounded by an excavation support system along Washington and Hawley Streets and a portion of Franklin Street and the existing buildings (Burnham and 1905 Jones McDuffee buildings).

3.1.8.2 Groundwater Conditions

Based on available data from observation wells installed during the 2007 exploration program, groundwater levels at the site range from approximately El. 0 to El. -10, about 5 to 15 feet below "normal" water levels that would be expected in this area of the City. Groundwater levels appear to be impacted by leakage into various nearby subsurface facilities.

Site groundwater levels are expected to fluctuate due to seasonal variations in precipitation and temperature, and other factors such as nearby construction activities, surface runoff, and leakage into and out of utilities and other below grade structures, and local fill and soil conditions.

3.1.8.3 Building Foundations

Burnham Building Renovation

The existing Burnham Building is supported on enlarged base (belled) footings and caissons bearing in the dense marine deposits and glacial soils underlying the building basements. No new foundations are anticipated for planned renovations and no excavation is planned within the limits of the Burnham Building.

Tower Construction

New foundations will be required for support of structure loads for the proposed Tower. The foundation design and construction methodology for the new structure has considered existing site conditions, proximity and conditions of adjacent structures, and the need to minimize potential impacts to adjacent structures including the Burnham Building and the MBTA Orange and Red Line tunnels.

The use of low impact, drilled-in foundation elements are planned to minimize the potential for vibration and ground disturbance during construction. Current planning provides for supporting the proposed development on high capacity drilled shafts supported in the glacial till and bedrock. Drilled shaft foundations have been successfully utilized for support of numerous buildings in Boston.

Excavation will be required for the construction of below-grade parking below the Tower. Currently, the depth of excavation in the Tower area is planned to match the existing Burnham Building third basement level at approximately El. -5.3, corresponding to one level below the existing site subgrade at approximately El. 7.

3.1.8.4 Impacts on Adjacent Structures

Minimizing impacts to surrounding structures is a primary consideration in the foundation design and construction methodology to be used for the Project below-grade construction. Measures will be implemented to protect existing adjacent structures such as the MBTA Orange and Red Line tunnels and the Burnham Building. Information on these adjacent structures has been collected, reviewed and evaluated by the Project team. As indicated above, low-impact drilled shaft foundations will be used. A soldier pile and lagging system will be installed to support the sides of the excavation.

The MBTA Orange Line tunnel abuts the west side of the proposed excavation. This edge of the tunnel was previously underpinned during the original construction for the Burnham Building. In the proposed new Tower portion of the site, the underpinning will need to be deepened to complete the proposed basement excavation. Conventional underpinning is proposed to be used and is not anticipated to have a significant impact on the tunnel.

Pre-construction condition surveys will be conducted to document existing structural conditions. An instrumentation program will be implemented to monitor noise, vibrations and impacts on adjacent structures. The proposed instrumentation program is described in more detail in Section 3.1.8.6.

The location of nearby utilities will be documented during and prior to construction. It is understood that some utilities may need to be relocated. Measures will be developed in the final foundation design and construction methods to protect utilities that are to remain.

3.1.8.5 Groundwater Impacts

Temporary construction dewatering will be required to dewater excavations and conduct foundation construction in the dry. Water levels will be monitored during the work, and the dewatering limits and duration will be limited to that required to perform the work. Prior to the start of construction, appropriate temporary construction dewatering permits will be obtained from applicable agencies such as the Massachusetts Water Resources Authority and Boston Water and Sewer Commission. Dewatering activities will be conducted in accordance with the criteria defined in the permits.

The Project Site is not located within the Groundwater Conservation Overlay District (regulated under Article 32 of the Boston Zoning Code). There are no wood pile supported buildings within close proximity of the Project Site that would be susceptible to impacts of groundwater lowering. No impacts to permanent groundwater levels at neighboring properties are anticipated.

3.1.8.6 Ground Movements and Vibrations

The Project proposes to implement a monitoring program prior to and during construction to document pre-construction conditions, and to detect construction effects on adjacent facilities, if any. The program will include conducting preconstruction condition surveys of adjacent structures, and installation and monitoring of instrumentation. The instrumentation program will include the following:

- Elevation reference points on adjacent buildings and structures;
- Monitoring gages on cracks that may be identified in adjacent buildings;
- Survey points to monitor lateral deflection of the excavation support system; and

- Vibration monitoring during vibration generating activities such as building demolition.

Baseline data will be developed prior to the start of work. Movement and vibration limits and other criteria will be incorporated into the construction contract documents.

3.1.8.7 Conclusion

The methodology and design for geotechnical aspects of the proposed construction are similar to the Previously Approved Project at the Site. Accordingly, the potential geotechnical, environmental and groundwater impacts should also be similar to the Previously Approved Project, and will be mitigated as described herein.

3.1.9 Construction Impacts

The construction impacts for the Project are anticipated to be similar to those described in the DPIR for the Previously Approved Project.

3.1.9.1 Introduction

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

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

During the construction phase of the Project, the Proponent will provide the name, telephone number and address of a contact person to communicate with on issues related to the construction. The Proponent will also publish a regular newsletter for the Project that will be issued to area property owners and the Downtown Boston Business Improvement District offices that will include a forward looking construction schedule and alert abutters of potential street openings, noise or unusual activities such as the installation of the Tower crane that could affect abutter's planned activities.

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

3.1.9.2 Demolition

Although most of the lead-based paint and asbestos has been abated already, there remains some areas that still need to be abated prior to the remaining demolition and extensive construction of the Project. All abatement that has yet to be done will be conducted in accordance with applicable regulatory procedures.

In addition, with respect to any demolition on the Project Site, the demolition debris will be disposed of at a properly licensed solid waste disposal facility. During demolition, provisions will be made for the use of water spray, or other means of containment for interior work, to control the generation of dust.

3.1.9.3 Construction Methodology/Public Safety

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

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

3.1.9.4 Construction Schedule

It is anticipated that the construction will commence in the spring of 2013. Once begun, construction is expected to last approximately 18 months for the Burnham Building and 36 months for the new Tower.

Typical construction hours will be from 7:00 a.m. to 6:00 p.m., Monday through Friday. No substantial sound-generating activity will occur before 7:00 a.m. If longer hours, additional shifts, or Saturday work is required, the construction manager will place a work permit request to the Boston Air Pollution Control Commission and BTD in advance. Notification should occur during normal business hours, Monday through Friday. It is noted that some activities such as finishing activities could run beyond 6:00 p.m. to ensure the structural integrity of the finished product; certain components must be completed in a single pour, and placement of concrete cannot be interrupted.

3.1.9.5 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.

3.1.9.6 Construction Mitigation

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

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

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

3.1.9.7 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 600 construction jobs will be created over the length of construction. The Proponent will make reasonable good-faith efforts to have at least 50% of the total employee work hours be for Boston residents, at least 25% of total employee work hours be for minorities and at least 10% of the total employee work hours be for women. The Proponent will enter into a jobs agreement with the City of Boston.

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

3.1.9.8 Construction Truck Routes and Deliveries

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

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

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

3.1.9.10 Construction Noise

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

Mitigation measures are expected to include:

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

3.1.9.11 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.

3.1.9.12 Construction Waste

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

3.1.9.13 Protection of Utilities

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

3.2 Sustainability

The Proponent is committed to developing an environmentally friendly building. The Millennium Tower and Burnham Building are being analyzed separately in regard to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system. The Burnham Building is currently anticipated to achieve the Silver level under LEED for Core and Shell. The Millennium Tower is anticipated to be certifiable under LEED for New Construction. The previously approved Project was anticipated to be certifiable under LEED for New Construction version 2.2. The preliminary credits targeted are outlined below, including pre-requisite credits under the various categories as outlined also in the LEED checklists provided in Appendix C. The assessment of achievable credits will be on-going as the design progresses.

3.2.1 Burnham Building

Sustainable Sites (SS)

SS Prerequisite 1 - Construction Activity Pollution Prevention

This is "Standard Operating Procedure" for Suffolk Construction. An ESC plan has been drafted. Suffolk Construction will ensure that all of the subcontractors adhere to the plan. Photographs and documentation will be collected as the Project progresses to ensure that all of the LEED requirements are met.

SS Credit 1 – Site Selection

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

SS Credit 2 – Development Density/Community Connectivity

The ten basic services within ½ mile from the Burnham Building site includes but is not limited to: bank, school, restaurant, community center, post office, library, place of worship, laundry, park, and pharmacy.

SS Credit 3 – Brownfield Redevelopment

An asbestos abatement process has already taken place by a qualified environmental professional and has been documented according to the U.S. Environmental Protection Agency and state regulations. Suffolk Construction will collect and submit all documentation regarding such.

SS Credit 4.1 – Alternate Transportation, Public Transportation

The Burnham Building site is located directly on top of the MBTA Downtown Crossing station which serves the Red and Orange Lines and is one block away from the MBTA Park Street station, which serves the Red and Green Lines, as well as several bus stops in the immediate area.

SS Credit 4.2 – Alternate Transportation - Bike Storage/Changing Room

Bicycle storage will be provided along with showers and a changing room for the tenants of the Burnham Building.

SS Credit 4.3 – Alternate Transportation – Low Emitting and Fuel Efficient Vehicles

The Project includes up to 550 parking spaces, of which a portion will be located beneath the Burnham Building. A portion of the parking spaces will be reserved for low emitting and fuel efficient vehicles. This will either be done by strategically locating the spaces near the elevator or by allowing the spaces at a discounted rate for a minimum of two years.

SS Credit 7.2 – Heat Island Effect - Roof

The Burnham Building will be using a white roof, Sarafil G410 EnergySmart roof membrane for the roof area. The SRI rating for this roof is 104.

SS Credit 9 – Tenant Design and Construction Guidelines

The Proponent is committed to the idea of educating future tenants on a sustainable approach to design; a tenant guide will be developed and shared with tenants in its welcoming package.

Water Efficiency (WE)

WE Prerequisite 1 and Credit 3 – Water Use Reduction

The Proponent has committed to low flow water closets (1.28 gpf), urinals (0.5 gpf), and lavatories (0.5 gpm), as well as metered lavatories using .09 gallons per cycle. The Proponent anticipates a water savings greater than 30%.

Energy and Atmosphere (EA)

EA Prerequisite 1 – Fundamental Building Systems Commissioning

The Proponent has contracted with Dyson Engineering to perform the commissioning. The basis of design has been reviewed and the appropriate reports will be completed.

EA Prerequisite 2 – Minimum Energy Performance

The Burnham Building design will incorporate a highly efficient mechanical system design in order to comply with the stringent Stretch Code provisions of the Massachusetts Building Code as well as the LEED requirements.

EA Prerequisite 3 – CFC Reduction in HVAC & R Equipment

WSP Flack & Kurtz, the engineer of record responsible for the mechanical design for the Burnham Building will select HVAC equipment with refrigerants that meet the LEED prerequisite thresholds regarding refrigerant types.

EA Credit 1 – Optimize Energy Performance

The Burnham Building design will incorporate a highly efficient mechanical system design in order to comply with the stringent Stretch Code provisions of the Massachusetts Building Code as well as the LEED requirements.

EA Credit 3 – Enhanced Commissioning

The Proponent has contracted with Dyson Engineering to perform the commissioning. The basis of design has been reviewed and the appropriate reports will be completed.

EA Credit 4 – Enhanced Refrigerant Management

WSP Flack & Kurtz, the engineer of record responsible for the mechanical design for the Burnham Building will select HVAC equipment with refrigerants that minimize the emission of compounds that contribute to ozone depletion and global climate change to the limits required by LEED.

EA Credit 6 – Green Power

The Proponent has agreed to purchase 75% of the building's electricity from renewable sources.

Materials and Resources (MR)

MR Prerequisite 1 – Storage and Collection of Recyclables

The Burnham Building design team has dedicated a storage and collection room of the appropriate square footage on the ground floor. The room is adequately sized based on the building square footage and easily accessible.

MR Credit 1 – Building Reuse – Maintain Existing Walls, Floor and Roof

The Burnham Building is an existing structure. Interior partitions have been removed, but the walls, floor and structure will remain.

MR Credit 2 – Construction Waste Management

The general contractor (Suffolk) has agreed to provide a construction waste management plan that will ensure that 75% of all waste and debris is directed to be recycled.

MR Credit 4 – Recycled Content

The Project architect will specify enough products with high recycled content to obtain the 10% threshold. The goal is to drive towards greater than 20% of the materials to contain the appropriate amount of recycled material.

MR Credit 5.1 – Regional Materials

The general contractor has generated a matrix of materials based on cost to determine which materials will allow the team to purchase and achieve this credit (10% based on cost of material). The goal is greater than 10%.

Indoor Environmental Air Quality (EQ)

EQ Prerequisite 1 – Minimum IAQ Performance

WSP Flack and Kurtz (MEP design engineer of record) are designing a ventilation system that uses energy recovery units on the roof to supply air to all areas of the building. The design will meet ASHRAE 62.1-2007.

EQ Prerequisite 2 – Environmental Tobacco Smoke

The Burnham Building will be an office building and therefore will be a non-smoking building. The dedicated smoking area will be located adjacent to the building away from any outdoor air intakes.

EQ Credit 1 – Outdoor Air Delivery Monitoring

Demand control ventilation will be incorporated in the HVAC design. CO_2 sensors will be installed to monitor the outdoor air quality throughout the building.

EQ Credit 3 – Construction IAQ Effectiveness During Construction

Suffolk Construction has agreed to develop and implement an IAQ management plan for the construction phases of the Project. This will include the proper storage of absorptive materials to prevent moisture damage. Air handlers used during construction will have MERV 8 filtration media that will be replaced before occupancy. The SMACNA sheet metal guides concerning IAQ will be strictly adhered to.

EQ Credit 4 – Low Emitting Materials

The Project architect will specify all adhesives, sealants, paints, coatings, flooring systems, and composite wood in such a manner that the LEED requirements are met with regard to off-gassing, VOC contents, formaldehydes, etc.

EQ Credit 5 – Indoor Chemical and Pollutant Source Control

The following design elements are being incorporated to address this credit: 1) all trash/recycle rooms have exhaust. 2) All equipment supplying outdoor air will have MERV 13 filtration. 3) Walk-off mats will be installed at entry ways.

EQ Credit 7 – Thermal Comfort - Design

WSP Flack & Kurtz (MEP design engineers of record) is designing the HVAC system to meet ASHRAE 55-2004. This is a standard practice for this type of building.

Innovation and Design Process (ID)

1. Construction Waste Management – Exemplary Performance (Innovation Credit 1.1)

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

2. Green Housekeeping (Innovation Credit 1.2)

The Proponent intends to engage in a green housekeeping policy wherein all cleaners used in common areas will comply with the Green Seal standard GS-37.

3. Alternate transportation exemplary performance (Innovation Credit 1.3)

The Project site is located adjacent to, and in the vicinity of, transit services with the required number of trips to achieve this credit.

4. LEED Accredited Professional

The Project team includes at least one LEED Accredited Professional.

Regional Priority Credits

Regional Priority Credits (RPC) are established LEED credits designated by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the Project. RPCs applicable to the Boston area include: SSc3, SSc6.1, SSc7.1, SSc7.2, EAc2 and MRc1.1. This Project anticipates two RPCs for the Burnham Building: SSc3-Brownfield Redevelopment and SSc7.2-Heat Island Effect, Roof.

3.2.2 Millennium Tower

Sustainable Sites (SS)

SS Prerequisite 1 - Construction Activity Pollution Prevention

This is "Standard Operating Procedure" for Suffolk Construction. An ESC plan has been drafted. Suffolk Construction will ensure that all of the subcontractors adhere to the plan. Photographs and documentation will be collected as the Project progresses to ensure that all of the LEED requirements are met.

SS Credit 1 – Site Selection

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

SS Credit 2 – Development Density/Community Connectivity

The ten basic services within ½ mile from the Millennium Tower site includes but is not limited to: bank, school, restaurant, community center, post office, library, place of worship, laundry, park, and pharmacy.

SS Credit 4.1 – Alternate Transportation, Public Transportation

The Millennium Tower site is located directly on top of the MBTA Downtown Crossing station, which serves the Red and Orange Lines and is one block away from the MBTA Park Street station which serves the Red and Green Lines, as well as several bus stops in the immediate area.

SS Credit 4.3 – Alternate Transportation – Low Emitting and Fuel Efficient Vehicles

The Project includes up to 550 parking spaces, of which a portion will be located beneath the Millennium Tower. A portion of the parking spaces will be reserved for low emitting and fuel efficient vehicles. This will either be done by strategically locating the spaces near the elevator or by allowing the spaces at a discounted rate for a minimum of two years.

SS Credit 7.2 – Heat Island Effect - Roof

The Millennium Tower will be using a white roof, Sarafil G410 EnergySmart roof membrane for the roof areas that are not green roofs or otherwise covered.. The SRI rating for this roof is 104.

Water Efficiency (WE)

WE Prerequisite 1 and Credit 3 – Water Use Reduction

The Proponent has committed to low flow water closets (1.28 gpf), urinals (0.5 gpf), lavatories (1.0 gpm), and low flow shower heads. The Proponent anticipates a water savings greater than 33%.

Energy and Atmosphere (EA)

EA Prerequisite 1 – Fundamental Building Systems Commissioning

The Proponent has committed to perform the fundamental commissioning. The basis of design has been reviewed and the appropriate reports will be completed.

EA Prerequisite 2 – Minimum Energy Performance

The Millennium Tower design will incorporate a highly efficient mechanical system design in order to comply with the stringent Stretch Code provisions of the Massachusetts Building Code as well as the LEED requirements.

EA Prerequisite 3 – CFC Reduction in HVAC & R Equipment

WSP Flack & Kurtz, the engineer of record responsible for the mechanical design for the Project will select HVAC equipment with refrigerants that meet the LEED prerequisite thresholds regarding refrigerant types.

EA Credit 1 – Optimize Energy Performance

The Millennium Tower design will incorporate a highly efficient mechanical system design in order to comply with the stringent Stretch Code provisions of the Massachusetts Building Code as well as the LEED requirements.

EA Credit 4 – Enhanced Refrigerant Management

WSP Flack & Kurtz, the engineer of record responsible for the mechanical design for the Project will select HVAC equipment with refrigerants that meet the LEED prerequisite thresholds regarding refrigerant types.

EA Credit 5 – Measurement and Verification

The Proponent has agreed to divulge energy consumption quantities.

EA Credit 6 – Green Power

The client has agreed to purchase 75% of the building's electricity from renewable sources for at least a two year contract..

Materials and Resources (MR)

MR Prerequisite 1 – Storage and Collection of Recyclables

The Tower design team has dedicated a storage and collection room of the appropriate square footage on the ground floor. The room is adequately sized based on the building square footage and easily accessible.

MR Credit 2 – Construction Waste Management

Suffolk Construction has agreed to provide a construction waste management plan that will ensure that 75% of all waste and debris is directed to be recycled.

MR Credit 4 – Recycled Content

The Project architect will specify enough products with high recycled content to obtain the 10% threshold. The goal is to drive towards greater than 20% of the materials to contain the appropriate amount of recycled material.

MR Credit 5 – Regional Materials

The general contractor has generated a matrix of materials based on cost to determine which materials will allow the team to purchase and achieve this credit (10% based on cost of material). The goal is greater than 10%.

Indoor Environmental Air Quality (EQ)

EQ Prerequisite 1 – Minimum IAQ Performance

WSP Flack and Kurtz (MEP design engineer of record) are designing a ventilation system that uses energy recovery units on the roof to supply air to all areas of the building. The design will meet ASHRAE 62.1-2007.

EQ Prerequisite 2 – Environmental Tobacco Smoke

The Millennium Tower will require blower door testing to prove that tobacco smoke does not migrate from one room to another. Suffolk Construction will ensure tight floor to wall construction on all unit demising partitions.

EQ Credit 1 – Outdoor Air Delivery Monitoring

Demand control ventilation will be incorporated in the HVAC design. CO_2 sensors will be installed to monitor the outdoor air quality throughout the building.

EQ Credit 3.1 – Construction IAQ Effectiveness During Construction

Suffolk Construction has agreed to develop and implement an IAQ management plan for the construction phases of the Project. This will include the proper storage of absorptive materials to prevent moisture damage. Air handlers used during construction will have MERV 8 filtration media that will be replaced before occupancy. The SMACNA sheet metal guides concerning IAQ will be strictly adhered to.

EQ Credit 4 – Low Emitting Materials

The Project architect will specify all adhesives, sealants, paints, coatings, flooring systems, and composite wood in such a manner that the LEED requirements are met with regard to off-gassing, VOC contents, formaldehydes, etc.

EQ Credit 5 – Indoor Chemical and Pollutant Source Control

The following design elements are being incorporated to address this credit: 1) all trash/recycle rooms have exhaust. 2) All equipment supplying outdoor air will have MERV 13 filtration. 3) Walk-off mats will be installed at entry ways.

EQ Credit 6.1 – Controllability of Systems – Lighting Control

Due to the nature of the occupancy type, there will be lighting controls for each residential bedroom as well as multiple lighting controls on all multipurpose rooms which include the lower level health club and retail spaces.

EQ Credit 7.1 – Thermal Comfort - Design

WSP Flack & Kurtz (MEP design engineers of record) is designing the HVAC system to meet ASHRAE 55-2004. This is a standard practice for this type of building.

EQ Credit 7.2 – Thermal Comfort - Verification

A thermal comfort survey will be drafted and distributed upon building occupation.

EQ Credit 8.2 – Daylight and Views – Views of 90% of Spaces

The inherent geometry of Millennium Tower (long and narrow) allows for all of the rooms to have a direct connection to the outdoors.

Innovation and Design Process (ID)

1. Construction Waste Management – Exemplary Performance (Innovation Credit 1.1)

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

2. Alternate transportation exemplary performance (Innovation Credit 1.2)

The Project Site is located adjacent to, and in the vicinity of, transit services with the required number of trips to achieve this credit.

3. LEED Accredited Professional

The Project team includes at least one LEED Accredited Professional.

Regional Priority Credits

Regional Priority Credits (RPC) are established LEED credits designated by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the Project. RPCs applicable to the Boston area include: SSc3, SSc6.1, SSc7.1, SSc7.2, EAc2 and MRc1.1. This Project anticipates one RPCs for the Millennium Tower: SSc7.2-Heat Island Effect, Roof.

Chapter 4.0

Urban Design

4.0 URBAN DESIGN

4.1 Project Massing and Design

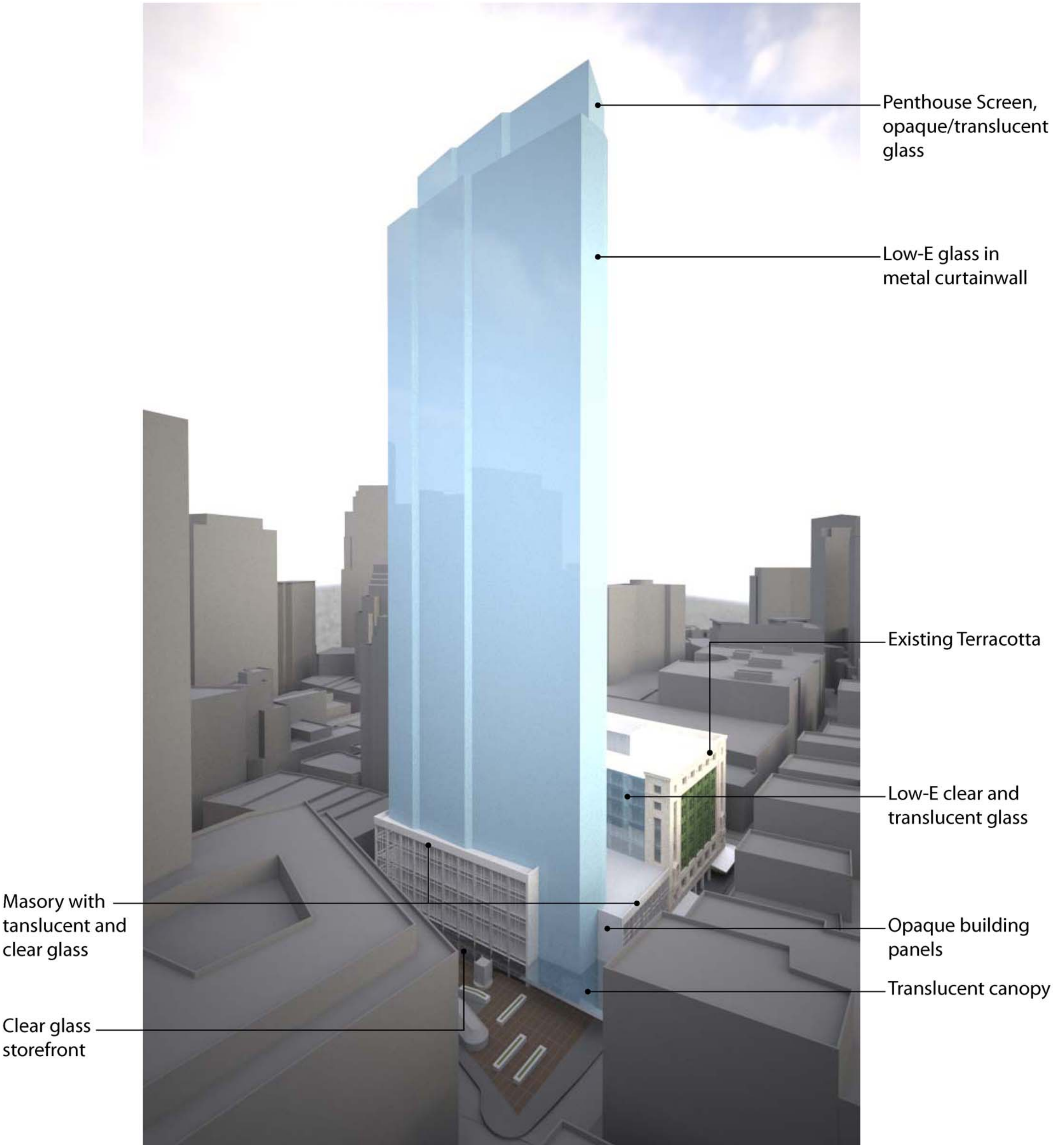
The relationship of the new Tower and podium to the restored Burnham Building is intended to accentuate the virtues of both parts of the Project: a slender, graceful Tower that marks this junction in downtown Boston connected to a landmark building with an intermediate-scale podium that discretely links to, but does not mimic, the historic façade (see Figure 4-1). The urban design of the Project addresses three important scales, all of which will be thoroughly reviewed with the BRA design staff, BCDC, and Boston Landmarks Commission:

- The urban skyline of Boston;
- The neighborhood of Downtown Crossing and the Midtown Cultural District; and
- The street, especially the immediate grid of Summer, Washington, and Franklin Streets.

On the urban skyline scale, the Tower intends to mark the resurgence and vitality of this part of Boston with a distinct geometric form and articulated profile to the sky, forming a contemporary beacon on the city skyline (see Figure 4-2). The location and shape of the Tower will create a vertical marker defining the plaza at Shopper's Park (see Figure 4-3), and the Project Site as a whole. The Tower is purposefully set apart from the historic Burnham Building to allow each to be perceived individually; one as a historic landmark with a viable future and the other as a symbol for the future (see Figure 4-4). The top of the Tower will include a distinct form, creating a visually dramatic addition to the Boston skyline.

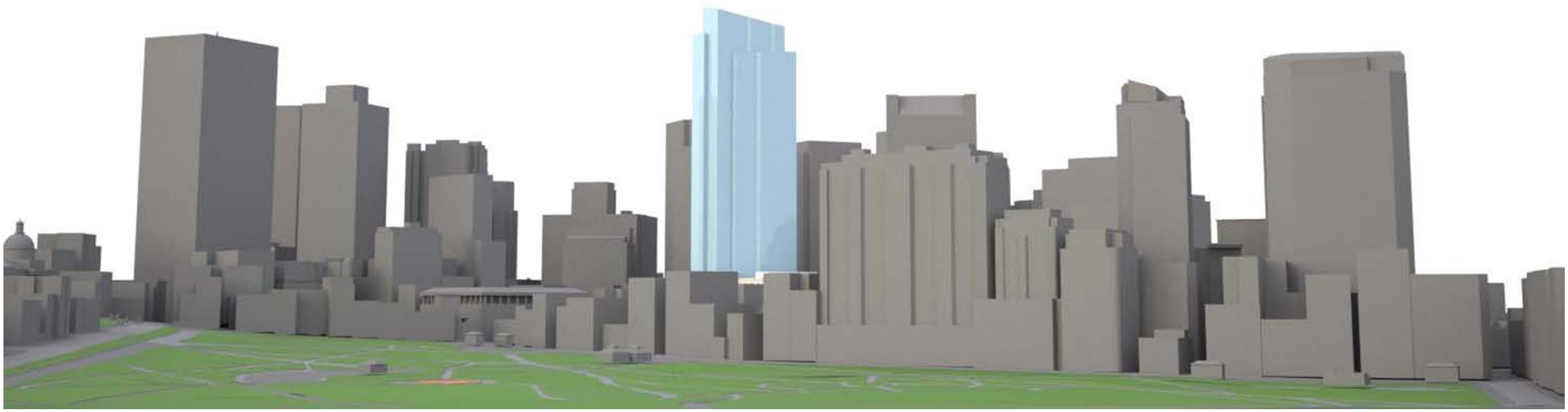
On the neighborhood scale, the differentiated heights of the podium will reinforce the streetwall along Washington Street, reinforce the unique and robust massing of the Burnham Building by exposing its northern corners, and complement the depth of the street facades in the neighborhood with a combination of deep and taut wall surfaces. At the corner of Washington and Franklin Streets, the podium will be set back from the street revealing the Tower to passing pedestrians. The podium will provide a human scale along Shopper's Park encouraging its active use as well as a space for relief and rest along the Washington Street corridor.

Along the edges of the Project Site, pedestrians will experience strong visual connections into the Project through display windows and entryways along three sides of the block. The residential lobbies, located on Franklin Street, will enliven the activity of the Franklin "crescent" as it connects into Shopper's Park. Most new entrances into the Project will have canopies in glass and metal that will restore daylight to the street façade while providing



Millennium Tower and Burnham Building

Figure 4-1
Looking South at the Project



Millennium Tower and Burnham Building

Figure 4-2

Project From the Boston Common

Millennium Tower and Burnham Building

Figure 4-3
Street Level View Looking South

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Figure 4-4

Street Level View Looking East

shelter from the elements, much as the original Burnham Building canopies did when first built. The Burnham Building will be restored, its windows illuminated at night with the office activities within, and the storefront illuminated from the display windows and historic canopies.

4.2 Project Materials

The Project consists of four distinct components, each of which is comprised of various building materials. Figure 4-1 displays the various materials in the Project.

The Burnham Building will contain office and retail uses above grade and is to be restored to meet National Park Service standards for historic tax credits. Its facade is made primarily of warm white and green colored glazed terracotta, blonde brick, clear glass (Chicago-style) unit windows and restored historic ground floor glass and metal storefronts. The Project will refurbish or replace various fiberglass castings or damaged terracotta pieces. The roof will contain new mechanical equipment enclosures to serve the new building systems within, and will be located to reduce sight lines from the street wherever possible. At the base of the building, storefronts will replicate the original Burnham Building design, modified only where necessary to meet current Codes and ventilation requirements. The storefronts will include restored column covers consistent with the original Burnham Building design, and will include portions of restored metal and glass canopies on Washington and Summer Streets.

The Washington Street retail base component will be composed of a mixture of opaque, transparent, and translucent materials. It will be approximately three stories high, and include a translucent canopy stretching from the north wall of the Burnham Building to the base of the Tower. Clear glass and translucent glass with minimal mullion detailing will likely be used to relate the activity within directly to the street, enlivening the public realm of Downtown Crossing. The Washington Street retail component will be distinct in form and character from the Tower and the Burnham Building, allowing both to be seen as defined elements of the overall urban design.

The Franklin Street podium is distinguished by the residential entries and a separate entry for the health club/spa, all facing onto Shopper's Park. Above the glazed entry areas, the materials for this five-story façade are intended to be masonry or stone. The intent is to create a visual link to the Franklin Crescent to the east, and its granite and limestone facades with heavily trabeated window openings. Clear and translucent glazing and expressed mullions will provide visual connections from the street to the retail and fitness uses on the upper floors.

The Tower is the fourth architectural element in the Project. It is almost exclusively residential in function, and is set back from the north façade of the Burnham Building. It will be made primarily of low-emissive clear and spandrel glass. A distinct set of facets will accentuate the verticality of the Tower and, by the subtle shifts in geometry of the glass planes, reduce the apparent breadth of the north and south Tower facades. The top of the Tower will be defined by a distinct diagonal figure of opposing glass planes unique to the downtown skyline. The mechanical penthouse will likely be translucent or opaque spandrel glass to conceal the mechanical equipment behind it. Architectural lighting may be employed to enhance the Tower profile in the evening skyline.

4.3 Shopper's Park

Similar to the Previously Approved Project, the proposed Project will include the renovation of Shopper's Park. The renovation will improve upon the character of the Project Site as a public urban open space, improve accessibility throughout the Project Site, provide an appropriate setting for the various building functions that front onto Shopper's Park, and upgrade access to the MBTA Orange Line platform below the Project Site. Shopper's Park is imagined as a place of both activity and rest, a crossroad of activity and reflection. Upon completion, it will be a vital link in a series of important open spaces within and adjacent to the Downtown Crossing area, including the Irish Memorial to the north, Boston Common and the Old Granary Burial Ground to the west, Post Office Square to the south, and Summer and Washington Streets to the south.

The Project Site will be regraded into a series of linked terraces that provide usable, scaled spaces for a variety of public activities and address code requirements for accessibility. The terraces will be paved with unit paving and will feature ample and varied amenities. Given the Orange Line station below, most landscaping will be placed in above grade planters. Both deciduous trees and seasonal interest plantings are envisioned. The planter walls will provide a variety of seating opportunities and arrangements, while seasonal movable seating within the terraces is also anticipated. Wind studies have been performed and will continue to help inform site design that maximizes pedestrian and seating comfort. Ample lighting for the terraces will be provided. It is envisioned that pole lighting will provide general ambient lighting levels for the park, while a variety of accent lighting strategies will be studied—including tree up-lighting, bollard lighting and integration of lighting with hardscape elements (step lights, planter lights or similar). Outdoor data hydrants—weatherproof receptacle boxes for both line and low voltage wiring—will be provided to provide maximum flexibility for audio-visual equipment use related to special events.

The above ground MBTA facilities will be renovated. The above grade portion of the Orange Line headhouse will be rebuilt. The proposed enclosure will reduce the overall footprint of the headhouse within Shopper's Park and will maximize transparency through the use of clear glass curtain wall and steel frame structural elements. The headhouse will be designed as a memorable, pavilion-like glass and steel structure.

Pedestrian access to MBTA facilities below grade will be maintained during the Project's construction phase, and all new installations impacting MBTA facilities will be coordinated with and receive appropriate approvals from the MBTA.

The renovation of Shopper's Park includes: 1) the proposed reopening of one-way vehicular traffic on a portion of Franklin Street between Washington and Hawley Streets in order to access the Project's drop-off/pick-up driveway, and 2) realignment of the existing curbs and taxi drop-off zone on the south side of Franklin Street, between Washington and Hawley Streets. The renovation plan proposes to relocate the bus stop for bus lines 92 and 93 one block east, from the corner of Franklin and Hawley Streets to the corner of Franklin and Arch Streets. This proposed relocation is consistent with previous recommendations for Franklin Street improvements, including "Case Studies for Downtown Boston – Boston Downtown Transportation Study, Memorandum #2" prepared for the Boston Transportation Department by Project for Public Spaces, August 1995.

The new automobile drop-off turn around will be designed to maximize pedestrian access through the plaza between Hawley and Washington Streets, and promote the interaction of the public with the occupants of the building. The drop-off is envisioned as an integral part of the special activities of Shopper's Park. Paving, landscape materials, architectural canopies, signage, and lighting will be coordinated to unify the drop-off with the entire plaza.

4.4 Conclusion

As described above, the Project includes a slender, graceful Tower that marks a junction in downtown Boston with a connection to a renovated and restored landmark building. The design of the Project addresses the urban skyline, the neighborhood and the street enlivening and improvement the area. The details of the Project design are evolving as it continues to undergo further planning and design review. The articulation of the Tower, including the location of the massing at the lower levels as well as the shaping of the upper levels, the manner in which the Tower meets Washington Street and the renovation of Shopper's Park, will continue to be refined to ensure a project worthy of its prominent site.

Chapter 5.0

Historic and Archaeological Resources

5.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

5.1 Historic Resources on the Project Site

The 1912 Filene's Department Store building (Burnham Building) is located on the Project Site at the corner of Washington and Summer Streets. The building is significant as one of the city's best examples of early 20th century Beaux Arts Commercial architecture. This original purpose-built Filene's Department Store building was the last major commission, and the only work in Massachusetts, of nationally prominent architect and city planner Daniel H. Burnham.

The Burnham Building is one of a series of major department stores throughout the world designed by Burnham, and served as the flagship store and corporate headquarters for Filene's. Located in the heart of Boston's Downtown Crossing retail district, the Burnham Building features two robustly ornamented principal facades, the seven-bay Washington Street façade, and the ten-bay Summer Street façade. The eight-story steel frame building employs a two-story glazed terra cotta base, which supports a colossal order of columns and a final attic story. The light gray, smooth finished course of terra cotta, which imitates granite at the second story, corner piers, and attic story, frames the dark green terra cotta columns and spandrel window grid on levels three through seven. The green grid imitates cast metal, having engaged columns of ornamental banded reed colonettes, which extend the full five-story height. Further detailing can be seen on the smaller piers and spandrels, which feature projecting lion heads and floreated spandrels. The richly ornamented eighth story forms an elaborate crown to the building with a variety of moldings, including "F's" in circles joined by elaborate floral garland. Additional distinctive detailing is located above the main entrance on Summer Street, where a metal sculpture of cherubs flanking a shield with an "F" on it and four bells below are located. While the original exterior detailing of the upper floors remain remarkably intact, the storefront level has been extensively modified with modern display windows and a replaced canopy.

Beginning in the early 1920s, Filene's started to purchase adjacent buildings along Washington Street and utilize them as annexes for the main building. The final acquisition was the Jones, McDuffee and Stratton Company Building (i.e.1905 Building) at 33-39 Franklin Street. Starting in 1951, portions of the annex buildings were demolished for the construction of a loading-dock addition on Hawley Street. In 1973, the remaining buildings on the corner of Washington and Franklin Streets were demolished for a three-story addition that was more functional in layout and built to support five stories. The additional stories were never added. On May 9, 2006, the Boston Landmarks Commission (BLC) voted to designate the Filene's Building, along with the other buildings on the Project Site, as a Boston Landmark. The Burnham Building was individually listed in the National Register of Historic Places in 1986.

5.2 Jones, McDuffee, and Stratton Company Building Façade Remnants

The 1905 Jones, McDuffee, and Stratton Company eight-story plus mezzanine, pier and spandrel commercial building was partially demolished as a component of the Previously Approved Project and only two facades, one bay deep, remain. The remnant features a two-level granite storefront base, topped with a single granite-faced story, and six additional stories in red brick. The storefront level features a glazed corner entrance, flanked by glazed display windows. The remainder of the building consists of six-story, red brick pilasters with granite bases flanking recessed, metal window sash and decorative metal spandrels. The building terminates with recessed red brick spandrels and a flat roof. An original decorative cornice was removed from the building prior to 1950. The building underwent substantial façade restoration efforts in 1997 resulting in the replacement of all the brick cladding, portions of granite units, replacement of deteriorated cast iron brackets with Fiber Reinforced Plastic (FRP) replicas and replacement of the existing aluminum windows with new aluminum windows.

The building was originally occupied by the Jones, McDuffee, and Stratton Company which sold crockery, china, glass, pottery, lamps, and gifts. The store occupied all nine floors. As noted above, Filene's bought the building and expanded into the space in 1929.

The 1905 Jones, McDuffee, and Stratton Company Building, along with the 1912 Burnham Building, the 1951 Hawley Street addition, and the 1973 addition on the corner of Washington and Franklin streets were collectively designated a Boston landmark in 2006. Subsequently, the 1951 and 1973 buildings were demolished, as were all but the Burnham Building and the facade of the 1905 Building in preparation for the Previously Approved Project.

5.3 Historic Resources in the Vicinity

Numerous other historic resources exist within the Project vicinity. Notable resources include: Old South Meetinghouse at 308 Washington Street; the Washington Street Theater District located one block south of the Project Site, the Commercial Palace Historic District located immediately east of the Project Site; and the Boston Common located west of the Project Site. These historic resources, and others within a quarter-mile radius of the Project Site, are identified in Figure 5-1 and listed in Table 5-1.

5.4 Archaeological Resources

The Project Site consists of a previously developed urban parcel. Due to previous development activities and disturbances, it is expected that the Project Site does not contain significant archaeological resources.

Millennium Tower and Burnham Building

Figure 5-1

Historic Resources

Table 5-1 Historic Resources Within 1/4-Mile Radius of the Project Site

Historic Resource	Address
1. Filene's Department Store	426 Washington Street
2. Boston Athenaeum	10 1⁄2 Beacon Street
3. Old State House	State Street
4. Second Brazer Building	25-29 State Street
5. King's Chapel Burying Ground	Tremont Street
6. King's Chapel	38 Tremont Street
7. Parker House	56-72 School Street
8. Tremont Temple Baptist Church	76-88 Tremont Street
9. Old City Hall	45 School Street
10. The Old Corner Bookstore	277-285 Washington Street
11. Winthrop Building	1-17 Water St., 276-278 Washington St. and 4-16 Spring Lane
12. Wesleyan Association Building	32-38 Bromfield Street
13. 20-30 Bromfield Street	23-30 Bromfield Street
14. Old South Meetinghouse	308 Washington Street
15. John W. McCormack Federal Building & Courthouse	5 Post Office Square
16. Newspaper Row	322-328 Washington St., 5-23 Milk St., and 11 Hawley St.
17. International Trust Co. Building	39-47 Milk Street
18. Federal Reserve Bank Building	30 Pearl Street
19. R.H. Sterns Building	76-78 Warrenton Street
20. Saint Paul's Church	136 Tremont Street
21. Lock-Ober Restaurant	3-4 Winter Place
22. Chester Harding House	16 Beacon Street
24. Tremont Street Subway	Tremont Street at Boston Common

Table 5-1 Historic Resources Within 1/4-Mile Radius of the Project Site (Continued)

Historic Resource	Address
26. Kennedy's Building	26-38 Summer Street
28. Paramount Theatre	549-563 Washington Street
30. The Bedford Building	89-103 Bedford Street
31. 83-87 Summer Street	83-87 Summer Street
32. 89-95 Summer Street	89-95 Summer Street
34. United Shoe Machinery Corporation Building	138-164 Federal Street and 34-66 High Street
39. Boston Common	Beacon, Park, Tremont and Charles Streets
41. Park Street Church	1 Park Street
42. Wigglesworth Building	83-89 Franklin Street
43. Old City Hall Plaza	Between School, Chapman, and Province Streets
44. Shopper's Park	At the corner of Franklin and Washington Streets
45. Irish Famine Memorial	At the corner of School and Washington Streets
46. Winthrop Square	Bounded by Otis and Devonshire Streets
47. Post Office Square	Bounded by Congress, Pearl, and Franklin Streets
48. Old Granary Burial Ground	Bounded by Tremont, Beacon, and Park Streets
57. Quincy Market	Roughly bounded by Clinton Street, Commercial Street, Chatham Street, and Merchants Row
58. Faneuil Hall	Roughly bounded by Clinton Street, Commercial Street, Chatham Street, and Merchants Row
59. Dock Square	Between Congress and North Streets
60. Sears Crescent Court Street and City Hall Plaza	38-68 Cornhill Street
61. Tremont Street Block Between Avery and Boylston	177 to 186 Tremont Street
62. Publicity Building	40-44 Bromfield Street
63. Ames Building	1 Court Street
64. John Adams Courthouse	Pemberton Square
65. Richardson Block	107-139 Pearl Street

66. Blackstone Block Historic District	Bounded by Union, Hanover, Blackstone, and North Streets
67. Custom House District	Bounded by Chatham Street, Expressway, High Street and Batterymarch Street
68. Massachusetts State House	24 Beacon Street
Commercial Palace Historic District	Roughly bounded by Bedford, Summer, Franklin, Hawley, and Chauncy Streets
Temple Place Historic District	11-55 and 26-58 Temple Place
Washington Street Theatre District	511-559 Washington Street
West Street Historic District	West and Tremont Streets
Church Green Buildings Historic District	101-113 Summer Street
Textile District	Roughly Essex Street from Phillips Square to Columbia Street and Chauncy Street from Phillips Square to Rowe Place
Leather District	Roughly bounded by Atlantic Avenue, Surface Artery and Kneeland Street
Piano Row Historic District	Park Sq. to Avery St. along Boylston and Tremont Streets
Beacon Hill Historic District	Roughly bounded by Beacon Street, Embankment Road, Storrow Drive, Cambridge and Bowdoin Streets

5.5 Impacts to Historic Resources

5.5.1 Design and Visual Impacts

The newly proposed Project differs substantially from the Previously Approved Project on its focus and treatment of the historic resources on site. Overall, the redesign will have a positive impact on historic resources in the city. The major Project change relates to the base of the Tower and the treatment of the Burnham Building and the remnant of the 1905 Building. The Previously Approved Project attempted to maximize the floor plan of the office component by directly abutting the Burnham Building at its base and cantilevering over the roof of the Burnham Building at the office floors resulting in what would appear to be a large addition to the Burnham Building. The design of the previously approved tower had some articulation at its base to mimic the former building transitions that took place along Washington and Franklin Streets prior to the construction of the 1973 addition. The Previously Approved Project proposed the retention and incorporation of the 1905 facades with the demolition of the remainder of the building and the construction of the Tower on the same plane above. The retention of the remnant facade, as well as the articulation at the base, were attempts to both minimize the impact on the Burnham Building and relate the base of the new building to the more traditional street wall still found along Washington and Franklin Streets.

The current Project has taken a different design approach that focuses on the Burnham Building, the original purpose-built Filene's department store and world headquarters of the Filene's Company, as the focus of the National Register and Boston Landmark designations. The Project has two components: one component is the restoration of the Burnham Building utilizing federal historic tax credits and the second component is the construction of the new Tower on the adjacent parcel away from the historic building. The historic tax credits are a key element of the financing for the Project and will require review of the exterior and interior design by the MHC and the National Park Service. The design must be in keeping with the Secretary of the Interior's *Standards for Rehabilitation*. The base of the new Tower component will not directly abut the Burnham Building, but be set to the corner of Franklin and Washington Streets. The placement of the Tower at this location will allow for a transitional connection between the Burnham Building and the new Tower. The intent of the connection is to be of a scale and massing similar to the building that previously abutted the Burnham Building prior to the 1973 addition. The transition will allow for the Burnham Building to retain its historic presence on Washington and Summer Streets while creating a more human scale at the base of the Tower. The massing of the Washington Street façade will be lower than the existing cornice line of the Burnham Building, as this was historically always the case. The massing will also be in scale with the existing historic buildings across Washington Street. In order to focus the preservation effort on the Burnham Building and to achieve separation with the Tower, the remnant of the 1905

Building is proposed for removal. The existing facades, retained for the Previously Approved Project, contain little historic fabric following their 1997 rehabilitation and do not convey the history of the Project Site or of Filene's.

Additionally, the current design of the Tower above the base has also been changed to minimize the impact on the Burnham Building and surrounding historic resources. The proposed Tower is narrow in profile and its shape creates a greater sense of separation with the Burnham Building with less of a visual impact on other surrounding historic resources in the area.

5.5.2 Shadow Impacts

The shadow study for the Project addresses the historic resources identified in the filing for the Previously Approved Project, including those requested by the Massachusetts Historical Commission (MHC) in response to the Project Notification Form (PNF) for the Previously Approved Project. Additionally, the Project impact area for the shadow study was expanded from one-quarter (1/4) mile to one-half (1/2) mile. Shadow studies were conducted at each of the 45 locations to investigate impacts from the Project on March 21st, June 21st, October 21st, and December 21st. In addition, at the request of the MHC, the expanded shadow analysis includes facade studies to determine where on the buildings shadows would be cast.

Results of the shadow analysis show that 21 of the 45 locations, fewer than half, experienced new shadow as a result of the Project. Of these locations, only one experienced new shadows on all four of the days studied and the majority of the new shadow impact was on the roof of the structures. In cases where the shadows extended beyond roofs to the building elevations, the vast majority of the shadows were cast on secondary elevations and not the primary building façades. Where there were shadows on building façades, existing shadows were also present and the additional shadow impacts on the Project were minor.

In reviewing the facade studies, the overall impact of the Project on primary or secondary elevations of historic resources was minimal. Of the 22 resources with new shadow, 14 of these buildings were impacted on their facades. The studies, contained in Appendix D, show the new shadow graphically represented with a red line. The Wesleyan Association Building, located at 32-38 Bromfield Street, is the one building that experienced new shadow on all four days that were modeled. The analysis shows that the extended time of impact happened prior to noon each day and that only a small fraction of the building was affected. Review of the remaining 12 historic resources modeled in the façade study showed some new shadow impact. Of the new impacts, only six of the resources had new shadow on their primary façade. In these cases, the shadow impact ranged in coverage area from partial to full coverage. Although the new coverage in some cases exceeds one hour, in no case was the primary façade fully covered in shadow for more than one hour.

5.5.3 Status of Project Review with Historical Agencies

The Project team has initiated contact with the BLC and Boston Preservation Alliance (BPA) and has discussed the proposed Project with these groups. The Previously Approved Project went through an extensive review process with historic agencies and interested parties. A Certificate of Design Approval with conditions of ongoing review was issued by the BLC in March of 2007. The Project team attended an advisory meeting with the BLC on July 24, 2012. Additionally, it is anticipated that the Project team will meet with the MHC, BLC, BPA and MBTA to discuss a revised Memorandum of Agreement (MOA) which will outline measures the Proponent will undertake to mitigate any adverse impacts of the Project to historic resources. The draft MOA developed in connection with the Previously Approved Project was not fully executed. The consultation will utilize the draft MOA of 2007 as a starting point and to clarify which stipulations have been met to date.

5.6 Potential Mitigation Measures

At the conclusion of the consultation process with the MHC, BLC, BPA and MBTA, a revised MOA will be generated. The potential mitigation measures may include the following:

- Opportunity for the MHC and BLC to participate in ongoing review of specific design elements including materials and masonry and window restoration specifications;
- Construction monitoring of the Burnham Building and other nearby historic resources during the construction of the proposed Tower; and
- Development of an interpretive exhibit/display which chronicles the history of the former Filene's Department Store and its contributions to Boston's Downtown Crossing retail district.

Chapter 6.0

Infrastructure

6.0 INFRASTRUCTURE COMPONENT

6.1 Introduction

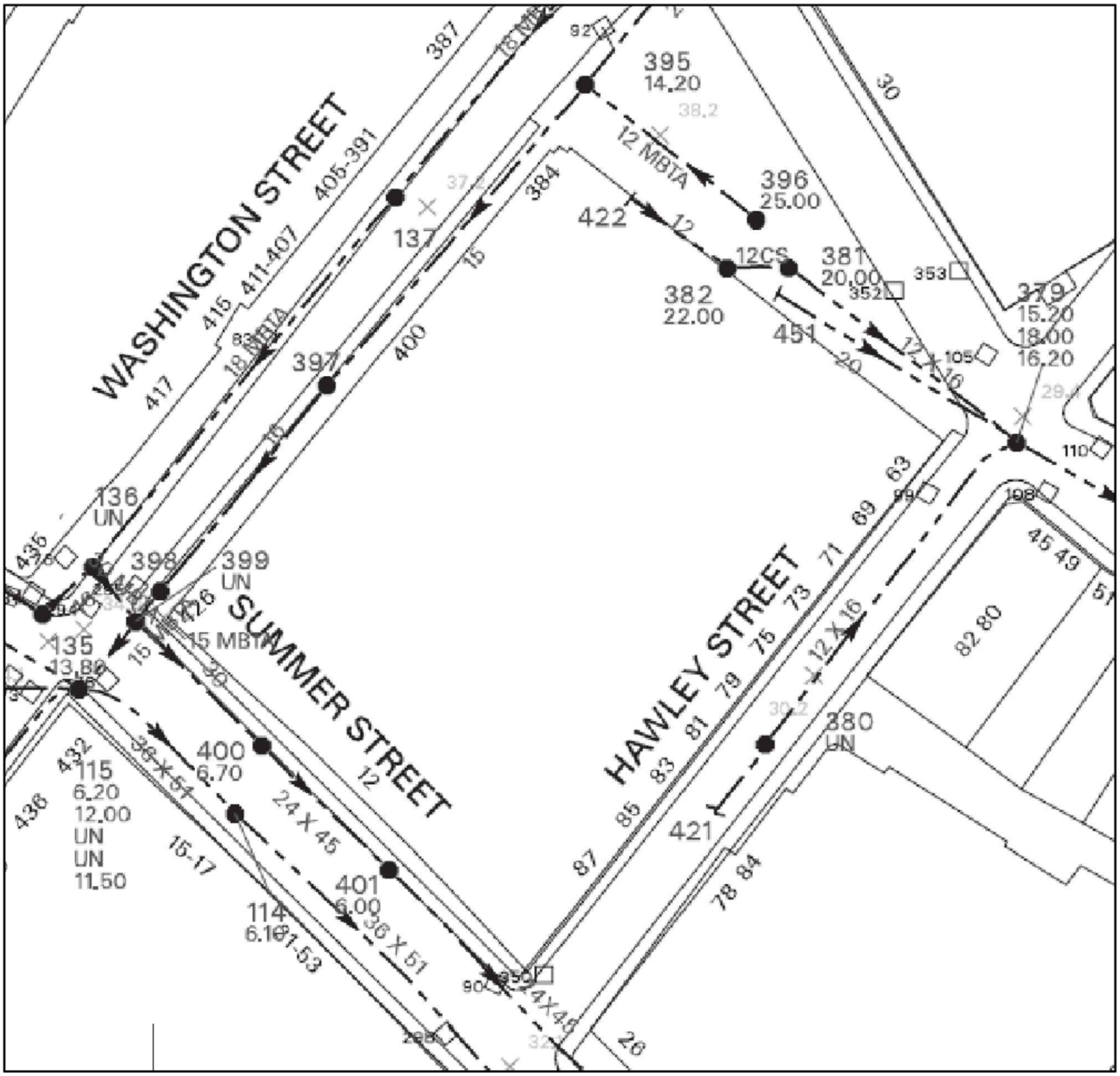
The following analysis describes the existing utility systems in the Project Site and their ability to provide service to the Project. Also discussed are the potential impacts this Project will have on the utility systems, and the ways these potential impacts could be mitigated. Best management practices and sustainable design will be incorporated into the Project wherever practical and applicable.

The Project's Civil and MEP engineers will coordinate with the City agencies responsible for the area's utility systems as the design progresses. The following sections describe the existing and proposed conditions of the sanitary sewer, domestic water, fire protection service, and storm drain systems. Although the estimated sewage generation and water use are somewhat greater for the Project than that of the Previously Approved Project, impacts are expected to be similar to the Previously Approved Project. All of the existing utility services are expected to be able to accommodate the proposed building program.

6.2 Overview of Existing Utility Services

The Project Site is bounded by Washington Street to the northwest, Franklin Street and Shoppers Park to the northeast, Hawley Street to the southeast, and Summer Street to the southwest. These public streets abutting the Project Site contain combined sewer lines of varying sizes, high-pressure water mains in all four streets, and low-pressure water mains in Hawley Street and under Shoppers Park between Franklin Street and the existing building.

Washington Street contains an 18-inch combined sewer line, a 24-inch by 45-inch combined sewer line, and a 16-inch high-pressure ductile iron (DI) water main that was installed in 1979. Franklin Street contains a 12-inch high-pressure DI water main that was installed in 2001. There are no combined sewer lines in the section of Franklin Street that is adjacent to the Project Site. Shopper's Park contains a 12-inch combined sewer line, a 20-inch combined sewer line, a 12-inch by 16-inch combined sewer line, an abandoned 12-inch high-pressure cast iron (CI) water main that was installed in 1890, and an abandoned 12-inch low-pressure CI water main that was installed in 1873. Hawley Street contains a 12-inch by 16-inch combined sewer line, a 12-inch high-pressure DI water main that was installed in 1989, a 12-inch low-pressure DI water main that was installed in 1989, and a 12-inch high-pressure CI fire service water main that was installed in 1923. Summer Street contains a 24-inch by 45-inch combined sewer line, a 36-inch by 51-inch combined sewer line, a 16-inch high-pressure DI water main that was installed in 1979, and a 16-inch high-pressure CI fire service water main that was installed in 1914. Multiple catch basins are located throughout the surrounding streets, all of which drain into the combined sewer system. The existing sanitary sewer and water distribution systems are shown on Figures 6-1 and 6-2.



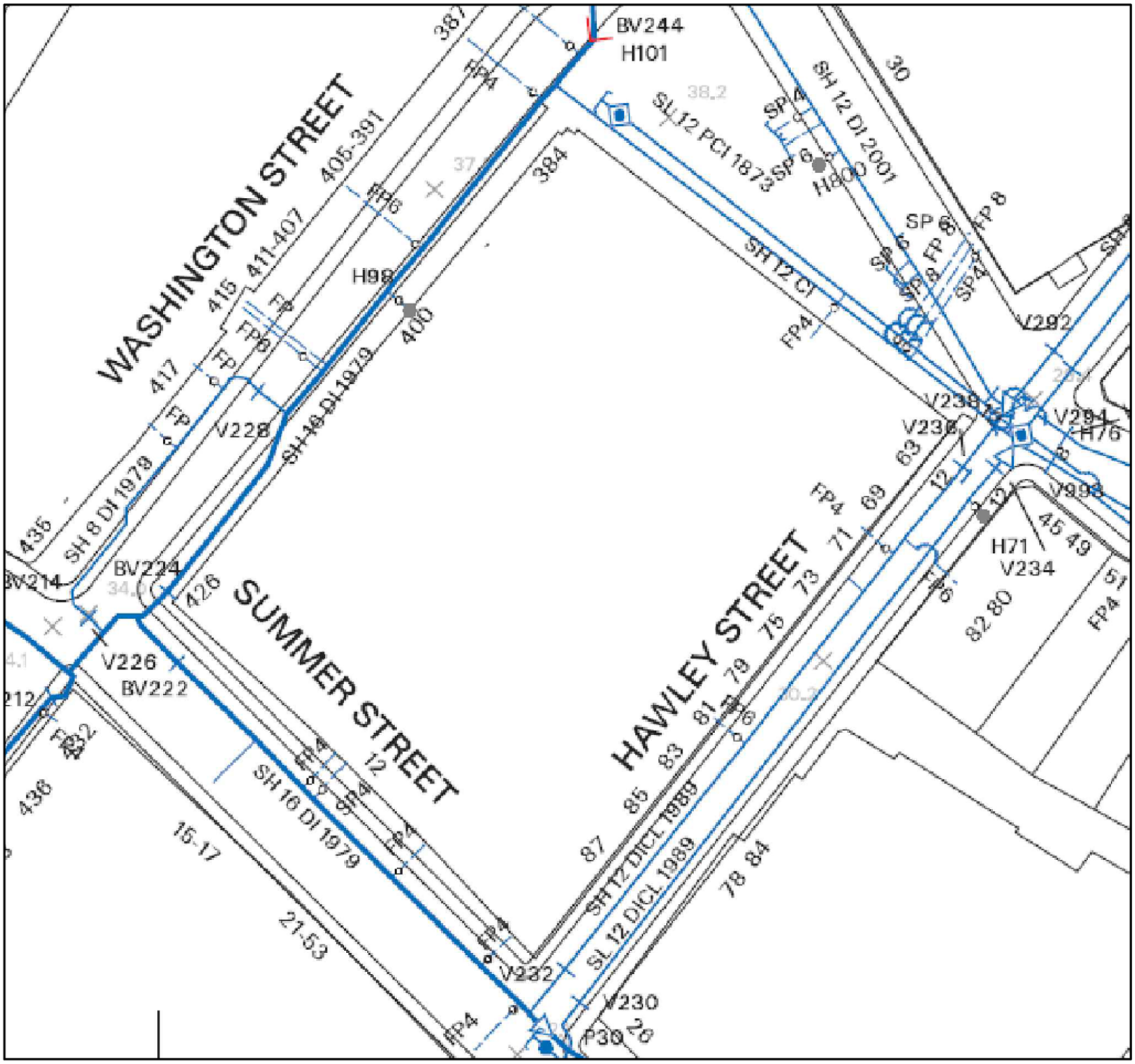
BWSC Sewer Map
Panel 24K

Millennium Tower and Burnham Building

Nitsch Engineering

Figure 6-1

Existing Sanitary Sewer System



BWSC Water Map
Panel 24K

Figure 6-2

Existing Water Distribution System

A Boston Water and Sewer Commission (BWSC) approved Site Plan and General Service Application is required for the construction of proposed water, sanitary sewer, and storm drain connections to main lines in the streets. In addition, a Stormwater Pollution Prevention Plan (SWPPP) will be submitted to BWSC specifying best management practices for protecting the drainage system during construction.

Proposed connections to the BWSC's water, sanitary sewer, and storm drain systems will be designed in conformance with the BWSC's design standards, Sewer Use and Water Distribution System Regulations, and Requirements for Site Plans. The Proponent will submit the General Service Application and a Site Plan to BWSC for review and approval prior to construction. The Site Plan will indicate the existing and proposed water mains, sanitary sewers, storm drains, telephone, gas, electric, steam, and cable television lines. The Site Plan will show which existing utilities will be abandoned, which utilities will be maintained and reused, where proposed connections will be located, and the limit of work to be performed in the street. Abandoned services will be cut and capped at the main line according to BWSC standards.

6.3 Sanitary Sewer Service

6.3.1 Existing Sanitary Sewer System

The BWSC owns, operates, and maintains the sanitary sewer system in the vicinity of the Project Site. The system in the area of the Project consists primarily of combined sanitary sewer lines and stormwater catch basins that drain into the combined sewer lines. The existing sanitary sewer system is illustrated in Figure 6-1.

Washington Street contains an 18-inch and a 24-inch by 45-inch combined sewer line, both of which flow in a southwesterly direction towards Summer Street, where they connect to a 24-inch by 45-inch combined sewer line. Both of these combined sewer lines are below the MBTA Orange Line platforms and therefore are not desirable connection points for proposed storm drain and sewer lines from the new building.

There are no combined sewer lines in the section of Franklin Street that is adjacent to the Project Site.

Shopper's Park contains a 12-inch combined sewer line that flows in a northwesterly direction towards Washington Street, where it connects to a 24-inch by 45-inch combined sewer line. Shopper's Park also contains a 20-inch and a 12-inch by 16-inch combined sewer line, both of which flow in a southeasterly direction towards Franklin Street, where they connect to a 20-inch by 30-inch combined sewer line located east of the Project Site.

Hawley Street contains a 12-inch by 16-inch combined sewer line that flows in a northeasterly direction towards Franklin Street, where it connects to a 20-inch by 30-inch combined sewer line located east of the Project Site.

Summer Street contains a 36-inch by 51-inch combined sewer line as well as a 24-inch by 45-inch combined sewer line. Both of these lines flow in a southeasterly direction and continue down Summer Street.

Regional sewer service and treatment are provided by the Massachusetts Water Resources Authority (MWRA) system, which ultimately connects to the Deer Island Wastewater Treatment Plant. From here, sanitary sewer flow is treated and discharged to Boston Harbor.

The Massachusetts Department of Environmental Protection (MassDEP) sets forth estimated sewage generation rates for specific establishments and building uses. These values can be related to the number of bedrooms, square footage of a building, number of seats, or various other factors. MassDEP's estimated sewage generation rates can be found in 310 CMR 15.203 and 314 CMR 7.15. The total estimated existing sanitary flow is 36,845 gallons per day (gpd) using the uses on the site in 2006 as the existing condition. Table 6-1 below includes a detailed breakdown of the different building uses and how this flow was calculated.

Table 6-1 Estimated Existing Sanitary Flow

Building Use	Size (sf)	Sewage Generation Rate	Total Flow (gpd)
Retail Space	506,300	50 gpd/1000 sf	25,315
Office Space	153,700	75 gpd/1000 sf	11,530
		Total =	36,845

6.3.2 Estimated Proposed Sanitary Flow

The Project will increase the effluent discharged to the existing sanitary sewer system. As with the sanitary flows described above, the proposed sanitary flows were calculated using MassDEP's standard values for sewage generation based on the type of establishment and building use. The total estimated proposed sanitary flow for the Project is 168,020 gpd which results in a net sanitary flow of 131,175 gpd. Table 6-2 includes a detailed breakdown of the proposed building program, the respective sewage generation rate for each building use, the total flow for each building use, and the total proposed sanitary flow for the Project. As described in Chapter 1, a range of uses are being considered for the Project. Because office use is a higher sewage generator than retail space, the higher end of the possible office range has been used for calculating sewage generation while the lower end of the possible retail space has been used. As the Project develops, some of the office space may shift to retail space. This change will result in less sanitary flow and therefore the information presented in Table 6-2 represents a higher volume of proposed sanitary flow than could be generated by the Project.

Table 6-2 Estimated Proposed Sanitary Flow

Building Use	Number	Sewage Generation Rate	Total Flow (gpd)
Residential Units (600)	1,212 Bedrooms	110 gpd/bedroom	133,320
Retail Space	122,000 sf	50 gpd/1000 sf	6,100
Office Space	218,000 sf	75 gpd/1000 sf	16,350
Health Club	35,000 sf	100 gpd/1000 sf	3,500
Restaurant	250 seats	35 gpd/seat	8,750
		Total =	**168,020**

Notes: Sewage generation rates taken from the MassDEP, 310 CMR 15.00, The State Environmental Code, Title V, Section 15.203: Sewage System Flow Design Criteria; and 314 CMR 7.00, Sewer System Extension and Connection Permit Program, Section 7.15: Calculation of Flows.

The net change in total sanitary flow is presented below in Table 6-3.

Table 6-3 Net Change in Total Sanitary Flow

	Existing Flow	Proposed Flow	Net New Flow
Total Sanitary Flow	36,845 gpd	168,020 gpd	131,175 gpd

By using MassDEP's standard values for sewage generation, which were based on the type of establishment and building use, the net sanitary flow for the Project is estimated to be 131,175 gpd. Because the net sanitary flow is greater than 50,000 gpd, a MassDEP Sewer Connection Permit will be required. MassDEP is currently in the process of eliminating their sewer connection permit program. Depending on the timing, the Project may not be required to submit to MassDEP. In that case, approval for the net sanitary flow will come from BWSC.

The Previously Approved Project had an estimated sewage generation of approximately 115,285 gpd (78,440 net new gpd) as shown on Tables 6-4 and 6-5 below. As described in more detail in Section 6.3.3, based on the Project's estimated daily sanitary flow of 168,020 gpd (131,175 net new gpd), the existing sewer system has adequate capacity for the estimated daily flow.

Table 6-4 Estimated Previously Proposed Sanitary Flow

Building Use	Number	Sewage Generation Rate	Total Flow (gpd)
Hotel	226 Bedrooms	110 gpd/bedroom	24,860
Studio/One Bedroom Unit (66 units)	66 Bedrooms	110 gpd/bedroom	7,260
Two Bedroom Unit (86 units)	172 Bedrooms	110 gpd/bedroom	18,920
Three Bedroom Unit (14 units)	42 Bedrooms	110 gpd/bedroom	4,620
Retail Space	204,500 sf	50 gpd/1000 sf	10,225
Office Space	469,000 sf	75 gpd/1000 sf	35,175
Grocery	50,000 sf	97 gpd/1000 sf	4,850
Spa/Fitness	50,000 sf	100 gpd/1000 sf	5,000
Restaurant	125 seats	35 gpd/seat	4,375
		Total =	**115,285**

Notes: Sewage generation rates taken from the Massachusetts Department of Environmental Protection, 310 CMR 15.00, The State Environmental Code, Title V, Section 15.203: Sewage System Flow Design Criteria; and 314 CMR 7.00, Sewer System Extension and Connection Permit Program, Section 7.15: Calculation of Flows.

Table 6-5 Net Change in Total Sanitary Flow

	Existing Flow	Proposed Flow	Net New Flow
Total Sanitary Flow	36,845 gpd	115,285 gpd	78,440 gpd

6.3.3 Proposed Sanitary Sewer Connections

Currently the only proposed sanitary sewer service is a 12-inch DI pipe that will tie into the existing 12-inch by 16-inch combined sewer line on Hawley Street. Multiple existing sanitary sewer pipes are proposed to be maintained and reused. These pipes include:

- 8-inch CI pipe on Summer Street;
- 4-inch CI pipe on Washington Street;
- 6-inch CI pipe on Washington Street; and
- 10-inch pipe in Shopper's Park.

Grease traps will be provided for any restaurant kitchen and other necessary building spaces, in accordance with BWSC's Sewer Use Regulations. The Plumbing Engineer will be responsible for the design of all grease traps. Information on the Project grease traps will be submitted to BWSC along with the Site Plan submission.

The underground parking garage will have a separate drainage system that will collect any runoff into oil traps, which will be located in the lowest level of the garage. The water collected by these oil traps will be pumped to the building's main sanitary system and discharged to the surrounding combined sewer system. Oil traps will conform to BWSC standards.

The construction of all connections will be performed so as to minimize any effects on adjacent streets, sidewalks, and any areas within the public right-of-way. All proposed sanitary sewer connections for the new building will be kept separate from proposed storm drain connections. Any existing sanitary sewer connections to be abandoned will be cut and capped at the main in accordance with BWSC standards. On Washington Street, where the existing combined sewer line is below the MBTA Orange Line platform, existing sanitary sewer connections will be cut and capped at the inside of the foundation wall. Also, all required approvals and permits for new sewer connections will be obtained prior to construction.

An analysis was performed on the existing combined sewer system that the Project will be connecting into. Information on the existing combined sewer lines was obtained from BWSC sewer maps and surveyed information. Flow capacity of the existing combined sewer lines was calculated using Manning's Equation. The results of these calculations are presented in Table 6-6.

Table 6-6 Hydraulic Capacity Analysis of the Existing Combined Sewer System

Manhole	Slope of Pipe	Diameter	"n" Value	Flow Capacity	
BWSC Number	%	Inches		cfs	MGD
Combined Sewer on North Side of Summer Street					
399 to 247	0.5	24″ x 45″	0.015	30.63	19.79
Combined Sewer on South Side of Washington Street					
395 to 398	0.5	24″ x 45″	0.015	30.63	19.79
Combined Sewer on Hawley Street					
421 to 379	0.5	12″ x 16″	0.015	3.19	2.06
Combined Sewer in Shoppers Park					
451 to 379	0.5	20″	0.015	8.55	5.52
Combined Sewer in Shoppers Park					
381 to 379	0.5	12″ x 16″	0.015	3.19	2.06

Notes:
1. Information from BWSC Sewer Map 23K and 24K.
2. Sewer manhole numbers for reference only.
3. Flow capacity derived from Manning's Equation.
4. Slope of pipes are estimated.

Based on the Project's estimated daily sanitary flow of 168,020 gpd, and with a peaking factor of five, the existing sanitary sewer system has adequate capacity for the estimated daily flow. Table 6-7 outlines the Project's estimated daily sanitary flow and its comparison to the existing sanitary system's capacity.

Table 6-7 Comparison of Project's Estimated Sanitary Flow and System Capacity

Estimated Flow (gpd)	Estimated Flow (cfs)	Peaking Factor	Revised Estimated Flow (cfs)	Capacity of Existing Combined Sewer Lines (cfs)		
				Summer and Washington Street	Hawley Street	Shoppers Park
168,020	0.26	5	1.30	30.63	3.19	8.55

6.3.4 Sewer System Mitigation

To help conserve water and reduce the amount of wastewater generated by the Project, water conservation devices, including low-flow toilets and urinals as well as flow-restricting faucets, will be incorporated into the Project design wherever possible.

6.4 Water System

6.4.1 Existing Water Service

The BWSC owns, operates, and maintains the water distribution system in the vicinity of the Project Site. The system in the area of the Project consists of high-pressure and low-pressure DI and CI water mains that were installed between 1873 and 2001 and fire hydrants. The existing water system is illustrated in Figure 6-2.

Washington Street contains a 16-inch high pressure DI water main that was installed in 1979. Franklin Street contains a 12-inch high-pressure DI water main that was installed in 2001. Shoppers Park contains an abandoned 12-inch high-pressure CI water main that was installed in 1890 and an abandoned 12-inch low-pressure CI water main that was installed in 1873. Hawley Street contains a 12-inch high-pressure and a 12-inch low-pressure DI water main, both of which were installed in 1989, and a 12-inch high-pressure CI fire service water main that was installed in 1923. Summer Street contains a 16-inch high-pressure DI water main that was installed in 1979 and a 16-inch high pressure CI fire service water main that was installed in 1914.

Multiple domestic water services entered the existing building at its sub-grade levels. A 3-inch domestic water line entered the building from Summer Street. This line was adjacent to the MBTA station entrance. A 4-inch domestic water line entered the building from

Washington Street. Lastly, a 4-inch domestic water line entered the building from Hawley Street. The existing domestic water services were cut and capped per BWSC standards as part of the building demolition work.

The existing Burnham Building also had multiple fire protection service connections. Three 4-inch fire protection water lines entered the building from Summer Street. Two 4-inch and two 6-inch fire protection water lines entered the building from Washington Street. Ten-inch and 4-inch fire protection water lines entered the building from Shopper's Park/Franklin Street. Lastly, 4-inch and 6-inch fire protection water lines entered the building from Hawley Street. The existing fire protection services were cut and capped per BWSC standards as part of the building demolition work.

Multiple fire hydrants are located in the vicinity of the Project. One hydrant is located on Washington Street. This hydrant should not be affected by the proposed work. Franklin Street contains two fire hydrants, one on the Project side and the other across the street. The Project-side hydrant will need to be relocated to accommodate the reconfigured roadway curb. The fire hydrant on the opposite side of Franklin Street should not be affected by the proposed work. One fire hydrant is located on Hawley Street. This hydrant is across the street from the Project Site and is not anticipated to be affected by the proposed work. Summer Street contains four fire hydrants, all of which are located across the street from the Project Site. These hydrants are not anticipated to be affected by the proposed work.

The BWSC's Southern Low Service (SLS) and Southern High Service (SHS) Systems are integrally connected to form loops that allow major water demands to be fed from more than one direction. A looped water system allows each individual distribution service to function at optimal efficiency while providing a measure of safety and redundancy in the event of a water main break.

The existing water distribution system is expected to have adequate capacity for the Project. Existing water system information from BWSC will be requested and hydrant flow tests will be performed if deemed necessary by the Plumbing and Fire Protection Engineers.

6.4.2 Estimated Proposed Water Demand

The Project's estimated water demand for domestic sources is based on the estimated sanitary flow as well as the estimated water demand of the cooling towers. A conservative factor of 1.10 is applied to the estimated sanitary flow to account for consumption and other miscellaneous losses. The Project's Mechanical Engineer has determined that the cooling towers will require a peak daily water demand of approximately 85,000 gpd. Therefore, the Project's estimated peak maximum water demand for domestic sources is 269,822 gpd. This water will be supplied by the BWSC. The Previously Approved Project had an estimated peak maximum water demand for domestic services of 211,814 gpd.

6.4.3 Proposed Water Service

Proposed domestic water service will connect to the low-pressure water mains in the vicinity of the Project Site. One 10-inch DI domestic water line will enter the proposed building from Summer Street, while a second 10-inch DI domestic water will enter the proposed building from Washington Street. Domestic water service to the proposed building will be metered in accordance with BWSC standards, which includes a meter transmission unit (MTU) as part of BWSC's automatic meter reading system. A gate valve will be installed on these new domestic water lines to minimize public hazard or inconvenience in the event of a water main break. A valve box and cover will be installed over the gate valve to provide shut-off access.

Proposed fire protection service will connect to the high-pressure water main in Hawley Street via an 8-inch DI fire protection water pipe. Inside the fire pump room, an 8-inch double check valve assembly will be provided to protect the municipal water supply, which is a requirement of BWSC. The Project will get approval from the Boston Fire Department for all fire department connections before construction begins.

All proposed domestic water and fire protection services will be located on the Site Plan submitted to BWSC. Any existing services to be abandoned will be noted to be cut and capped at the main.

6.4.4 Water Supply Conservation and Mitigation

The Project will be certifiable under the LEED rating system, and the Massachusetts State Building Code requires the use of water conserving fixtures. As a result of these two items, water conservation measures, including low-flow toilets and urinals, restricted flow faucets, and sensor operated sinks, toilets, and urinals, will be incorporated into the design wherever possible.

6.5 Storm Drainage System

6.5.1 Existing Storm Drainage System

The existing conditions (2006) Project Site is approximately 63,100 square feet and is composed of 100% impervious area. Roof drains for the existing Burnham Building discharge to the surrounding combined sewer system. Surface runoff in the Project Site is collected by catch basins and area drains, and discharges to the surrounding combined sewer system.

6.5.2 Proposed Storm Drainage System

From a stormwater management standpoint, the Project Site will mirror the previously approved Project Site. The Project Site area will remain 100% impervious. Therefore, stormwater mitigation will not be necessary as proposed runoff rates and volume will match existing conditions.

Proposed storm drain lines will connect to the combined sewer lines in the vicinity of the Project Site. A 12-inch DI storm drain service will tie into the existing 12-inch by 16-inch combined sewer line in Shopper's Park. A second 12-inch CI storm drain service will tie into the existing 12-inch by 16-inch combined sewer line in Hawley Street. In addition, two existing storm drain services, a 12-inch line on Summer Street and an 8-inch line on Washington Street, will be maintained and reused for the building's roof drain services. All proposed storm drain connections will be kept separate from new sanitary sewer connections.

Phosphorous treatment, as required by BWSC, will be provided either through proprietary treatment structures or groundwater recharge below the building. The final treatment method and design will be determined as the Project develops and will be included in the Site Plan Submission to BWSC.

The Previously Approved Project was approved with an under-slab drainage system below the lowest garage slab of the new structure. The Project team is currently evaluating if this system is still required. If an under-slab drainage system is employed, the water will be collected and discharged into the combined sewer system through the building's main storm drain.

Any proposed layout changes to Shopper's Park will also include any necessary changes to the drainage system to ensure that this area is properly drained and adequate stormwater treatment is achieved.

The Project will incorporate best stormwater management practices (BMPs) to satisfy the MassDEP Stormwater Management Policy Standards. Permanent plaques bearing the warning "Don't Dump – Drains to Boston Harbor" will be installed at all new catch basins and at any existing catch basins that are adjacent to a reconstructed area.

The design objective for the stormwater management system proposed for the Project is to meet the Massachusetts Stormwater Management Standards to the greatest extent possible. These standards have been specifically addressed in Section 7.5.3, MassDEP Stormwater Management Standards.

During construction, existing catch basins will be protected with silt sacks to provide for sediment removal from runoff. These controls will be inspected and maintained throughout the construction phase until all areas of disturbance have been stabilized through the placement of pavement, structure, or vegetative cover.

In addition, the Project will obtain a NPDES General Permit for Construction from the U.S. Environmental Protection Agency. A copy of the Stormwater Pollution Prevention Plan will also be provided to BWSC.

6.5.3 MassDEP Stormwater Management Standards

In March of 1997, MassDEP adopted Stormwater Management Standards to address non-point source pollution. 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 BMPs in the stormwater management design. MassDEP updated the Standards in March of 2008 to provide additional guidance and more stringent requirements for specific standards.

A brief explanation of each policy standard and the system compliance is provided below:

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

Compliance: The proposed design will comply with this Standard. There will be no untreated stormwater discharge. All discharges will be treated prior to connection to the BWSC system.

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

Compliance: The proposed design will not increase the impervious area compared to the existing (2006) conditions. Therefore, post-development peak discharge rates will be equal to pre-development peak discharge rates, negating any requirement for stormwater mitigation.

Standard #3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Compliance: Since the Project will not increase the impervious area compared to existing (2006) conditions, the annual recharge from the post-development site will approximate the annual recharge from pre-development conditions. The proposed design will comply with this Standard. Recharge to groundwater will be evaluated as a means of achieving the requirements for phosphorous removal.

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

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

2. Structural stormwater BMPs are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and

3. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

Compliance: The Project Site will be mostly comprised of impervious roof area. Roof runoff is considered "clean" and does not require treatment. Runoff from Shopper's Park will be provided with appropriate treatment. Therefore, the Project will conform to this Standard.

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 CMP 3.00, 314 CMR 4.00, and 314 CMR 5.00.

Compliance: The Project Site does not contain any land uses that will yield higher potential pollutant loads. Therefore this standard is not applicable.

Standard #6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing the discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1. Or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

Compliance: The Project will not discharge any stormwater to critical areas. Therefore, this Standard is not applicable.

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 all other requirements of the Stormwater Management Standards and improve existing conditions.

Compliance: The Project is a combination of new development and redevelopment. The Project will improve existing conditions to comply with the Stormwater Management Standards.

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

Compliance: The Project will comply with this standard. A Stormwater Pollution Prevention Plan (will be prepared for the Project. Sedimentation and erosion controls will be incorporated as part of the design for the Project and employed during onsite construction.

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

Compliance: An O&M Plan including long-term BMP operation requirements will be prepared for the Project to ensure 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.

6.5.4 Stormwater Mitigation Measures

The surface cover of the Project site will not change as a result of the proposed construction. The existing site (2006) is 100% impervious area and the proposed development will also be 100% impervious area. Post-development runoff rates will not increase as a result of the Project and therefore stormwater mitigation will not be required.

6.6 Other Utilities

6.6.1 Heating and Cooling

The Project's heating and cooling will be provided by a condenser water system and gas-fired hot water system, respectively.

The cooling system will require four cooling tower cells located on the Tower roof and four cooling tower cells located on the Burnham Building roof, both with an adjacent mechanical room for pumps, heat exchangers, boilers etc. The cooling load is estimated at 2,500 tons for the residential use and 2,000 tons for the office/retail areas. Heating will be produced by gas-fired hot water boilers which will be located in their respective mechanical equipment rooms. Domestic hot water will be produced by separate gas-fired boilers. The Burnham Building will be provided with electric hot water heaters. There will be two separate gas services for the site. The estimated gas load for the residential use will be approximately 25,000,000 BTUH with service most likely provided off of the 20-inch LP Main located at Washington Street. The estimated gas load for the office/retail areas will be approximately 20,000,000 BTUH with service most likely provided off of the 12-inch LP Main located at Summer Street. The increase in size of the current design's gas service compared with the Previously Approved Project can be attributed to the change in uses of the Project. The current design has a marked increase in the number of residential apartments and subsequent decrease in the area of the office space. Residential apartments inherently have a larger requirement for natural gas in the form of gas stoves than compared with office functions. The local gas utility provider will need to provide finalized direction on the exact location of service connections.

6.6.2 Electricity

The total code calculated electrical demand for the residential portion is 12,000 kVA with an actual electric demand of approximately 9,000 kVA. The total code calculated electrical demand for the Office/Retail spaces is 6,400 kVA with an actual electric demand of approximately 4,500 kVA. Two separate electric services will be provided for the site.

NSTAR (Boston Edison Company) provides electric service in the City of Boston. Therefore, an NSTAR Network Transformer Vault is anticipated for the Project for both services. It is anticipated that the primary services will be fed from Hawley Street up to NSTAR vaults with an exact location to be determined.

6.6.3 Steam and Chilled Water

The Project will not require steam and chilled water.

6.6.4 Sustainable Design/Energy Conservation

Energy conservation measures will be an integral part of the Project's infrastructure design. The buildings will employ energy-efficient and water-conservation features for mechanical, electrical, architectural, and structural systems, assemblies, and materials where possible. The base configuration of the proposed building will meet the Massachusetts Energy Code. Mechanical and HVAC systems will be installed to the current industry standards and full cooperation with the local utility providers will be maintained during design and construction.

6.7 Conclusions

Although the estimated sewage generation and water use is greater for the Millennium Tower and Burnham Building Project than that of the Previously Approved Project, impacts are expected to be similar to the Previously Approved Project. Based on the Project's estimated daily sanitary flow, and the capacity of the existing infrastructure, the existing sanitary sewer and water distribution systems are expected to have adequate capacity for the Project. There are no expected water capacity problems in the vicinity of the Project Site. Water conservation measures including low-flow toilets and urinals, restricted flow faucets, and sensor operated sinks, toilets, and urinals will be incorporated into the design wherever possible. From a stormwater management standpoint, the Project Site will mirror the Previously Approved Project and will remain 100% impervious. Therefore, stormwater mitigation will not be necessary as proposed runoff rates and volume will match existing (2006) conditions.

Transportation Appendix

Former Filene's and Filene's Basement

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

Land Use	Size	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal trips[1]	Pass-by %	Less capture trips	Assumed national vehicle occupancy rate[2]	**Converted to Person trips**	Transit Share[3]	**Transit Trips**	Walk/Bike/ Other Share[3]	**Walk/ Bike/ Other Trips**	Vehicle Share[3]	Vehicle Person Trips	Assumed local vehicle occupancy rate[4]	**Total Adjusted Vehicle Trips**
Daily Trip Generation																	
Retail [5]																	
	349.3	Total	42.94	14,999	2,299	25%	9,525	1.8	**17,145**	35%	**6,001**	41%	**7,030**	24%	4,115	1.8	**2,286**
	KSF	In	21.47	7,499	1,216	25%	4,713	1.8	**8,483**	35%	**2,969**	41%	**3,478**	24%	2,036	1.8	**1,131**
		Out	21.47	7,499	1,083	25%	4,812	1.8	**8662**	35%	**3,032**	41%	**3,551**	24%	2079	1.8	**1,155**
Filene's Basement [6]																	
	157.0	Total	42.94	6,742	2,191	25%	3,413	1.8	**6,143**	35%	**2,150**	41%	**2,519**	24%	1,474	1.8	**819**
	KSF	In	21.47	3,371	1,079	25%	1,719	1.8	**3,094**	35%	**1,083**	41%	**1,269**	24%	743	1.8	**413**
		Out	21.47	3,371	1,112	25%	1,694	1.8	**3049**	35%	**1,067**	41%	**1,250**	24%	732	1.8	**407**
Office [7]																	
	153.7	Total	12.08	1,857	580	0%	1,278	1.2	**1,533**	43%	**659**	31%	**475**	26%	399	1.2	**332**
	KSF	In	6.04	929	240	0%	688	1.2	**826**	43%	**355**	31%	**256**	26%	215	1.2	**179**
		Out	6.04	929	339	0%	590	1.2	**707**	43%	**304**	31%	**219**	26%	184	1.2	**153**
Total		Total		23,598					**24,822**		**8,810**		**10,024**				**3,437**
		In		11,799					**12,404**		**4,407**		**5,003**				**1,723**
		Out		11,799					**12,418**		**4,403**		**5,021**				**1,715**

Former Filene's and Filene's Basement

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

AM Peak Hour Trip Generation																	
Retail [5]																	
	349.3	Total	1.03	360	0	50%	180	1.8	**324**	63%	**204**	5%	**16**	32%	104	1.8	**58**
	KSF	In	0.63	219	0	50%	110	1.8	**198**	63%	**124**	5%	**10**	32%	63	1.8	**35**
		Out	0.40	140	0	50%	70	1.8	**126**	63%	**80**	5%	**6**	32%	40	1.8	**22**
Filene's Basement [6]																	
	157.0	Total	1.03	162	0	50%	81	1.8	**146**	63%	**92**	5%	**7**	32%	47	1.8	**26**
	KSF	In	0.63	99	0	50%	49	1.8	**89**	63%	**56**	5%	**4**	32%	28	1.8	**16**
		Out	0.40	63	0	50%	32	1.8	**57**	63%	**36**	5%	**3**	32%	18	1.8	**10**
Office [7]																	
	153.7	Total	1.72	265	0	0%	265	1.2	**317**		**183**		**24**		111	1.2	**92**
	KSF	In	1.51	233	0	0%	233	1.2	**279**	63%	**176**	5%	**14**	32%	89	1.2	**74**
		Out	0.21	32	0	0%	32	1.2	**38**	18%	**7**	26%	**10**	56%	21	1.2	**18**
Total		Total		786					**787**		**479**		**47**				**176**
		In		551					**566**		**356**		**28**				**125**
		Out		235					**221**		**122**		**19**				**50**

Former Filene's and Filene's Basement

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

PM Peak Hour Trip Generation																
Retail [5]																
349.3	Total	3.75	1,310	144	50%	583	1.8	**1,050**		**416**		**257**		376	1.8	**209**
KSF	In	1.80	629	74	50%	277	1.8	**499**	15%	**75**	46%	**230**	39%	195	1.8	**108**
	Out	1.95	681	70	50%	306	1.8	**550**	62%	**341**	5%	**28**	33%	182	1.8	**101**
Filene's Basement [6]																
157.0	Total	3.75	589	133	50%	228	1.8	**411**		**161**		**102**		147	1.8	**82**
KSF	In	1.80	283	62	50%	110	1.8	**198**	15%	**30**	46%	**91**	39%	77	1.8	**43**
	Out	1.95	306	70	50%	118	1.8	**212**	62%	**132**	5%	**11**	33%	70	1.8	**39**
Office [7]																
153.7	Total	1.63	251	41	0%	210	1.2	**252**		**148**		**18**		87	1.2	**72**
KSF	In	0.28	43	22	0%	20	1.2	**24**	18%	**4**	26%	**6**	56%	14	1.2	**11**
	Out	1.36	208	18	0%	190	1.2	**228**	63%	**144**	5%	**11**	32%	73	1.2	**61**
Total	Total		2,150					**1,713**		**725**		**377**				**363**
	In		954					**722**		**109**		**327**				**163**
	Out		1,196					**990**		**616**		**50**				**201**

Former Filene's and Filene's Basement

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

Saturday Mid-day Peak Hour Trip Generation

Retail [5]																	
	349.3	Total	4.97	1,736	250	25%	1,115	1.8	**2,006**		**564**		**1,004**		439	1.8	**244**
	KSF	In	2.58	903	113	25%	592	1.8	**1,066**	22%	**234**	58%	**618**	20%	213	1.8	**118**
		Out	2.39	833	137	25%	523	1.8	**941**	35%	**329**	41%	**386**	24%	226	1.8	**125**
Filene's Basement [6]																	
	157.0	Total	4.97	780	250	25%	398	1.8	**716**		**202**		**357**		157	1.8	**87**
	KSF	In	2.58	406	131	25%	206	1.8	**371**	22%	**82**	58%	**215**	20%	74	1.8	**41**
		Out	2.39	375	119	25%	191	1.8	**344**	35%	**121**	41%	**141**	24%	83	1.8	**46**
Office [7]																	
	153.7	Total	0.34	52	31	0%	21	1.2	**25**		**8**		**12**		6	1.2	**5**
	KSF	In	0.18	28	21	0%	7	1.2	**8**	22%	**2**	58%	**5**	20%	2	1.2	**1**
		Out	0.16	24	10	0%	14	1.2	**17**	35%	**6**	41%	**7**	24%	4	1.2	**3**
Total		Total		2,569					**2,748**		**774**		**1,372**				**336**
		In		1,337					**1,445**		**318**		**838**				**161**
		Out		1,232					**1,302**		**456**		**534**				**175**

Notes:

1. Intrenal trips based on ITE Trip Generation Handbook, 2nd Edition, Multi-Use Development
2. 2001 National vehicle occupancy rates - 1.2: Home to work; 1.8: Retail
3. Mode shares based on 2000 Census data and BTD Data for Area 2
4. Local vehicle occupancy rates based on 2000 Census data and 2001 National VOR.
5. ITE Trip Generation Equation, 7th Edition, LUC 820 (Shopping Center), average rate
6. ITE Trip Generation Equation, 7th Edition, LUC 820 (Shopping Center), average rate
7. ITE Trip Generation Equation, 7th Edition, LUC 710 (General Office), equation

One Franklin Street Redevelopment- Build - Previously Approved Project (from DPIR)

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

Land Use	Size	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal trips[1]	Pass-by %	Less capture trips	Assumed national vehicle occupancy rate[2]	**Converted to Person trips**	Transit Share[3]	**Transit Trips**	Walk/Bike/ Other Share[3]	**Walk/ Bike/ Other Trips**	Vehicle Share[3]	Vehicle Person Trips	Assumed local vehicle occupancy rate[4]	**Total Adjusted Vehicle Trips**
Daily Trip Generation																	
Residential - High-Rise Condominiums [5]																	
	166	Total	4.18	694	267	0%	427	1.2	**512**	30%	**154**	42%	**215**	28%	143	1.2	**120**
	Units	In	2.09	347	125	0%	222	1.2	**266**	30%	**80**	42%	**112**	28%	75	1.2	**62**
		Out	2.09	347	142	0%	205	1.2	**246**	30%	**74**	42%	**103**	28%	69	1.2	**57**
Retail [6]																	
	129.5	Total	42.94	5,561	587	25%	3,730	1.8	**6,715**	35%	**2,350**	41%	**2,753**	24%	1,611	1.8	**895**
	KSF	In	21.47	2,780	323	25%	1,843	1.8	**3,317**	35%	**1,161**	41%	**1,360**	24%	796	1.8	**442**
		Out	21.47	2,780	264	25%	1,887	1.8	**3397**	35%	**1,189**	41%	**1,393**	24%	815	1.8	**453**
Filene's Basement [7]																	
	125.0	Total	42.94	5,368	566	25%	3,601	1.8	**6,482**	35%	**2,269**	41%	**2,658**	24%	1,556	1.8	**864**
	KSF	In	21.47	2,684	311	25%	1,780	1.8	**3,203**	35%	**1,121**	41%	**1,313**	24%	769	1.8	**427**
		Out	21.47	2,684	255	25%	1,822	1.8	**3279**	35%	**1,148**	41%	**1,344**	24%	787	1.8	**437**
Grocery [8]																	
	50.0	Total	94.78	4,739	227	25%	3,384	1.8	**6,091**	35%	**2,132**	41%	**2,497**	24%	1,462	1.8	**812**
	KSF	In	47.39	2,370	125	25%	1,683	1.8	**3,030**	35%	**1,061**	41%	**1,242**	24%	727	1.8	**404**
		Out	47.39	2,370	102	25%	1,701	1.8	**3061**	35%	**1,071**	41%	**1,255**	24%	735	1.8	**408**
Restaurant [9]																	
	10.0	Total	127.15	1,272	45	25%	920	1.8	**1,656**	35%	**580**	41%	**679**	24%	397	1.8	**221**
	KSF	In	63.58	636	25	25%	458	1.8	**825**	35%	**289**	41%	**338**	24%	198	1.8	**110**
		Out	63.58	636	20	25%	462	1.8	**831**	35%	**291**	41%	**341**	24%	200	1.8	**111**
Office [10]																	
	469.0	Total	9.35	4,385	663	0%	3,722	1.2	**4,466**	43%	**1,921**	31%	**1,385**	26%	1,161	1.2	**968**
	KSF	In	4.67	2,193	289	0%	1,903	1.2	**2,284**	43%	**982**	31%	**708**	26%	594	1.2	**495**
		Out	4.67	2,193	374	0%	1,819	1.2	**2182**	43%	**938**	31%	**677**	26%	567	1.2	**473**
Hotel [11]																	
	226	Total	7.30	1,650	635	0%	1,015	2.1	**2,131**	20%	**426**	59%	**1,257**	21%	447	2.1	**213**
	rooms	In	3.65	825	297	0%	528	2.1	**1,108**	20%	**222**	59%	**654**	21%	233	2.1	**111**
		Out	3.65	825	338	0%	487	2.1	**1022**	20%	**204**	59%	**603**	21%	215	2.1	**102**
Total		Total		23,667					**28,053**		**9,831**		**11,444**				**4,093**
		In		11,834					**14,034**		**4,915**		**5,728**				**2,051**
		Out		11,834					**14,019**		**4,916**		**5,716**				**2,042**

One Franklin Street Redevelopment- Build - Previously Approved Project (from DPIR)

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

AM Peak Hour Trip Generation																	
Residential - High-Rise Condominiums [5]																	
	166	Total	0.34	56	0	0%	56	1.2	**68**		**17**		**29**		22	1.2	**19**
	Units	In	0.06	11	0	0%	11	1.2	**13**	52%	**7**	7%	**1**	41%	5	1.2	**4**
		Out	0.28	46	0	0%	46	1.2	**55**	18%	**10**	51%	**28**	31%	17	1.2	**14**
Retail [6]																	
	129.5	Total	1.03	133	0	50%	67	1.8	**120**	63%	**76**	5%	**6**	32%	38	1.8	**21**
	KSF	In	0.63	81	0	50%	41	1.8	**73**	63%	**46**	5%	**4**	32%	23	1.8	**13**
		Out	0.40	52	0	50%	26	1.8	**47**	63%	**29**	5%	**2**	32%	15	1.8	**8**
Filene's Basement [7]																	
	125.0	Total	1.03	129	0	50%	64	1.8	**116**	63%	**73**	5%	**6**	32%	37	1.8	**21**
	KSF	In	0.63	79	0	50%	39	1.8	**71**	63%	**45**	5%	**4**	32%	23	1.8	**13**
		Out	0.40	50	0	50%	25	1.8	**45**	63%	**28**	5%	**2**	32%	14	1.8	**8**
Grocery [8]																	
	50.0	Total	3.74	187	0	50%	93	1.8	**168**	63%	**106**	5%	**8**	32%	54	1.8	**30**
	KSF	In	2.28	114	0	50%	57	1.8	**103**	63%	**65**	5%	**5**	32%	33	1.8	**18**
		Out	1.46	73	0	50%	36	1.8	**66**	63%	**41**	5%	**3**	32%	21	1.8	**12**
Restaurant [9]																	
	10.0	Total	11.52	115	0	50%	58	1.8	**104**	63%	**65**	5%	**5**	32%	33	1.8	**18**
	KSF	In	5.99	60	0	50%	30	1.8	**54**	63%	**34**	5%	**3**	32%	17	1.8	**10**
		Out	5.53	55	0	50%	28	1.8	**50**	63%	**31**	5%	**2**	32%	16	1.8	**9**
Office [10]																	
	469.0	Total	1.38	646	0	0%	646	1.2	**775**		**446**		**58**		270	1.2	**225**
	KSF	In	1.21	568	0	0%	568	1.2	**682**	63%	**430**	5%	**34**	32%	218	1.2	**182**
		Out	0.17	77	0	0%	77	1.2	**93**	18%	**17**	26%	**24**	56%	52	1.2	**43**
Hotel [11]																	
	226	Total	0.50	112	0	0%	112	2.1	**236**		**75**		**74**		87	2.1	**41**
	rooms	In	0.30	69	0	0%	69	2.1	**144**	46%	**66**	14%	**20**	40%	58	2.1	**27**
		Out	0.19	44	0	0%	44	2.1	**92**	10%	**9**	58%	**53**	32%	29	2.1	**14**
Total		Total		1,379					**1,586**		**858**		**186**				**376**
		In		981					**1,139**		**692**		**70**				**267**
		Out		397					**447**		**166**		**116**				**108**

One Franklin Street Redevelopment- Build - Previously Approved Project (from DPIR)

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

PM Peak Hour Trip Generation																	
Residential - High-Rise Condominiums [5]																	
	166	Total	0.38	63	26	0%	37	1.2	**44**		**12**		**17**		15	1.2	**13**
	Units	In	0.24	39	13	0%	26	1.2	**31**	18%	**6**	51%	**16**	31%	10	1.2	**8**
		Out	0.14	24	13	0%	11	1.2	**13**	52%	**7**	7%	**1**	41%	5	1.2	**4**
Retail [6]																	
	129.5	Total	3.75	486	49	50%	218	1.8	**393**		**156**		**96**		141	1.8	**78**
	KSF	In	1.80	233	25	50%	104	1.8	**187**	15%	**28**	46%	**86**	39%	73	1.8	**41**
		Out	1.95	253	24	50%	114	1.8	**206**	62%	**128**	5%	**10**	33%	68	1.8	**38**
Filene's Basement [7]																	
	125.0	Total	3.75	469	48	50%	210	1.8	**379**		**150**		**93**		136	1.8	**75**
	KSF	In	1.80	225	25	50%	100	1.8	**180**	15%	**27**	46%	**83**	39%	70	1.8	**39**
		Out	1.95	244	23	50%	110	1.8	**199**	62%	**123**	5%	**10**	33%	66	1.8	**36**
Grocery [8]																	
	50.0	Total	10.79	539	19	50%	260	1.8	**468**		**178**		**121**		169	1.8	**94**
	KSF	In	5.50	275	10	50%	133	1.8	**239**	15%	**36**	46%	**110**	39%	93	1.8	**52**
		Out	5.29	264	9	50%	128	1.8	**230**	62%	**142**	5%	**11**	33%	76	1.8	**42**
Restaurant [9]																	
	10.0	Total	10.92	109	4	50%	53	1.8	**95**		**31**		**29**		35	1.8	**19**
	KSF	In	6.66	67	2	50%	32	1.8	**58**	15%	**9**	46%	**27**	39%	23	1.8	**13**
		Out	4.26	43	2	50%	20	1.8	**37**	62%	**23**	5%	**2**	33%	12	1.8	**7**
Office [10]																	
	469.0	Total	1.29	604	42	0%	562	1.2	**674**		**382**		**54**		238	1.2	**199**
	KSF	In	0.22	103	24	0%	79	1.2	**94**	18%	**17**	26%	**25**	56%	53	1.2	**44**
		Out	1.07	501	18	0%	483	1.2	**580**	63%	**365**	5%	**29**	32%	186	1.2	**155**
Hotel [11]																	
	226	Total	0.59	133	56	0%	77	2.1	**162**		**39**		**67**		57	2.1	**27**
	rooms	In	0.31	71	23	0%	48	2.1	**100**	10%	**10**	58%	**58**	32%	32	2.1	**15**
		Out	0.28	63	33	0%	30	2.1	**62**	46%	**29**	14%	**9**	40%	25	2.1	**12**
Total		Total		2,404					**2,216**		**949**		**476**				**505**
		In		1,012					**890**		**132**		**404**				**211**
		Out		1,391					**1,326**		**817**		**72**				**294**

One Franklin Street Redevelopment- Build - Previously Approved Project (from DPIR)

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

Saturday Mid-day Peak Hour Trip Generation																	
Residential - High-Rise Condominiums [5]																	
	166	Total	0.35	58	20	0%	38	1.2	**46**		**14**		**22**		10	1.2	**9**
	Units	In	0.15	25	9	0%	16	1.2	**19**	22%	**4**	58%	**11**	20%	4	1.2	**3**
		Out	0.20	33	11	0%	22	1.2	**27**	35%	**9**	41%	**11**	24%	6	1.2	**5**
Retail [6]																	
	129.5	Total	4.97	644	47	25%	447	1.8	**805**		**226**		**403**		176	1.8	**98**
	KSF	In	2.58	335	19	25%	237	1.8	**426**	22%	**94**	58%	**247**	20%	85	1.8	**47**
		Out	2.39	309	28	25%	211	1.8	**379**	35%	**133**	41%	**155**	24%	91	1.8	**51**
Filene's Basement [7]																	
	125.0	Total	4.97	621	47	25%	431	1.8	**775**		**218**		**388**		170	1.8	**94**
	KSF	In	2.58	323	19	25%	228	1.8	**410**	22%	**90**	58%	**238**	20%	82	1.8	**46**
		Out	2.39	298	28	25%	203	1.8	**365**	35%	**128**	41%	**150**	24%	88	1.8	**49**
Grocery [8]																	
	50.0	Total	10.67	534	18	25%	387	1.8	**696**		**199**		**344**		153	1.8	**85**
	KSF	In	5.23	262	7	25%	191	1.8	**344**	22%	**76**	58%	**199**	20%	69	1.8	**38**
		Out	5.44	272	11	25%	196	1.8	**353**	35%	**123**	41%	**145**	24%	85	1.8	**47**
Restaurant [9]																	
	10.0	Total	20.00	200	4	25%	147	1.8	**265**		**71**		**137**		57	1.8	**32**
	KSF	In	12.60	126	2	25%	93	1.8	**167**	22%	**37**	58%	**97**	20%	33	1.8	**19**
		Out	7.40	74	2	25%	54	1.8	**97**	35%	**34**	41%	**40**	24%	23	1.8	**13**
Office [10]																	
	469.0	Total	0.28	129	38	0%	91	1.2	**109**		**31**		**54**		24	1.2	**20**
	KSF	In	0.15	70	27	0%	43	1.2	**52**	22%	**11**	58%	**30**	20%	10	1.2	**9**
		Out	0.13	59	12	0%	48	1.2	**57**	35%	**20**	41%	**23**	24%	14	1.2	**11**
Hotel [11]																	
	226	Total	0.71	160	57	0%	103	2.1	**217**		**60**		**109**		47	2.1	**23**
	rooms	In	0.40	90	33	0%	57	2.1	**119**	22%	**26**	58%	**69**	20%	24	2.1	**11**
		Out	0.31	71	24	0%	47	2.1	**98**	35%	**34**	41%	**40**	24%	23	2.1	**11**
Total		Total		2,346					**2,913**		**820**		**1,456**				**360**
		In		1,230					**1,538**		**338**		**892**				**173**
		Out		1,116					**1,375**		**481**		**564**				**187**

Notes:

1. Intrenal trips based on ITE Trip Generation Handbook, 2nd Edition, Multi-Use Development
2. 2001 National vehicle occupancy rates - 1.2: Home to work; 1.8: Retail; 2.1: Social and Recreational
3. Mode shares based on 2000 Census data and BTD Data for Area 2
4. Local vehicle occupancy rates based on 2000 Census data and 2001 National VOR.
5. ITE Trip Generation Equation, 7th Edition, LUC 232 (Condominium/Townhouse), average rate
6. ITE Trip Generation Rate, 7th Edition, LUC 820 (Shopping Center), average rate
7. ITE Trip Generation Rate, 7th Edition, LUC 820 (Shopping Center), average rate
8. ITE Trip Generation Rate, 7th Edition, LUC 850 (Supermarket), equation
9. ITE Trip Generation Rate, 7th Edition, LUC 932 (High-Turnover (Sit-Down) Restaurant), average rate
10. ITE Trip Generation Rate, 7th Edition, LUC 710 (General Office), equation
11. ITE Trip Generation Rate, 7th Edition, LUC 310 (Hotel), equation

Millennium Tower and Burnham Building

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

Land Use	Size	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal trips[1]	Pass-by %	Less capture trips	Assumed national vehicle occupancy rate[2]	**Converted to Person trips**	Transit Share[3]	**Transit Trips**	Walk/Bike/ Other Share[3]	**Walk/ Bike/ Other Trips**	Vehicle Share[3]	Vehicle Person Trips	Assumed local vehicle occupancy rate[4]	**Total Adjusted Vehicle Trips**
Daily Trip Generation																	
Residential - High-Rise Apartments [5]																	
	600	Total	4.20	2,520	823	0%	1,697	1.1	**1,867**	30%	**560**	42%	**784**	28%	523	1.2	**436**
	Units	In	2.10	1,260	411	0%	849	1.1	**933**	30%	**280**	42%	**392**	28%	261	1.2	**218**
		Out	2.10	1,260	411	0%	849	1.1	**933**	30%	**280**	42%	**392**	28%	261	1.2	**218**
Retail [6]																	
	122.0	Total	42.94	5,239	752	25%	3,365	1.8	**6,057**	35%	**2,120**	41%	**2,483**	24%	1,454	1.8	**808**
	KSF	In	21.47	2,619	376	25%	1,683	1.8	**3,029**	35%	**1,060**	41%	**1,242**	24%	727	1.8	**404**
		Out	21.47	2,619	376	25%	1,683	1.8	**3029**	35%	**1,060**	41%	**1,242**	24%	727	1.8	**404**
Restaurant [8]																	
	10.0	Total	127.15	1,272	62	25%	907	1.8	**1,633**	35%	**571**	41%	**669**	24%	392	1.8	**218**
	KSF	In	63.58	636	31	25%	454	1.8	**816**	35%	**286**	41%	**335**	24%	196	1.8	**109**
		Out	63.58	636	31	25%	454	1.8	**816**	35%	**286**	41%	**335**	24%	196	1.8	**109**
Office [9]																	
	218.0	Total	11.15	2,431	330	0%	2,101	1.1	**2,311**	43%	**994**	31%	**716**	26%	601	1.2	**501**
	KSF	In	5.58	1,216	165	0%	1,050	1.1	**1,155**	43%	**497**	31%	**358**	26%	300	1.2	**250**
		Out	5.58	1,216	165	0%	1,050	1.1	**1155**	43%	**497**	31%	**358**	26%	300	1.2	**250**
Health Spa/Fitness Center [10]																	
	35.0	Total	32.93	1153	215	25%	703	1.8	**1,266**	20%	**253**	59%	**747**	21%	266	1.8	**148**
	KSF	In	16.47	576	108	25%	352	1.8	**633**	20%	**127**	59%	**373**	21%	133	1.8	**74**
		Out	16.47	576	108	25%	352	1.8	**633**	20%	**127**	59%	**373**	21%	133	1.8	**74**
Total		Total		12,614	2,182		8,773		**13,133**		**4,498**		**5,400**				**2,109**
		In		6,307	1,091		4,387		**6,567**		**2,249**		**2,700**				**1,055**
		Out		6,307	1,091		4,387		**6,567**		**2,249**		**2,700**				**1,055**

Millennium Tower and Burnham Building

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

Land Use	Size	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal trips[1]	Pass-by %	Less capture trips	Assumed national vehicle occupancy rate[2]	**Converted to Person trips**	Transit Share[3]	**Transit Trips**	Walk/Bike/ Other Share[3]	**Walk/ Bike/ Other Trips**	Vehicle Share[3]	Vehicle Person Trips	Assumed local vehicle occupancy rate[4]	**Total Adjusted Vehicle Trips**
AM Peak Hour Trip Generation																	
Residential - High-Rise Condominiums [5]																	
	600	Total	0.30	180	26	0%	154	1.1	**169**		**42**		**71**		56	1.2	**47**
	Units	In	0.08	45	14	0%	31	1.1	**34**	52%	**18**	7%	**2**	41%	14	1.2	**12**
		Out	0.23	135	13	0%	122	1.1	**135**	18%	**24**	51%	**69**	31%	42	1.2	**35**
Retail [6]																	
	122.0	Total	1.00	122	23	50%	50	1.8	**89**		**0**		**0**		29	1.8	**16**
	KSF	In	0.61	74	11	50%	32	1.8	**57**	63%	**36**	5%	**3**	32%	18	1.8	**10**
		Out	0.39	48	12	50%	18	1.8	**32**	63%	**20**	5%	**2**	32%	10	1.8	**6**
Restaurant [8]																	
	10.0	Total	11.52	115	2	50%	57	1.8	**102**		**0**		**0**		33	1.8	**18**
	KSF	In	5.99	60	1	50%	29	1.8	**53**	63%	**33**	5%	**3**	32%	17	1.8	**9**
		Out	5.53	55	1	50%	27	1.8	**49**	63%	**31**	5%	**2**	32%	16	1.8	**9**
Office [9]																	
	218.0	Total	1.60	350	7	0%	343	1.1	**377**		**219**		**28**		131	1.2	**109**
	KSF	In	1.41	308	3	0%	305	1.1	**335**	63%	**211**	5%	**17**	32%	107	1.2	**89**
		Out	0.19	42	4	0%	38	1.1	**42**	18%	**8**	26%	**11**	56%	24	1.2	**20**
Health Spa/Fitness Center [10]																	
	35.0	Total	1.38	11	0	50%	6	1.8	**10**		**3**		**3**		4	1.8	**2**
	KSF	In	0.62	7	0	50%	3	1.8	**6**	46%	**3**	14%	**1**	40%	2	1.8	**1**
		Out	0.76	4	0	50%	2	1.8	**4**	10%	**0**	58%	**2**	32%	1	1.8	**1**
Total		Total		778			608		**747**		**264**		**102**				**192**
		In		494			401		**486**		**301**		**26**				**122**
		Out		284			208		**261**		**83**		**86**				**70**

Millennium Tower and Burnham Building

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

Land Use	Size	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal trips[1]	Pass-by %	Less capture trips	Assumed national vehicle occupancy rate[2]	**Converted to Person trips**	Transit Share[3]	**Transit Trips**	Walk/Bike/ Other Share[3]	**Walk/ Bike/ Other Trips**	Vehicle Share[3]	Vehicle Person Trips	Assumed local vehicle occupancy rate[4]	**Total Adjusted Vehicle Trips**
PM Peak Hour Trip Generation																	
Residential - High-Rise Condominiums [5]																	
	600	Total	0.35	210	63	0%	147	1.1	**161**		**50**		**55**		56	1.2	**47**
	Units	In	0.21	128	37	0%	91	1.1	**100**	18%	**18**	51%	**51**	31%	31	1.2	**26**
		Out	0.14	82	26	0%	56	1.1	**62**	52%	**32**	7%	**4**	41%	25	1.2	**21**
Retail [6]																	
	122.0	Total	3.73	455	53	50%	201	1.8	**362**		**140**		**92**		130	1.8	**72**
	KSF	In	1.83	223	23	50%	100	1.8	**180**	15%	**27**	46%	**83**	39%	70	1.8	**39**
		Out	1.90	232	30	50%	101	1.8	**182**	62%	**113**	5%	**9**	33%	60	1.8	**33**
Restaurant [8]																	
	10.0	Total	11.15	112	4	50%	54	1.8	**97**		**33**		**28**		35	1.8	**20**
	KSF	In	6.58	66	2	50%	32	1.8	**57**	15%	**9**	46%	**26**	39%	22	1.8	**12**
		Out	4.57	46	2	50%	22	1.8	**39**	62%	**24**	5%	**2**	33%	13	1.8	**7**
Office [9]																	
	218.0	Total	1.48	323	18	0%	305	1.1	**335**		**188**		**28**		120	1.2	**100**
	KSF	In	0.25	55	8	0%	47	1.1	**51**	18%	**9**	26%	**13**	56%	29	1.2	**24**
		Out	1.23	268	10	0%	258	1.1	**284**	63%	**179**	5%	**14**	32%	91	1.2	**76**
Health Spa/Fitness Center [10]																	
	35.0	Total	3.53	124	4	50%	60	1.8	**108**		**27**		**42**		38	1.8	**21**
	KSF	In	2.01	70	2	50%	34	1.8	**62**	10%	**6**	58%	**36**	32%	20	1.8	**11**
		Out	1.52	53	2	50%	26	1.8	**46**	46%	**21**	14%	**6**	40%	18	1.8	**10**
Total		Total		1,223					**1,063**		**438**		**245**				**260**
		In		542					**450**		**69**		**209**				**112**
		Out		681					**613**		**369**		**36**				**148**

Millennium Tower and Burnham Building

8/1/2012

Detailed Trip Generation Estimate

Howard/Stein-Hudson Associates

Land Use	Size	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal trips[1]	Pass-by %	Less capture trips	Assumed national vehicle occupancy rate[2]	**Converted to Person trips**	Transit Share[3]	**Transit Trips**	Walk/Bike/ Other Share[3]	**Walk/ Bike/ Other Trips**	Vehicle Share[3]	Vehicle Person Trips	Assumed local vehicle occupancy rate[4]	**Total Adjusted Vehicle Trips**
Saturday Mid-day Peak Hour Trip Generation																	
Residential - High-Rise Condominiums [5]																	
	600	Total	0.40	240	47	0%	193	1.1	**212**		**58**		**108**		46	1.2	**38**
	Units	In	0.23	137	25	0%	112	1.1	**123**	22%	**27**	58%	**71**	20%	25	1.2	**20**
		Out	0.17	103	22	0%	81	1.1	**90**	35%	**31**	41%	**37**	24%	21	1.2	**18**
Retail [6]																	
	122.0	Total	4.89	597	47	25%	412	1.8	**742**		**209**		**371**		162	1.8	**90**
	KSF	In	2.54	310	21	25%	217	1.8	**390**	22%	**86**	58%	**226**	20%	78	1.8	**43**
		Out	2.35	286	26	25%	195	1.8	**351**	35%	**123**	41%	**144**	24%	84	1.8	**47**
Restaurant [8]																	
	10.0	Total	20.00	200	4	25%	147	1.8	**265**		**71**		**137**		57	1.8	**32**
	KSF	In	12.60	126	2	25%	93	1.8	**167**	22%	**37**	58%	**97**	20%	33	1.8	**19**
		Out	7.40	74	2	25%	54	1.8	**97**	35%	**34**	41%	**40**	24%	23	1.8	**13**
Office [9]																	
	218.0	Total	0.32	70	17	0%	52	1.1	**58**		**16**		**29**		13	1.2	**11**
	KSF	In	0.17	38	11	0%	27	1.1	**29**	22%	**6**	58%	**17**	20%	6	1.2	**5**
		Out	0.15	32	6	0%	26	1.1	**28**	35%	**10**	41%	**12**	24%	7	1.2	**6**
Health Spa/Fitness Center [10]																	
	35.0	Total	2.78	28	4	25%	18	1.8	**33**		**9**		**17**		7	1.8	**4**
	KSF	In	1.25	16	2	25%	10	1.8	**19**	22%	**4**	58%	**11**	20%	4	1.8	**2**
		Out	1.53	13	2	25%	8	1.8	**14**	35%	**5**	41%	**6**	24%	3	1.8	**2**
Total		Total		1,135					**1,309**		**364**		**661**				**175**
		In		626					**729**		**160**		**423**				**89**
		Out		508					**581**		**203**		**238**				**85**

Notes:

1. Intrenal trips based on ITE Trip Generation Handbook, 2nd Edition, Multi-Use Development
2. 2001 National vehicle occupancy rates - 1.1: Home to work; 1.8: Retail; 2.2: Social and Recreational
3. Mode shares based on 2000 Census data and BTD Data for Area 2
4. Local vehicle occupancy rates based on 2000 Census data and 2001 National VOR.
5. ITE Trip Generation Equation, 8th Edition, LUC 232 (High-Rise Condominium/Townhouse), average rate
6. ITE Trip Generation Rate, 8th Edition, LUC 820 (Shopping Center), average rate
8. ITE Trip Generation Rate, 8th Edition, LUC 932 (High-Turnover (Sit-Down) Restaurant), average rate
9. ITE Trip Generation Rate, 8th Edition, LUC 710 (General Office), equation
10. ITE Trip Generation Rate, 8th Edition, LUC 492 (Health/Fitness Center), average rate

Appendix A
Wind Data

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
1	A	Spring	14		Standing	22		Acceptable
		Summer	12		Sitting	20		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	12		Sitting	21		Acceptable
		Annual	13		Standing	21		Acceptable
	B	Spring	18	29%	Walking	26	18%	Acceptable
		Summer	16	33%	Walking	22		Acceptable
		Fall	17	31%	Walking	24	14%	Acceptable
		Winter	18	50%	Walking	25	19%	Acceptable
		Annual	17	31%	Walking	24	14%	Acceptable
2	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	18	64%	Walking	23	35%	Acceptable
		Summer	14	56%	Standing	18	29%	Acceptable
		Fall	17	55%	Walking	22	38%	Acceptable
		Winter	19	58%	Walking	24	33%	Acceptable
		Annual	17	55%	Walking	22	29%	Acceptable
3	A	Spring	14		Standing	22		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	16	14%	Walking	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	17	13%	Walking	23		Acceptable
		Annual	16	14%	Walking	22		Acceptable
4	A	Spring	15		Standing	23		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	22		Acceptable
	B	Spring	20	33%	Uncomfortable	28	22%	Acceptable
		Summer	16	33%	Walking	22	16%	Acceptable
		Fall	19	36%	Walking	26	24%	Acceptable
		Winter	22	47%	Uncomfortable	30	30%	Acceptable
		Annual	20	43%	Uncomfortable	27	23%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
5	A	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	19	58%	Walking	28	56%	Acceptable
		Summer	14	40%	Standing	21	31%	Acceptable
		Fall	18	64%	Walking	26	53%	Acceptable
		Winter	20	82%	Uncomfortable	30	67%	Acceptable
		Annual	18	64%	Walking	27	59%	Acceptable
6	A	Spring	9		Sitting	15		Acceptable
		Summer	8		Sitting	12		Acceptable
		Fall	9		Sitting	14		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	10	11%	Sitting	17	13%	Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10	11%	Sitting	16	14%	Acceptable
		Winter	11	22%	Sitting	18	20%	Acceptable
		Annual	10	11%	Sitting	17	21%	Acceptable
7	A	Spring	12		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	10		Sitting	17		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	19		Acceptable
		Annual	10		Sitting	17		Acceptable
8	A	Spring	7		Sitting	11		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	6		Sitting	10		Acceptable
		Winter	7		Sitting	11		Acceptable
		Annual	7		Sitting	11		Acceptable
	B	Spring	7		Sitting	12		Acceptable
		Summer	7	17%	Sitting	12	20%	Acceptable
		Fall	7	17%	Sitting	12	20%	Acceptable
		Winter	8	14%	Sitting	14	27%	Acceptable
		Annual	7		Sitting	13	18%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A - No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
9	A	Spring	7		Sitting	11		Acceptable
		Summer	6		Sitting	9		Acceptable
		Fall	7		Sitting	10		Acceptable
		Winter	7		Sitting	11		Acceptable
		Annual	7		Sitting	11		Acceptable
	B	Spring	6		Sitting	10		Acceptable
		Summer	5		Sitting	8		Acceptable
		Fall	6		Sitting	9		Acceptable
		Winter	7		Sitting	10		Acceptable
		Annual	6		Sitting	9		Acceptable
10	A	Spring	7		Sitting	11		Acceptable
		Summer	6		Sitting	9		Acceptable
		Fall	7		Sitting	11		Acceptable
		Winter	8		Sitting	12		Acceptable
		Annual	7		Sitting	11		Acceptable
	B	Spring	8	14%	Sitting	13	18%	Acceptable
		Summer	7	17%	Sitting	11	22%	Acceptable
		Fall	8	14%	Sitting	12		Acceptable
		Winter	9	12%	Sitting	14	17%	Acceptable
		Annual	8	14%	Sitting	13	18%	Acceptable
11	A	Spring	8		Sitting	13		Acceptable
		Summer	7		Sitting	10		Acceptable
		Fall	8		Sitting	12		Acceptable
		Winter	9		Sitting	13		Acceptable
		Annual	8		Sitting	12		Acceptable
	B	Spring	13	62%	Standing	17	31%	Acceptable
		Summer	10	43%	Sitting	14	40%	Acceptable
		Fall	12	50%	Sitting	16	33%	Acceptable
		Winter	14	56%	Standing	19	46%	Acceptable
		Annual	13	62%	Standing	17	42%	Acceptable
12	A	Spring	7		Sitting	12		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	7		Sitting	11		Acceptable
		Winter	7		Sitting	12		Acceptable
		Annual	7		Sitting	11		Acceptable
	B	Spring	9	29%	Sitting	13		Acceptable
		Summer	7	17%	Sitting	10		Acceptable
		Fall	8	14%	Sitting	13	18%	Acceptable
		Winter	9	29%	Sitting	14	17%	Acceptable
		Annual	8	14%	Sitting	13	18%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
13	A	Spring	7		Sitting	11		Acceptable
		Summer	5		Sitting	9		Acceptable
		Fall	6		Sitting	10		Acceptable
		Winter	7		Sitting	11		Acceptable
		Annual	6		Sitting	10		Acceptable
	B	Spring	9	29%	Sitting	15	36%	Acceptable
		Summer	7	40%	Sitting	12	33%	Acceptable
		Fall	9	50%	Sitting	14	40%	Acceptable
		Winter	10	43%	Sitting	16	45%	Acceptable
		Annual	9	50%	Sitting	15	50%	Acceptable
14	A	Spring	6		Sitting	10		Acceptable
		Summer	5		Sitting	8		Acceptable
		Fall	6		Sitting	10		Acceptable
		Winter	6		Sitting	11		Acceptable
		Annual	6		Sitting	10		Acceptable
	B	Spring	11	83%	Sitting	16	60%	Acceptable
		Summer	8	60%	Sitting	13	62%	Acceptable
		Fall	10	67%	Sitting	15	50%	Acceptable
		Winter	11	83%	Sitting	17	55%	Acceptable
		Annual	10	67%	Sitting	16	60%	Acceptable
15	A	Spring	6		Sitting	10		Acceptable
		Summer	5		Sitting	8		Acceptable
		Fall	6		Sitting	10		Acceptable
		Winter	7		Sitting	11		Acceptable
		Annual	6		Sitting	10		Acceptable
	B	Spring	18	200%	Walking	24	140%	Acceptable
		Summer	15	200%	Standing	20	150%	Acceptable
		Fall	17	183%	Walking	23	130%	Acceptable
		Winter	20	186%	Uncomfortable	26	136%	Acceptable
		Annual	18	200%	Walking	24	140%	Acceptable
16	A	Data Not Available						
	B	Spring	18		Walking	25		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	25		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A - No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
17	A	Data Not Available						
	B	Spring	11		Sitting	17		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	10		Sitting	17		Acceptable
18	A	Spring	10		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	17	70%	Walking	24	41%	Acceptable
		Summer	14	56%	Standing	21	50%	Acceptable
		Fall	16	60%	Walking	23	44%	Acceptable
		Winter	17	55%	Walking	24	33%	Acceptable
		Annual	16	60%	Walking	23	44%	Acceptable
19	A	Spring	9		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	9		Sitting	16		Acceptable
	B	Spring	14	56%	Standing	21	31%	Acceptable
		Summer	12	50%	Sitting	18	38%	Acceptable
		Fall	13	44%	Standing	20	33%	Acceptable
		Winter	14	40%	Standing	21	24%	Acceptable
		Annual	13	44%	Standing	20	25%	Acceptable
20	A	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	16	45%	Walking	23	28%	Acceptable
		Summer	13	44%	Standing	19	27%	Acceptable
		Fall	14	27%	Standing	21	24%	Acceptable
		Winter	16	33%	Walking	24	20%	Acceptable
		Annual	15	36%	Standing	22	22%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
21	A	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	14		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	10		Sitting	15		Acceptable
	B	Spring	15	50%	Standing	22	38%	Acceptable
		Summer	13	62%	Standing	19	36%	Acceptable
		Fall	15	67%	Standing	22	47%	Acceptable
		Winter	16	60%	Walking	24	50%	Acceptable
		Annual	15	50%	Standing	22	47%	Acceptable
22	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	15	15%	Standing	22		Acceptable
		Summer	13	18%	Standing	19	12%	Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
23	A	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	15		Standing	22		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
24	A	Spring	7		Sitting	12		Acceptable
		Summer	6		Sitting	9		Acceptable
		Fall	7		Sitting	11		Acceptable
		Winter	7		Sitting	12		Acceptable
		Annual	7		Sitting	12		Acceptable
	B	Spring	17	143%	Walking	24	100%	Acceptable
		Summer	15	150%	Standing	22	144%	Acceptable
		Fall	16	129%	Walking	23	109%	Acceptable
		Winter	17	143%	Walking	25	108%	Acceptable
		Annual	16	129%	Walking	24	100%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A - No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
25	A	Spring	18		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	23	28%	Uncomfortable	30	20%	Acceptable
		Summer	18	20%	Walking	25	25%	Acceptable
		Fall	22	29%	Uncomfortable	29	21%	Acceptable
		Winter	24	26%	Uncomfortable	32	19%	Unacceptable
		Annual	23	28%	Uncomfortable	30	20%	Acceptable
26	A	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	18	29%	Walking	25	25%	Acceptable
		Summer	14	27%	Standing	20	25%	Acceptable
		Fall	17	31%	Walking	23	21%	Acceptable
		Winter	19	27%	Walking	26	18%	Acceptable
		Annual	17	31%	Walking	24	20%	Acceptable
27	A	Spring	17		Walking	26		Acceptable
		Summer	15		Standing	23		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	17		Walking	26		Acceptable
		Annual	17		Walking	25		Acceptable
	B	Spring	17		Walking	25		Acceptable
		Summer	15		Standing	22		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	17		Walking	26		Acceptable
		Annual	16		Walking	24		Acceptable
28	A	Spring	9		Sitting	15		Acceptable
		Summer	8		Sitting	12		Acceptable
		Fall	9		Sitting	14		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	13	44%	Standing	20	33%	Acceptable
		Summer	10	25%	Sitting	16	33%	Acceptable
		Fall	12	33%	Sitting	19	36%	Acceptable
		Winter	14	40%	Standing	21	31%	Acceptable
		Annual	13	44%	Standing	19	27%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A - No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
29	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	15		Standing	23		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
30	A	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	12		Sitting	20		Acceptable
	B	Spring	16	23%	Walking	24	14%	Acceptable
		Summer	12		Sitting	19	12%	Acceptable
		Fall	15	25%	Standing	22	16%	Acceptable
		Winter	17	42%	Walking	25	25%	Acceptable
		Annual	15	25%	Standing	23	15%	Acceptable
31	A	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
32	A	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	22	38%	Uncomfortable	31	35%	Acceptable
		Summer	17	31%	Walking	24	26%	Acceptable
		Fall	21	40%	Uncomfortable	29	32%	Acceptable
		Winter	24	41%	Uncomfortable	33	38%	Unacceptable
		Annual	22	38%	Uncomfortable	30	30%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
33	A	Spring	8		Sitting	14		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	10	25%	Sitting	16	14%	Acceptable
		Summer	8	14%	Sitting	14	27%	Acceptable
		Fall	10	25%	Sitting	16	23%	Acceptable
		Winter	11	22%	Sitting	17	13%	Acceptable
		Annual	10	25%	Sitting	16	23%	Acceptable
34	A	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	12		Sitting	20	11%	Acceptable
		Summer	10		Sitting	17	13%	Acceptable
		Fall	11		Sitting	19	12%	Acceptable
		Winter	13		Standing	22	16%	Acceptable
		Annual	12		Sitting	20	11%	Acceptable
35	A	Spring	12		Sitting	17		Acceptable
		Summer	9		Sitting	13		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	14	17%	Standing	21	24%	Acceptable
		Summer	11	22%	Sitting	17	31%	Acceptable
		Fall	13	18%	Standing	19	19%	Acceptable
		Winter	15	25%	Standing	22	22%	Acceptable
		Annual	14	27%	Standing	20	18%	Acceptable
36	A	Spring	12		Sitting	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	12		Sitting	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A - No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
37	A	Spring	8		Sitting	13		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	8		Sitting	12		Acceptable
		Winter	9		Sitting	13		Acceptable
		Annual	8		Sitting	12		Acceptable
	B	Spring	10	25%	Sitting	15	15%	Acceptable
		Summer	8	33%	Sitting	12	20%	Acceptable
		Fall	9	12%	Sitting	14	17%	Acceptable
		Winter	11	22%	Sitting	16	23%	Acceptable
		Annual	10	25%	Sitting	14	17%	Acceptable
38	A	Spring	9		Sitting	15		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	9		Sitting	14		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	10	11%	Sitting	16		Acceptable
		Summer	8	14%	Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	11	22%	Sitting	17	13%	Acceptable
		Annual	10	11%	Sitting	15		Acceptable
39	A	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	11		Sitting	17		Acceptable
		Summer	9	12%	Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
40	A	Spring	8		Sitting	13		Acceptable
		Summer	6		Sitting	11		Acceptable
		Fall	7		Sitting	12		Acceptable
		Winter	8		Sitting	13		Acceptable
		Annual	7		Sitting	12		Acceptable
	B	Spring	9	12%	Sitting	15	15%	Acceptable
		Summer	8	33%	Sitting	13	18%	Acceptable
		Fall	9	29%	Sitting	14	17%	Acceptable
		Winter	10	25%	Sitting	15	15%	Acceptable
		Annual	9	29%	Sitting	14	17%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
41	A	Spring	13		Standing	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	13		Standing	18		Acceptable
		Winter	14		Standing	21	11%	Acceptable
		Annual	13		Standing	19		Acceptable
42	A	Spring	17		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	16		Walking	23		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	22		Acceptable
43	A	Spring	9		Sitting	15		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	14		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	10	11%	Sitting	15		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	9	12%	Sitting	14		Acceptable
		Winter	11	22%	Sitting	16		Acceptable
		Annual	10	11%	Sitting	15		Acceptable
44	A	Spring	7		Sitting	12		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	7		Sitting	12		Acceptable
		Winter	8		Sitting	13		Acceptable
		Annual	7		Sitting	12		Acceptable
	B	Spring	9	29%	Sitting	14	17%	Acceptable
		Summer	8	33%	Sitting	11		Acceptable
		Fall	9	29%	Sitting	13		Acceptable
		Winter	10	25%	Sitting	15	15%	Acceptable
		Annual	9	29%	Sitting	14	17%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations

A - No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
45	A	Spring	8		Sitting	13		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	12		Acceptable
		Winter	9		Sitting	13		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	9	12%	Sitting	14		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	14		Acceptable
		Annual	9	12%	Sitting	13		Acceptable
46	A	Spring	9		Sitting	14		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	14		Acceptable
		Winter	10		Sitting	15		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	9		Sitting	13		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable
47	A	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	14		Standing	20		Acceptable
		Annual	13		Standing	19		Acceptable
	B	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
48	A	Spring	8		Sitting	13		Acceptable
		Summer	7		Sitting	13		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	8		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	8		Sitting	13		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9	12%	Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
49	A	Spring	12		Sitting	17		Acceptable
		Summer	10		Sitting	14		Acceptable
		Fall	12		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	17		Acceptable
	B	Spring	12		Sitting	17		Acceptable
		Summer	10		Sitting	14		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	13		Standing	18		Acceptable
		Annual	12		Sitting	17		Acceptable
50	A	Spring	7		Sitting	10		Acceptable
		Summer	6		Sitting	9		Acceptable
		Fall	6		Sitting	10		Acceptable
		Winter	7		Sitting	11		Acceptable
		Annual	6		Sitting	10		Acceptable
	B	Spring	7		Sitting	11		Acceptable
		Summer	6		Sitting	9		Acceptable
		Fall	7	17%	Sitting	10		Acceptable
		Winter	7		Sitting	11		Acceptable
		Annual	7	17%	Sitting	10		Acceptable
51	A	Spring	9		Sitting	14		Acceptable
		Summer	8		Sitting	12		Acceptable
		Fall	9		Sitting	13		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	8		Sitting	13		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable
52	A	Spring	7		Sitting	12		Acceptable
		Summer	6		Sitting	9		Acceptable
		Fall	7		Sitting	11		Acceptable
		Winter	7		Sitting	12		Acceptable
		Annual	7		Sitting	11		Acceptable
	B	Spring	10	43%	Sitting	15	25%	Acceptable
		Summer	8	33%	Sitting	12	33%	Acceptable
		Fall	10	43%	Sitting	15	36%	Acceptable
		Winter	11	57%	Sitting	17	42%	Acceptable
		Annual	10	43%	Sitting	15	36%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A - No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
53	A	Spring	8		Sitting	13		Acceptable
		Summer	8		Sitting	11		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	9	12%	Sitting	15	15%	Acceptable
		Summer	8		Sitting	12		Acceptable
		Fall	9	12%	Sitting	14		Acceptable
		Winter	10	11%	Sitting	16	14%	Acceptable
		Annual	9	12%	Sitting	15	15%	Acceptable
54	A	Spring	7		Sitting	12		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	7		Sitting	11		Acceptable
		Winter	7		Sitting	12		Acceptable
		Annual	7		Sitting	11		Acceptable
	B	Spring	10	43%	Sitting	16	33%	Acceptable
		Summer	8	33%	Sitting	13	30%	Acceptable
		Fall	10	43%	Sitting	15	36%	Acceptable
		Winter	11	57%	Sitting	17	42%	Acceptable
		Annual	10	43%	Sitting	15	36%	Acceptable
55	A	Spring	6		Sitting	11		Acceptable
		Summer	5		Sitting	9		Acceptable
		Fall	6		Sitting	10		Acceptable
		Winter	7		Sitting	11		Acceptable
		Annual	6		Sitting	10		Acceptable
	B	Spring	12	100%	Sitting	18	64%	Acceptable
		Summer	10	100%	Sitting	14	56%	Acceptable
		Fall	11	83%	Sitting	16	60%	Acceptable
		Winter	12	71%	Sitting	18	64%	Acceptable
		Annual	11	83%	Sitting	17	70%	Acceptable
56	A	Spring	7		Sitting	13		Acceptable
		Summer	6		Sitting	11		Acceptable
		Fall	7		Sitting	13		Acceptable
		Winter	8		Sitting	14		Acceptable
		Annual	7		Sitting	13		Acceptable
	B	Spring	15	114%	Standing	21	62%	Acceptable
		Summer	12	100%	Sitting	17	55%	Acceptable
		Fall	14	100%	Standing	20	54%	Acceptable
		Winter	16	100%	Walking	22	57%	Acceptable
		Annual	15	114%	Standing	20	54%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
57	A	Spring	7		Sitting	12		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	7		Sitting	11		Acceptable
		Winter	7		Sitting	13		Acceptable
		Annual	7		Sitting	12		Acceptable
	B	Spring	15	114%	Standing	21	75%	Acceptable
		Summer	12	100%	Sitting	17	70%	Acceptable
		Fall	14	100%	Standing	20	82%	Acceptable
		Winter	16	129%	Walking	22	69%	Acceptable
		Annual	14	100%	Standing	20	67%	Acceptable
58	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	16	45%	Walking	23	35%	Acceptable
		Summer	13	44%	Standing	20	43%	Acceptable
		Fall	14	40%	Standing	21	31%	Acceptable
		Winter	15	36%	Standing	23	28%	Acceptable
		Annual	15	36%	Standing	22	29%	Acceptable
59	A	Spring	9		Sitting	15		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	14		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	12	33%	Sitting	17	13%	Acceptable
		Summer	12	50%	Sitting	16	23%	Acceptable
		Fall	12	33%	Sitting	17	21%	Acceptable
		Winter	13	44%	Standing	18	20%	Acceptable
		Annual	12	33%	Sitting	17	13%	Acceptable
60	A	Spring	11		Sitting	16		Acceptable
		Summer	9		Sitting	13		Acceptable
		Fall	10		Sitting	15		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	11		Sitting	16		Acceptable
	B	Spring	13	18%	Standing	18	12%	Acceptable
		Summer	11	22%	Sitting	15	15%	Acceptable
		Fall	12	20%	Sitting	17	13%	Acceptable
		Winter	13	18%	Standing	19	12%	Acceptable
		Annual	12		Sitting	18	12%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
61	A	Spring	12		Sitting	19		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11	22%	Sitting	17	13%	Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
62	A	Spring	12		Sitting	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	11		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	12		Sitting	19		Acceptable
63	A	Spring	15		Standing	24		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	18	20%	Walking	25		Acceptable
		Summer	15	36%	Standing	21	24%	Acceptable
		Fall	16	14%	Walking	23		Acceptable
		Winter	17	21%	Walking	24	14%	Acceptable
		Annual	17	21%	Walking	24	14%	Acceptable
64	A	Spring	15		Standing	23		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	16		Walking	24		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	15		Standing	23		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A - No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 1: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
65	A	Spring	9		Sitting	13		Acceptable
		Summer	7		Sitting	11		Acceptable
		Fall	8		Sitting	12		Acceptable
		Winter	9		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	15	67%	Standing	22	69%	Acceptable
		Summer	12	71%	Sitting	17	55%	Acceptable
		Fall	14	75%	Standing	20	67%	Acceptable
		Winter	16	78%	Walking	23	64%	Acceptable
		Annual	14	75%	Standing	21	62%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) %Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

<u>Configurations</u>

A - No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

<u>Effective Gust Criteria</u>

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Appendix B

Shadow Studies

For the article 38 shadow study, a 3D model of the Project was inserted into the 3D model of the City of Boston distributed by the BRA. Snapshot plan images were rendered of the area at the points when the net new shadow impacts from the Project occurred on open space and shadow impact areas. As described in Article 38, the study was conducted between the hours of 8:00 am and 2:30 pm. Two images are provided: the first image shows the period indicating the beginning of the shadow impact, and the second image shows when the shadow impact is over. The study took snapshots separated by two minute intervals. Some images display little to no visible shadow on the designated asset because the shadow first occurred or left during this two minute interval. The 2007 daylight savings time was used in the analysis.

Legend
- Historic Resources
- Existing Shadow
- Shadow Impact Area
- Net New Shadow
- Ⓣ Typical MBTA Station
- Ⓑ Typical Bus Stop
- ② Typical Key Number

Article 38 - Shadow Analysis

ASSET KEY	March	June	October	December
5 King's Chapel Burial Ground				
39** Boston Common				
41** Park Street Church				
43** Old City Hall Plaza				
44 Shopper's Park				
45 Irish Famine Memorial				
46 Winthrop Square				
47 Post Office Square				
48** Old Granary Burial Ground				
49 Winter Street-Between Tremont & Washington				
50 Washington Street-Between West Street & Temple				
51 Washington Street-Between Temple & Winter				
52 Washington Street-Between Winter & Bromfield				
53 Washington Street-Between Bromfield & Milk St.				
54 Summer Street-Between Washington & Hawley				
55 Franklin Street-Between Washington & Hawley				
56 Milk Street-Between Washington & Hawley				

LEGEND	
	NO New Shadow
	New Shadow
	MHC ASSET / SHADOW IMPACT AREA
	OPEN SPACE / SHADOW IMPACT AREA
	N/A

Appendix B - 1

The Boston Common

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Boston Common - 8:00 AM, March 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Boston Common - 9:50 AM, March 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Boston Common - 8:00 AM, June 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Boston Common - 8:54 AM, October 21st

Appendix B - 2

Shadow Impact Areas

In order to identify net new shadow area that remains for more than two hours within the Shadow Impact Areas, the following diagrams were generated by overlapping snapshots of the net new shadow cast by the Project at every two minutes from 8:00 am to 2:30 pm.

Legend
- Historic Resources
- Existing Shadow
- Shadow Impact Area
- Net New Shadow
- Ⓣ Typical MBTA Station
- Ⓑ Typical Bus Stop
- ② Typical Key Number

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Shadow Impact Area Greater than Two Hours, March 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Shadow Impact Area Greater than Two Hours, June 21st

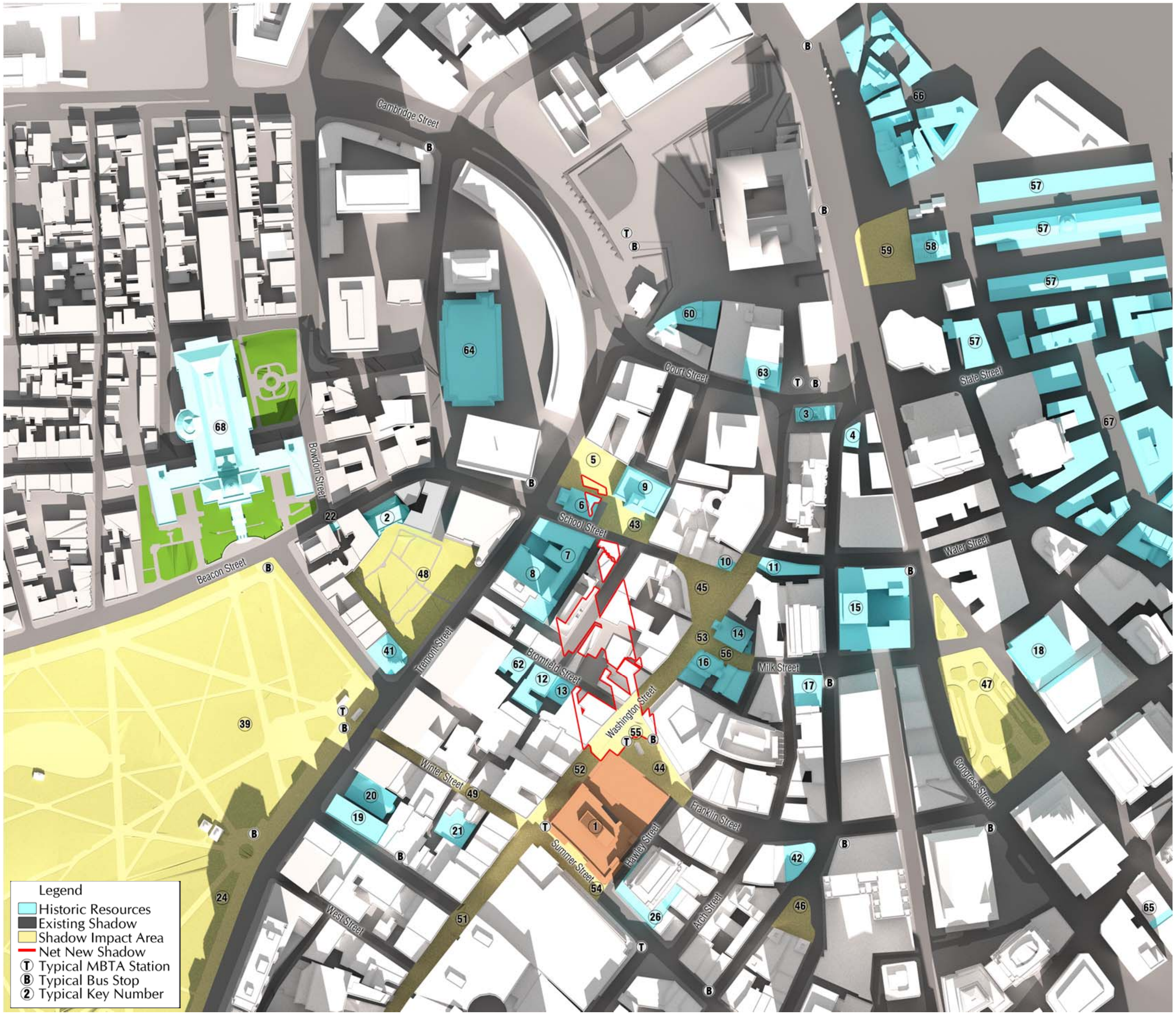
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Shadow Impact Area Greater than Two Hours, October 21st

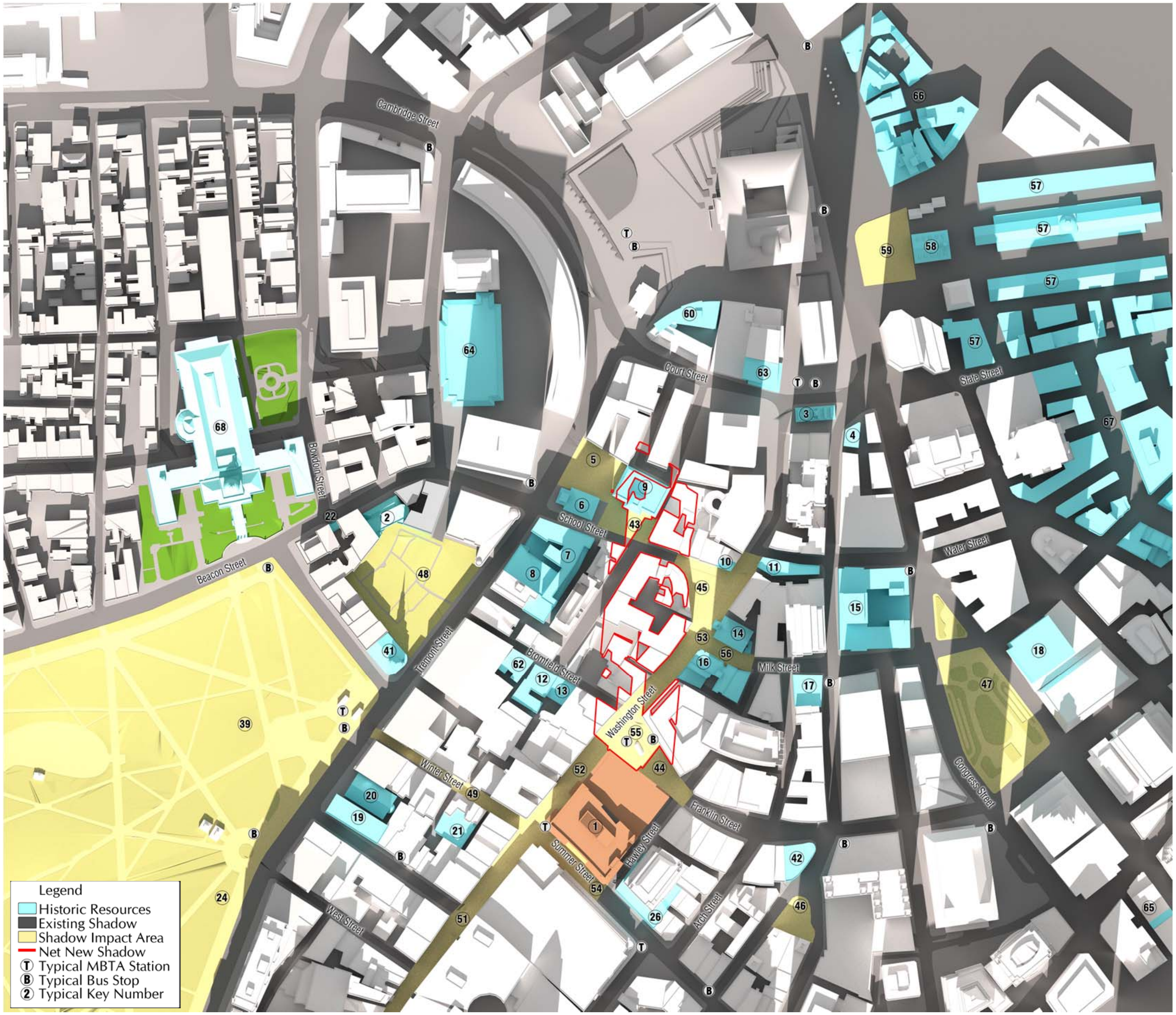
For the article 38 shadow study, a 3D model of the Project was inserted into the 3D model of the City of Boston distributed by the BRA. Snapshot plan images were rendered of the area at the points when the net new shadow impacts from the Project occurred on open space and shadow impact areas. As described in Article 38, the study was conducted between the hours of 8:00 am and 2:30 pm. Two images are provided: the first image shows the period indicating the beginning of the shadow impact, and the second image shows when the shadow impact is over. The study took snapshots separated by two minute intervals. Some images display little to no visible shadow on the designated asset because the shadow first occurred or left during this two minute interval. The 2007 daylight savings time was used in the analysis.

Legend
- Historic Resources
- Existing Shadow
- Shadow Impact Area
- Net New Shadow
- Ⓣ Typical MBTA Station
- Ⓑ Typical Bus Stop
- ② Typical Key Number



Millennium Tower and Burnham Building

King's Chapel - 11:50 AM, October 21st



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

King's Chapel - 12:47 PM, October 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

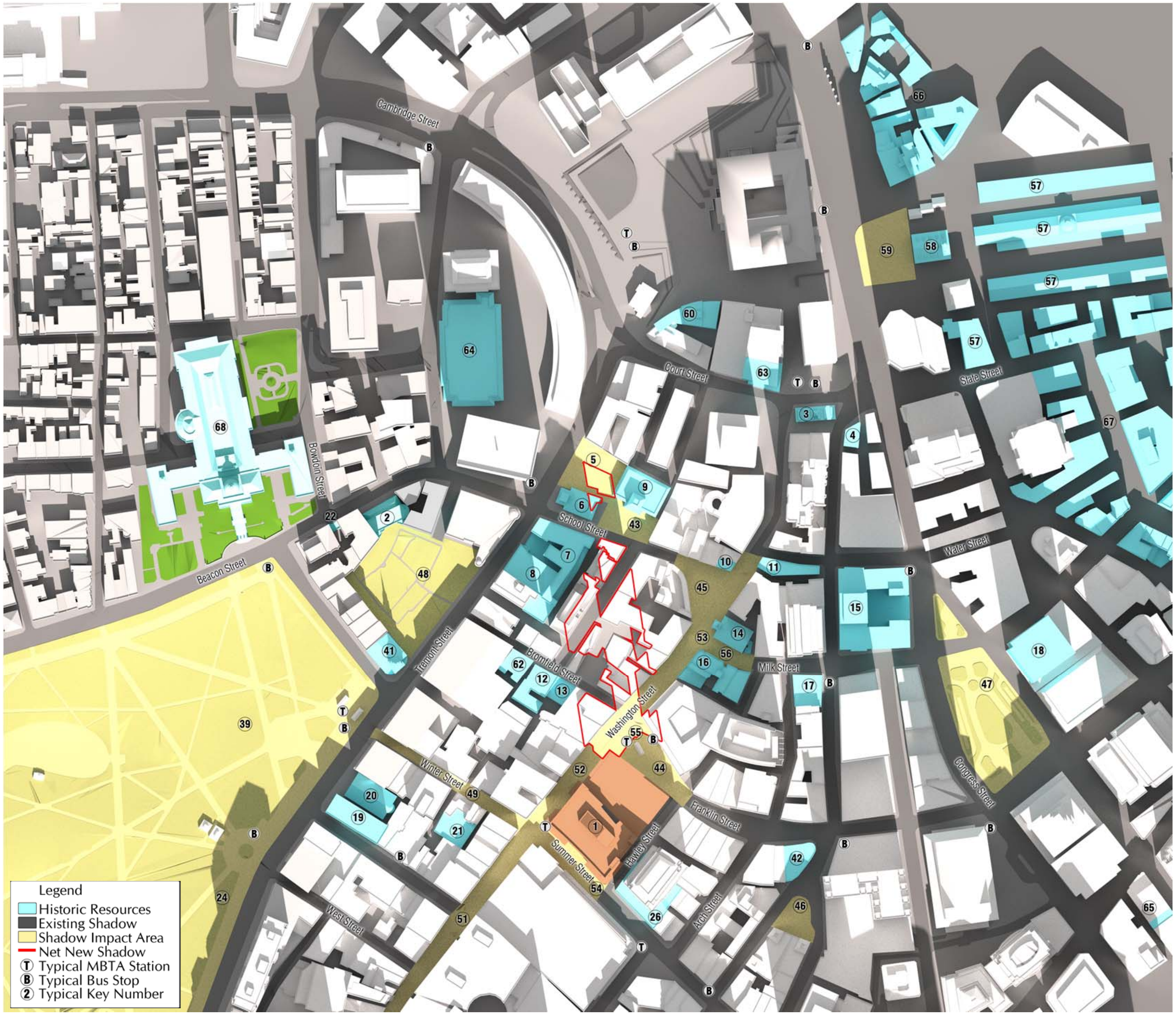
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

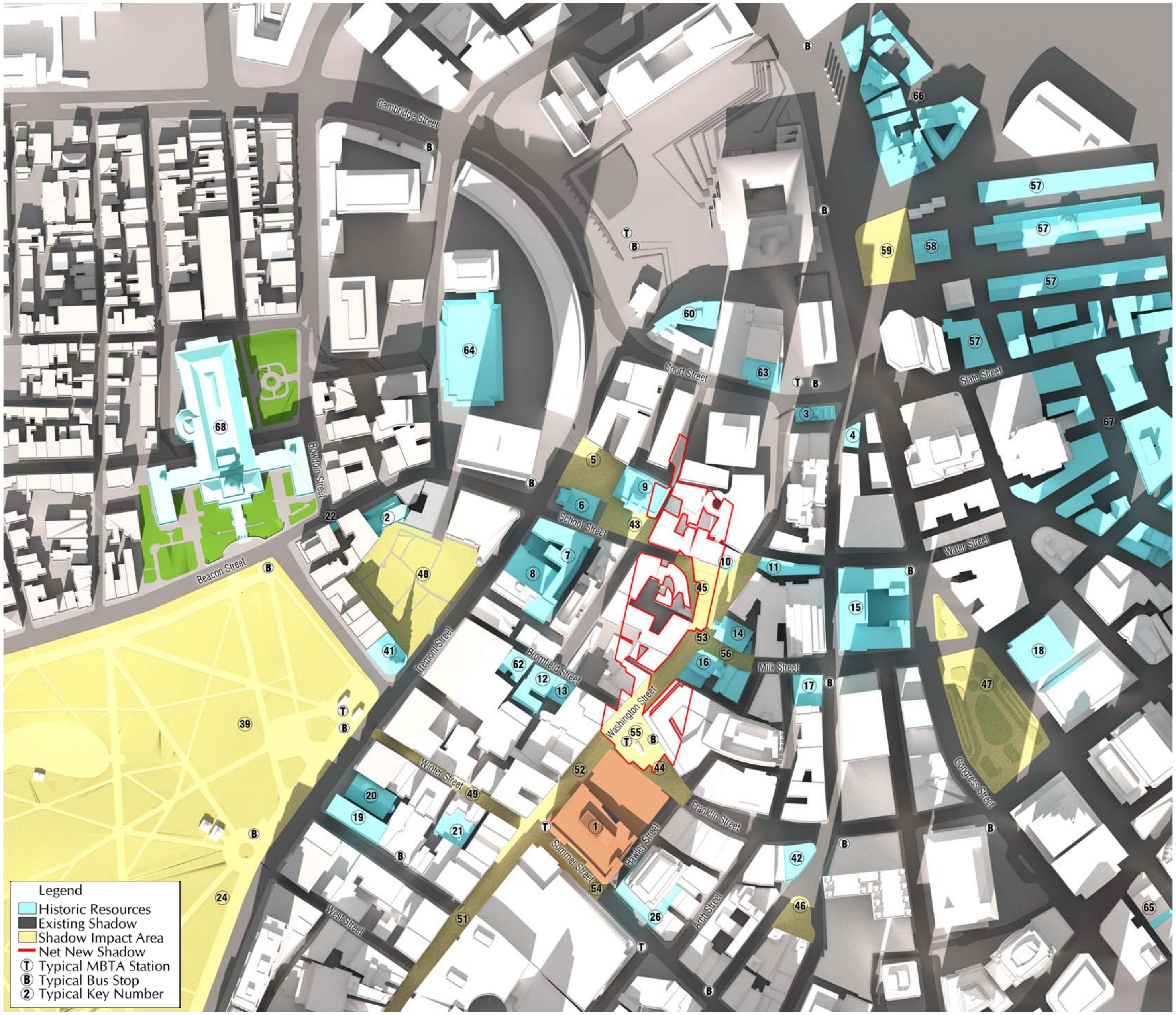
Park Street Church - 8:04 AM, October 21st

Millennium Tower and Burnham Building

Park Street Church - 8:44 AM, October 21st



Millennium Tower and Burnham Building

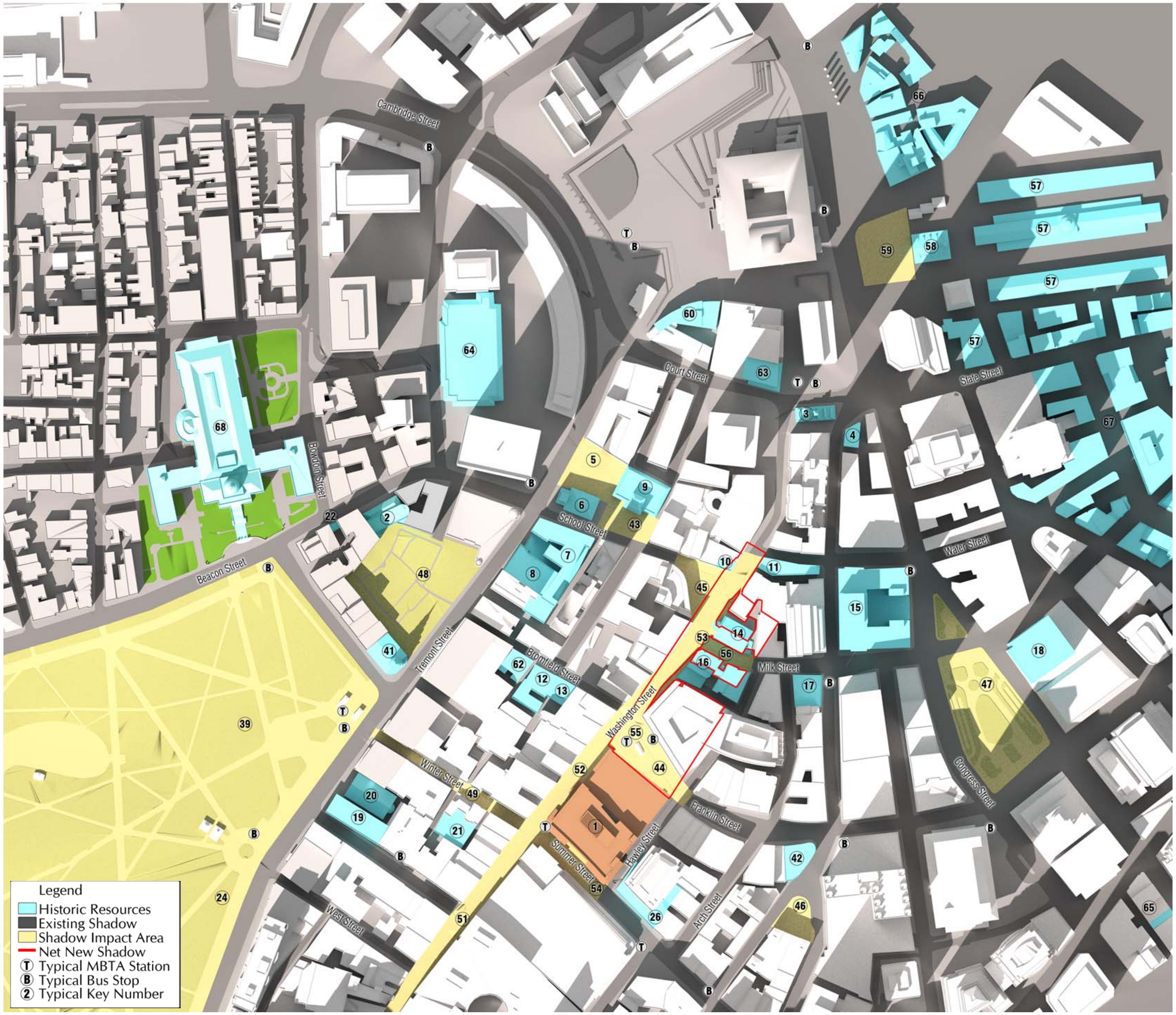


Millennium Tower and Burnham Building

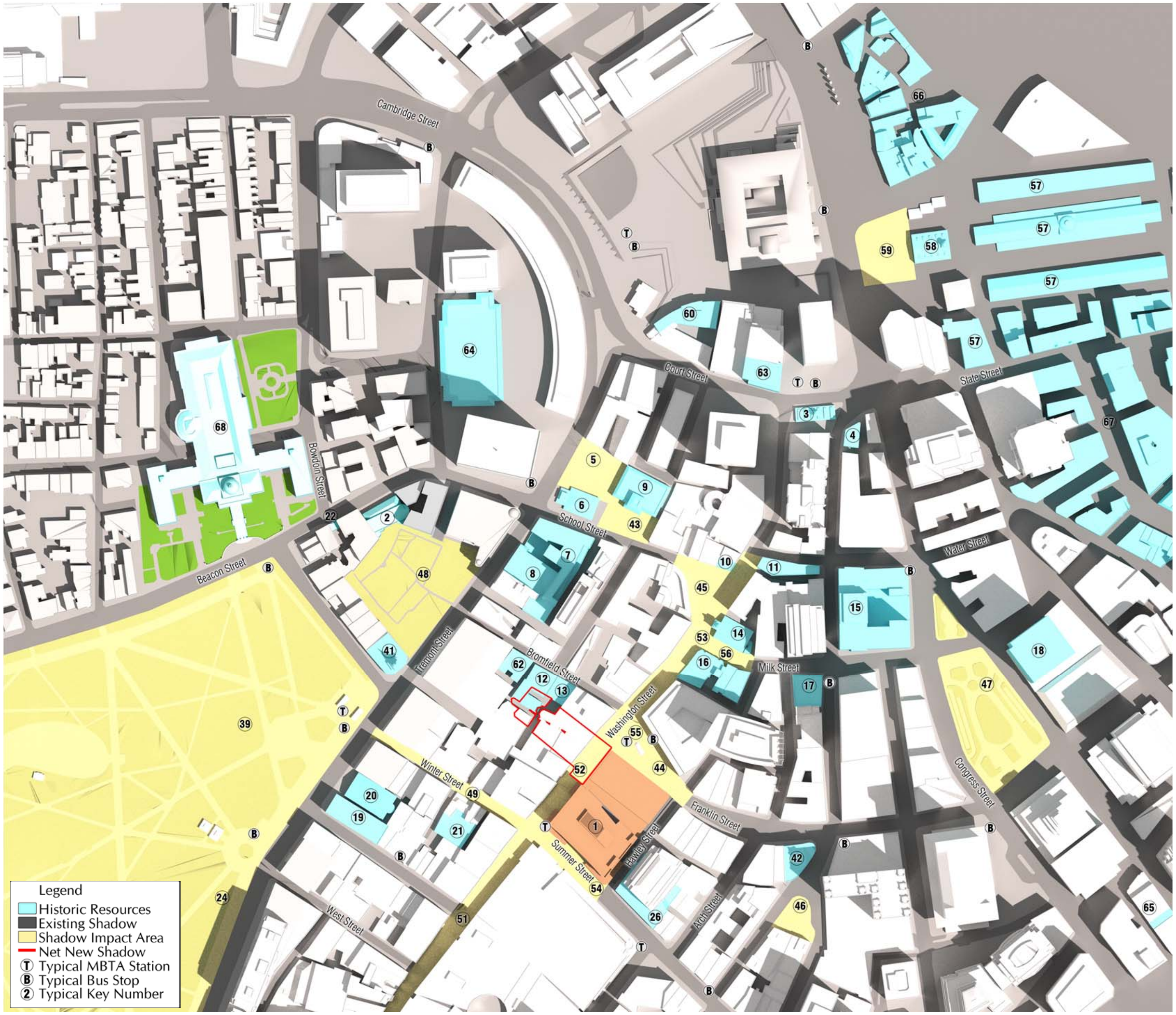
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Shopper's Park - 10:14 AM, March 21st



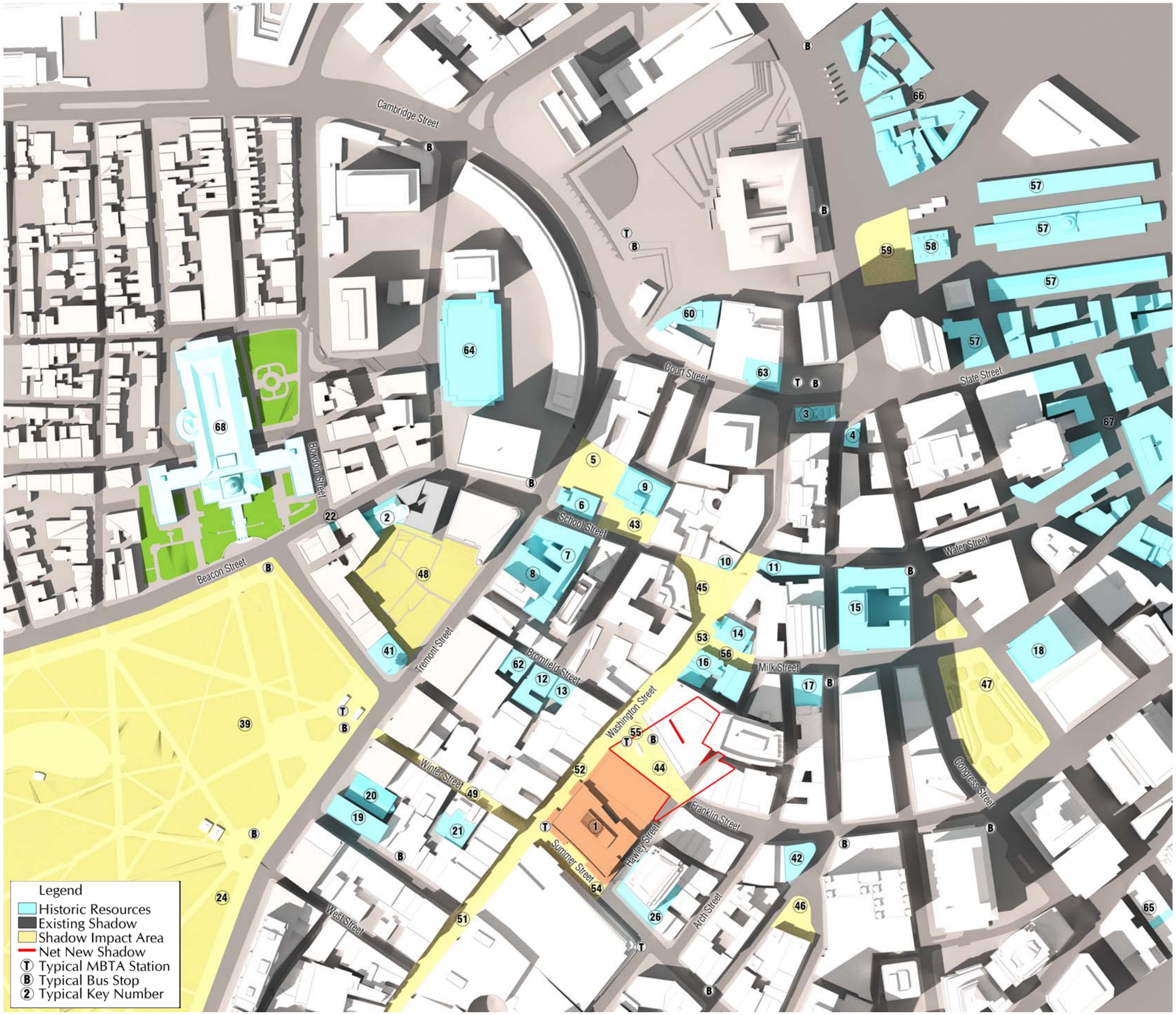
Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Shopper's Park - 11:20 AM, June 21st



Millennium Tower and Burnham Building

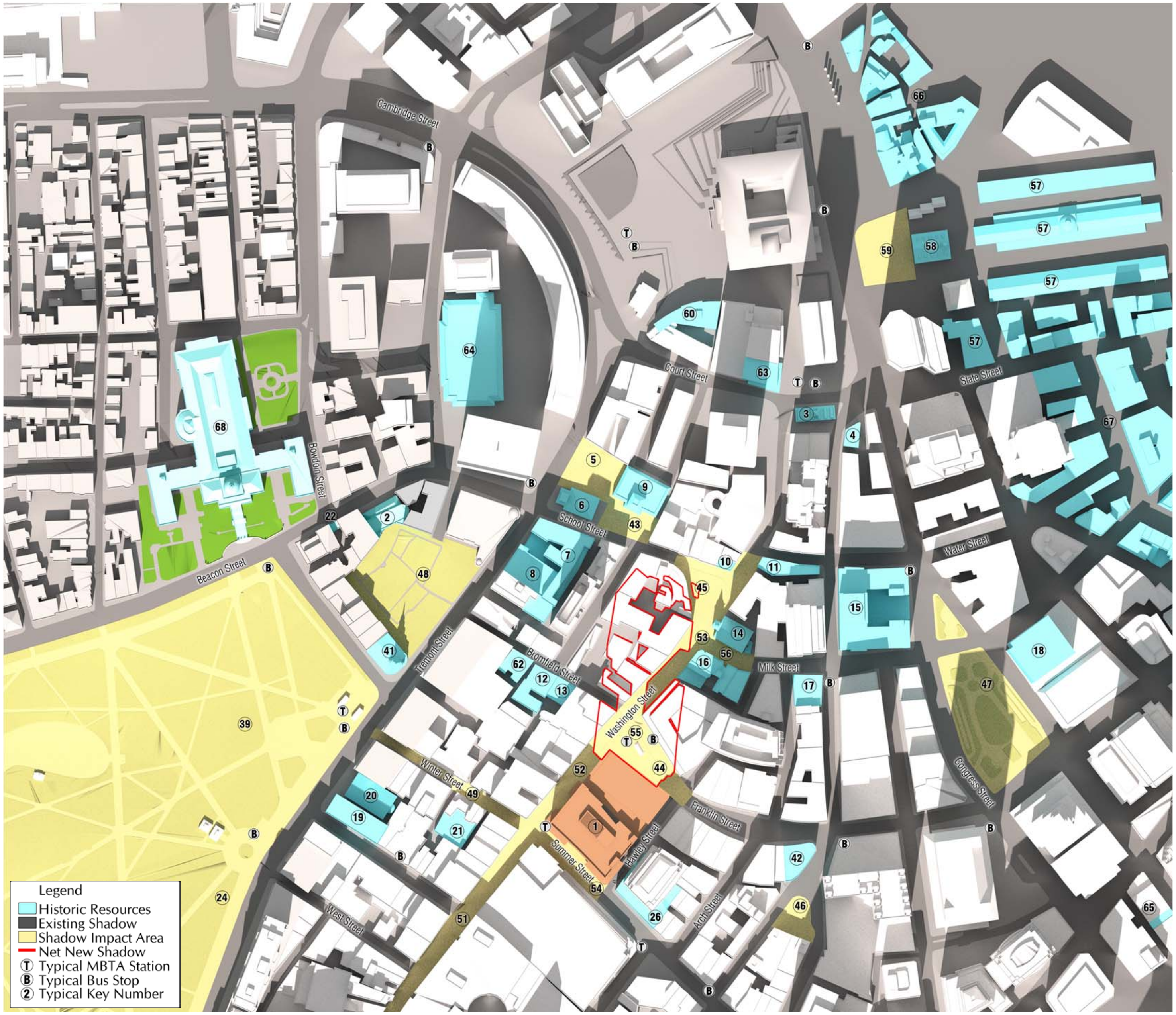
HANDEL ARCHITECTS LLP

Shopper's Park - 2:30 PM, June 21st

Millennium Tower and Burnham Building

Shopper's Park - 9:14 AM, October 21st

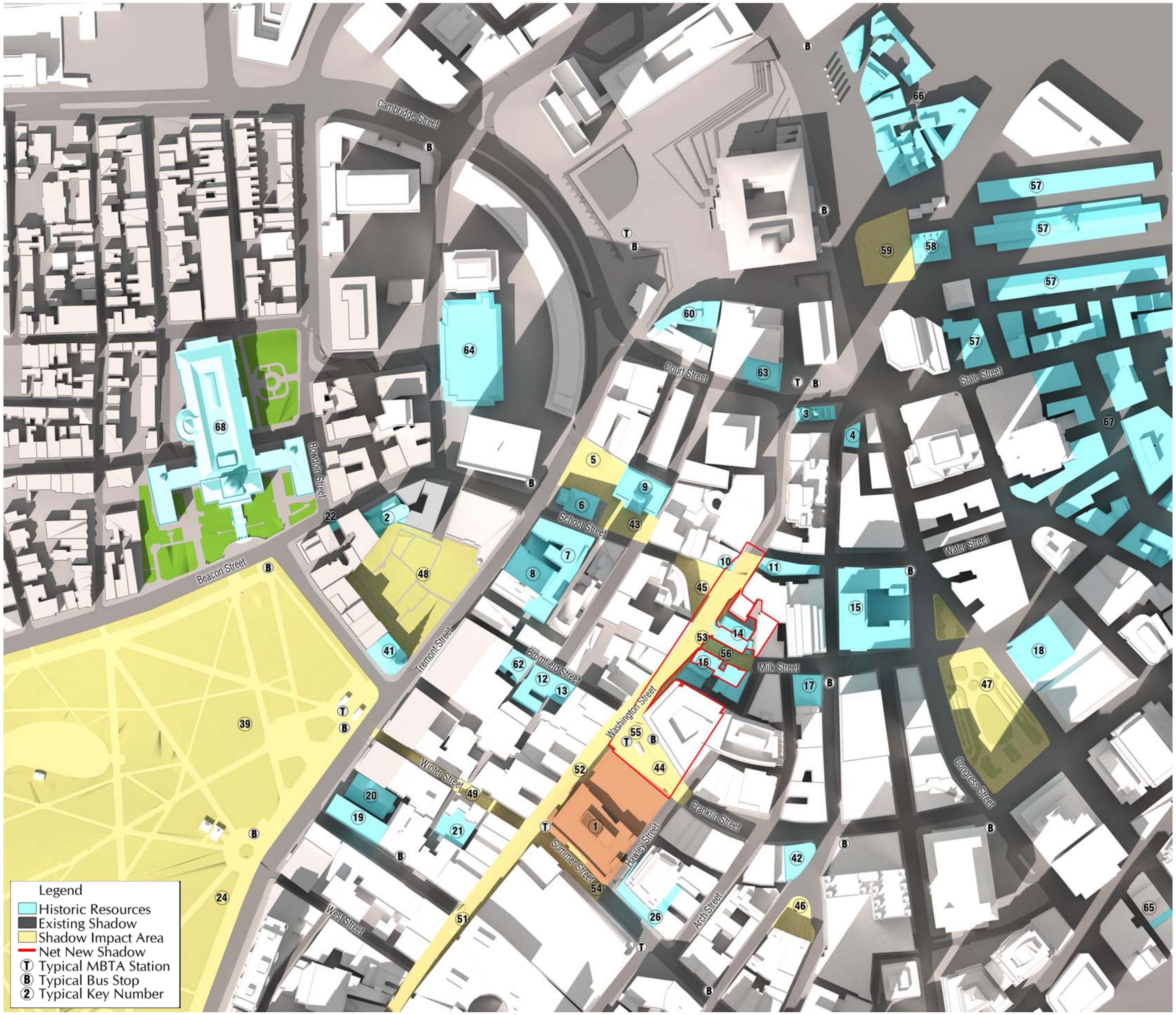
Millennium Tower and Burnham Building



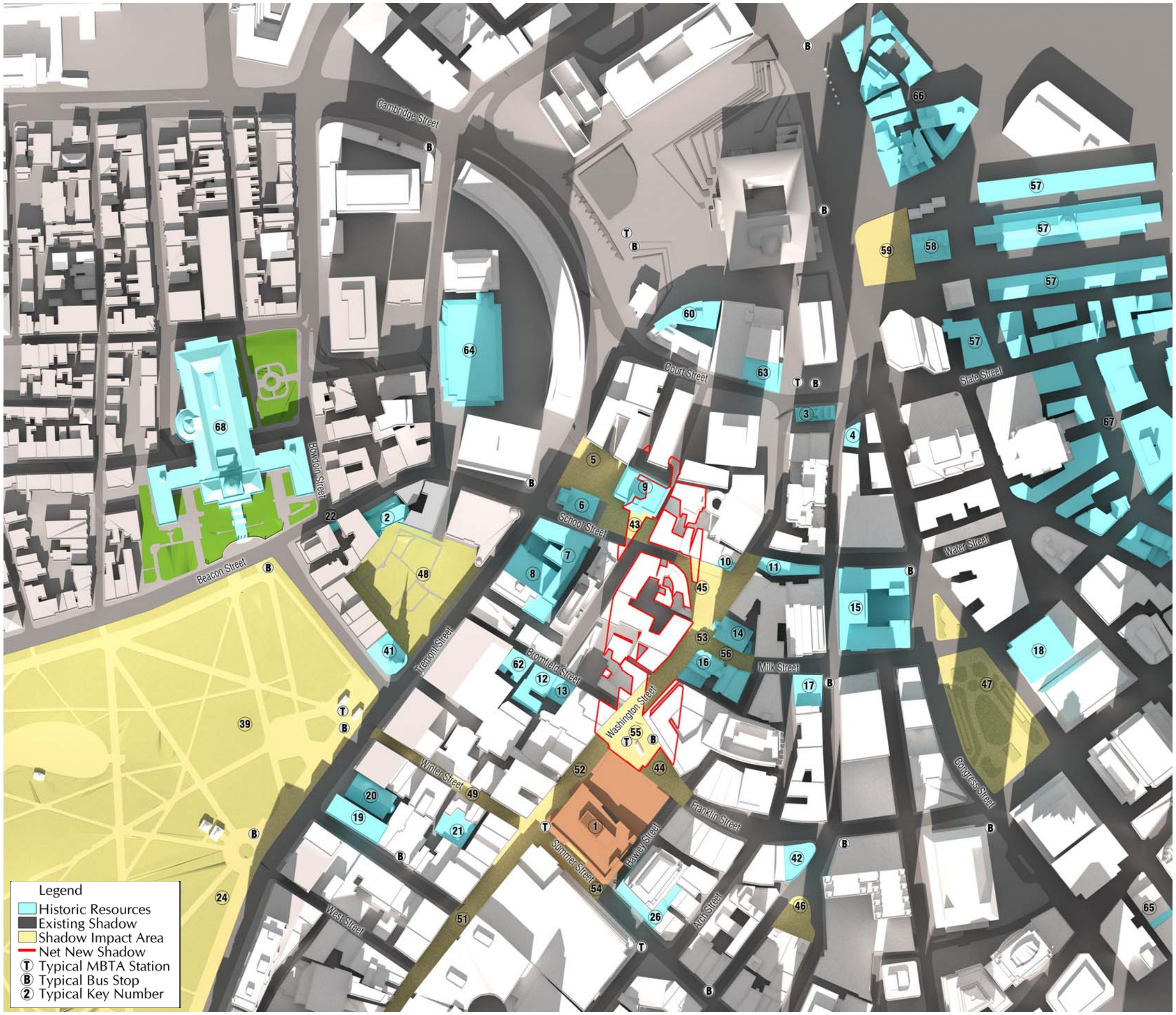
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Irish Famine Memorial - 1:14 PM, March 21st



Millennium Tower and Burnham Building



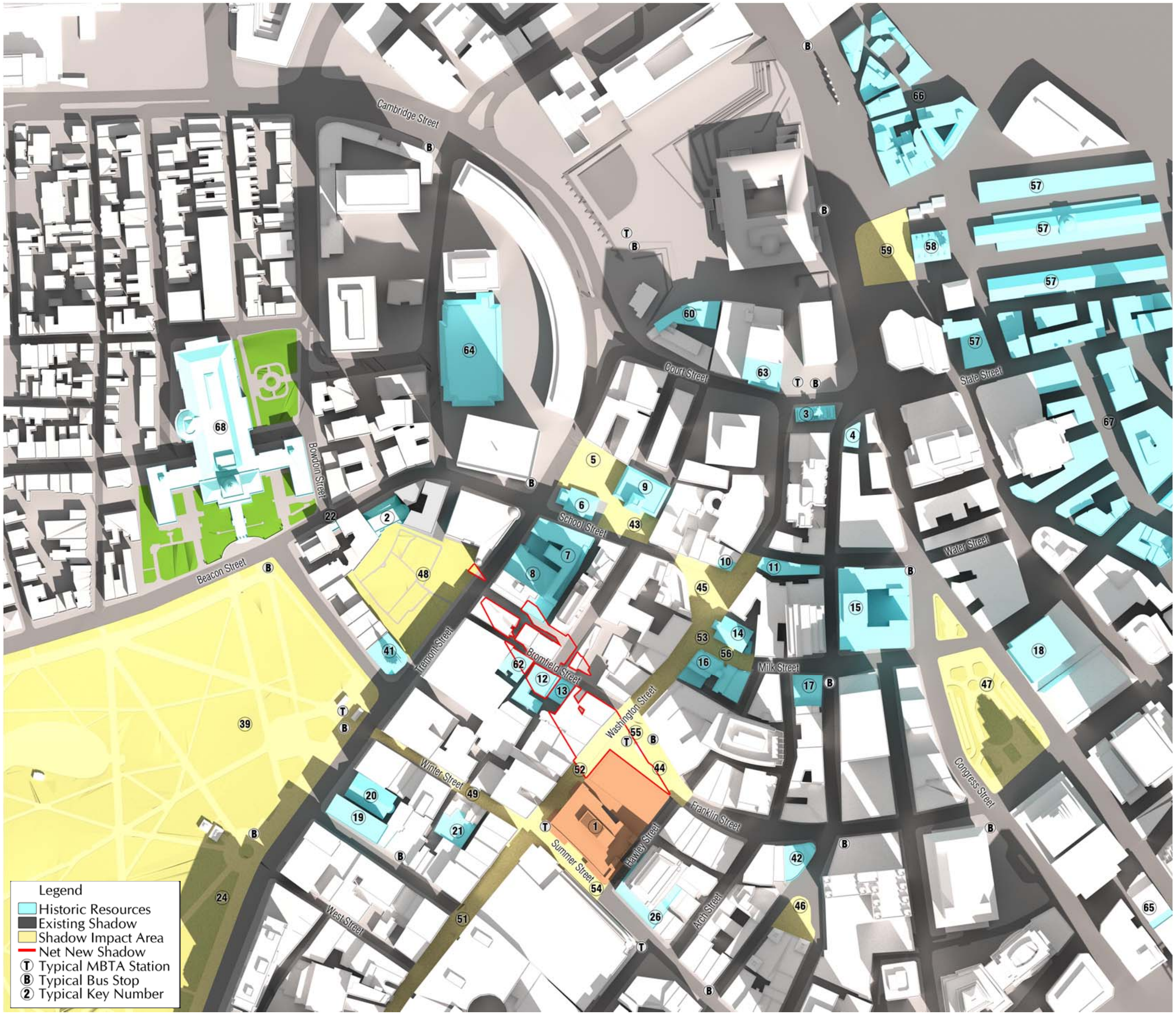
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Irish Famine Memorial - 12:52 PM, October 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building



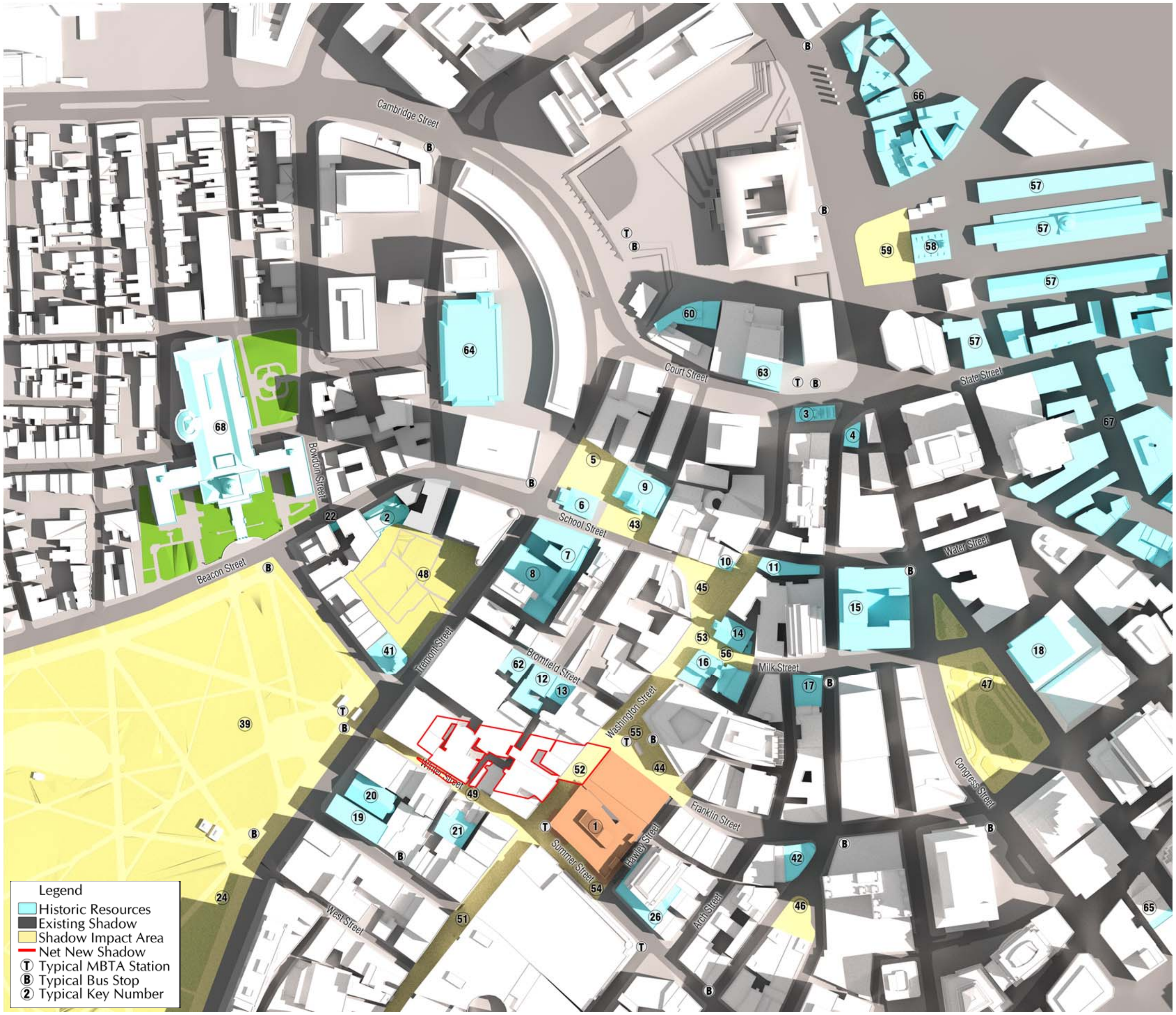
Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Old Granary Burial Ground - 8:58 AM, October 21st

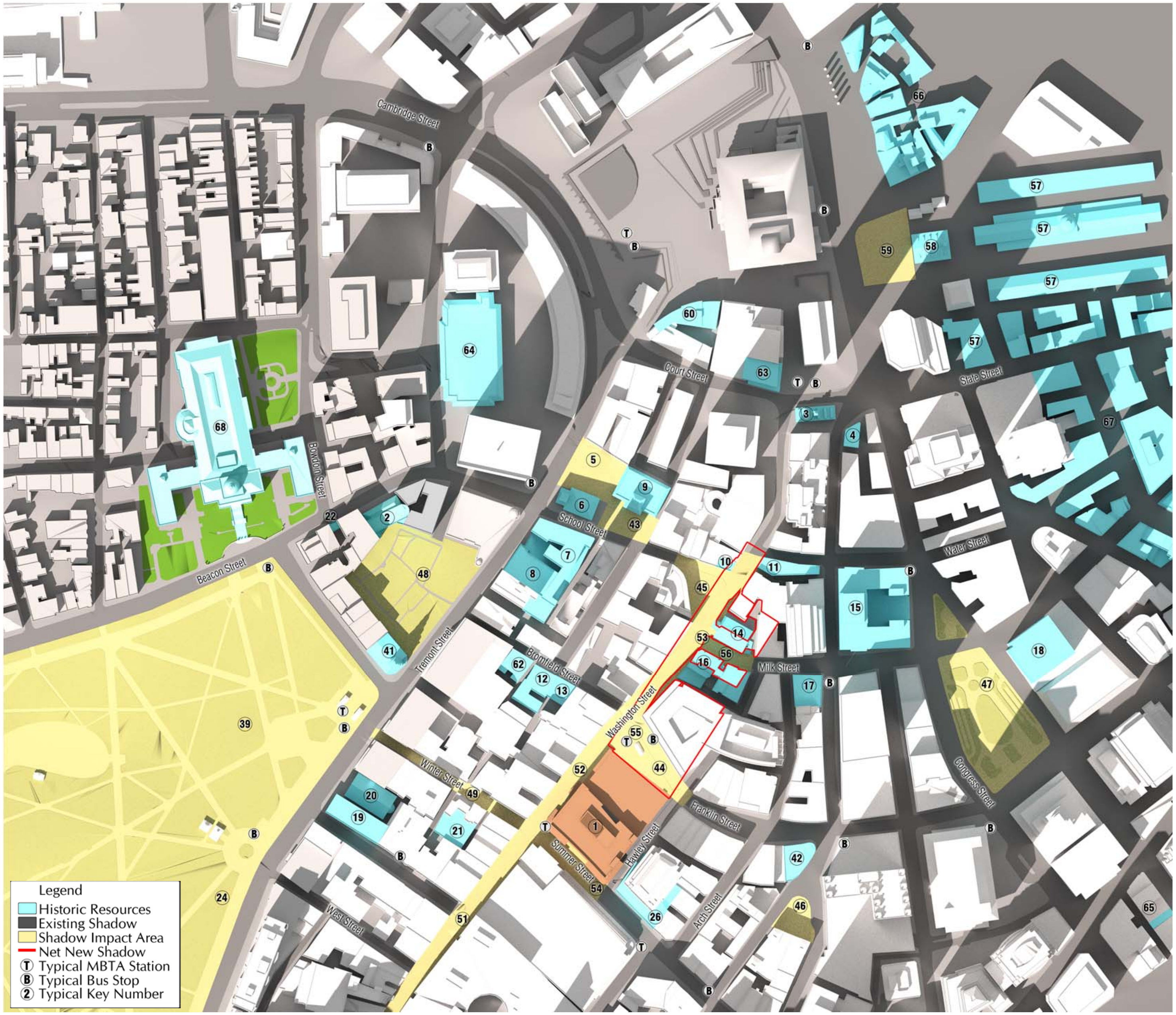
Millennium Tower and Burnham Building

Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

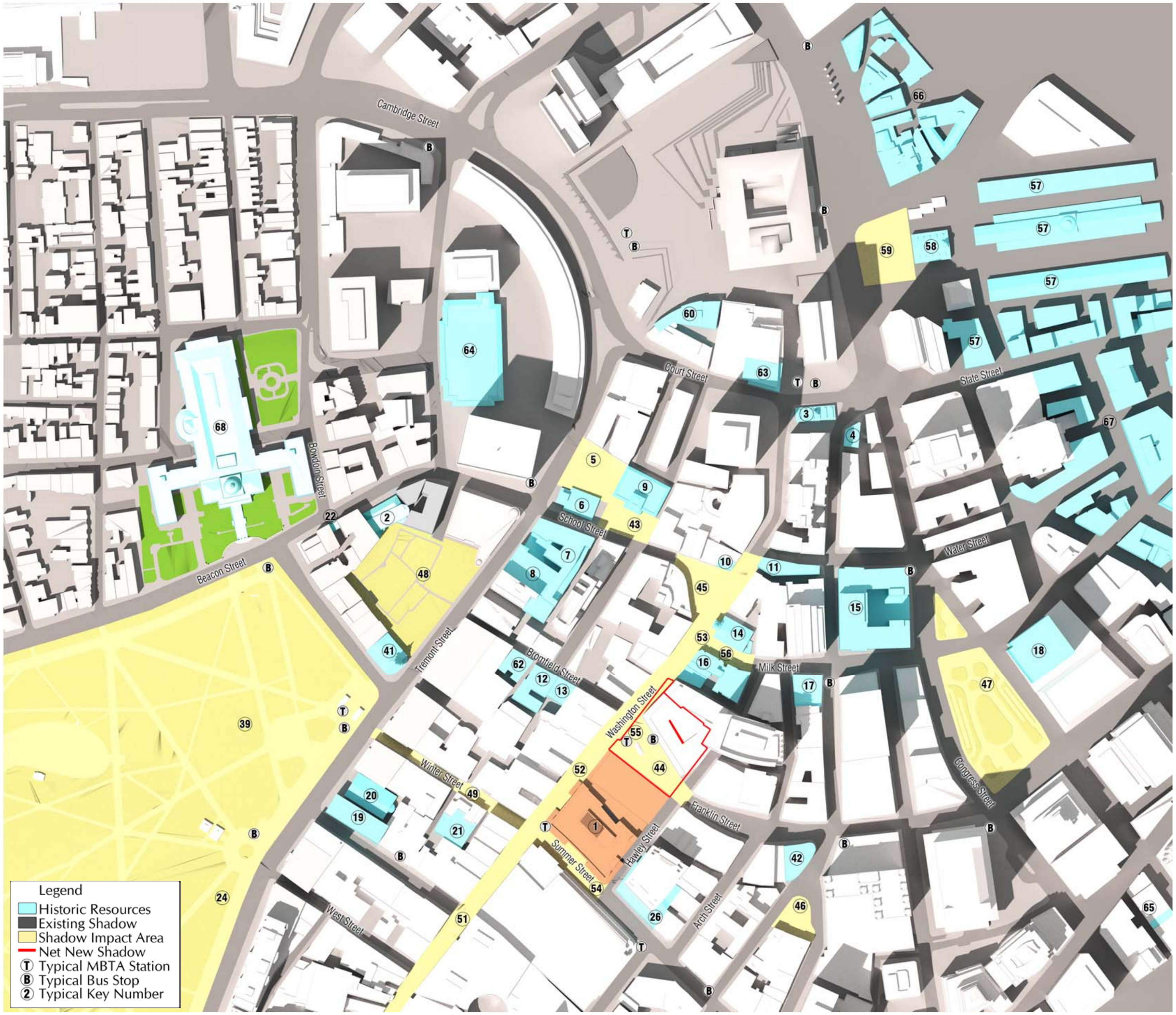
HANDEL ARCHITECTS LLP

Washington Street (between Winter & Bromfield) - 2:30 PM, March 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Washington Street (between Winter & Bromfield) - 8:00 AM, June 21st



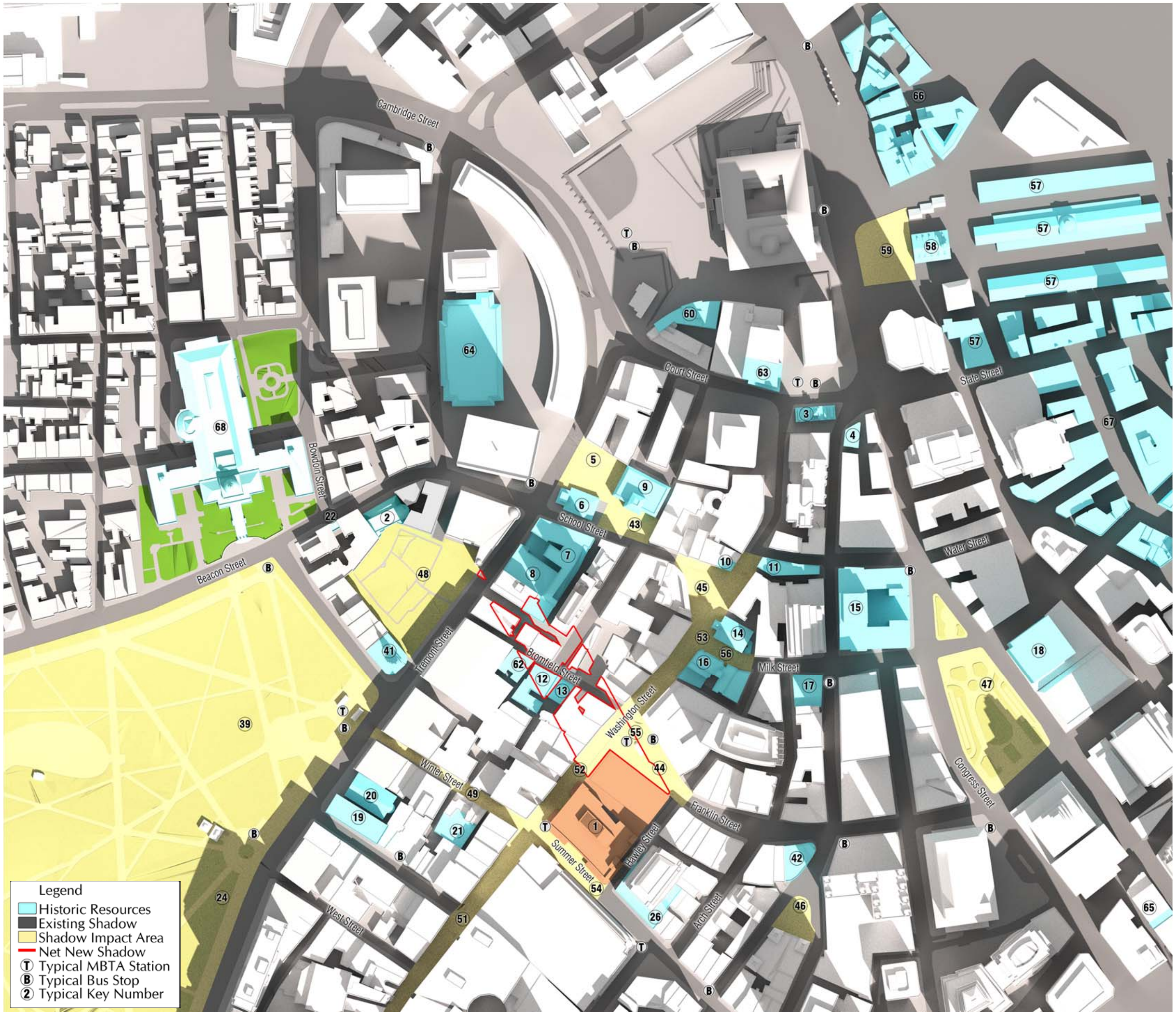
Millennium Tower and Burnham Building

Washington Street (between Winter & Bromfield) - 1:46 PM, June 21st

Millennium Tower and Burnham Building

Washington Street (between Winter & Bromfield) - 8:37 AM, October 21st

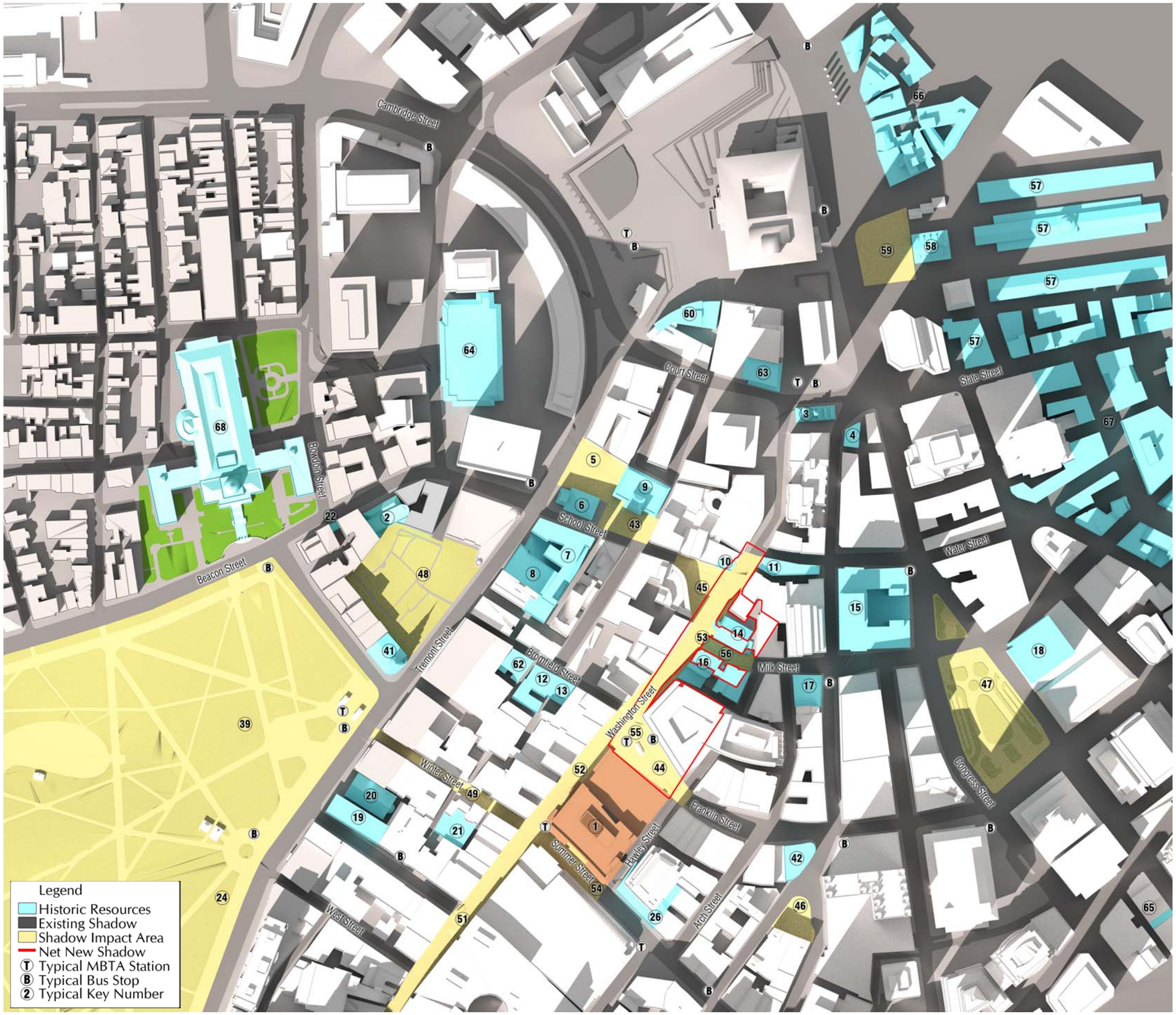
Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

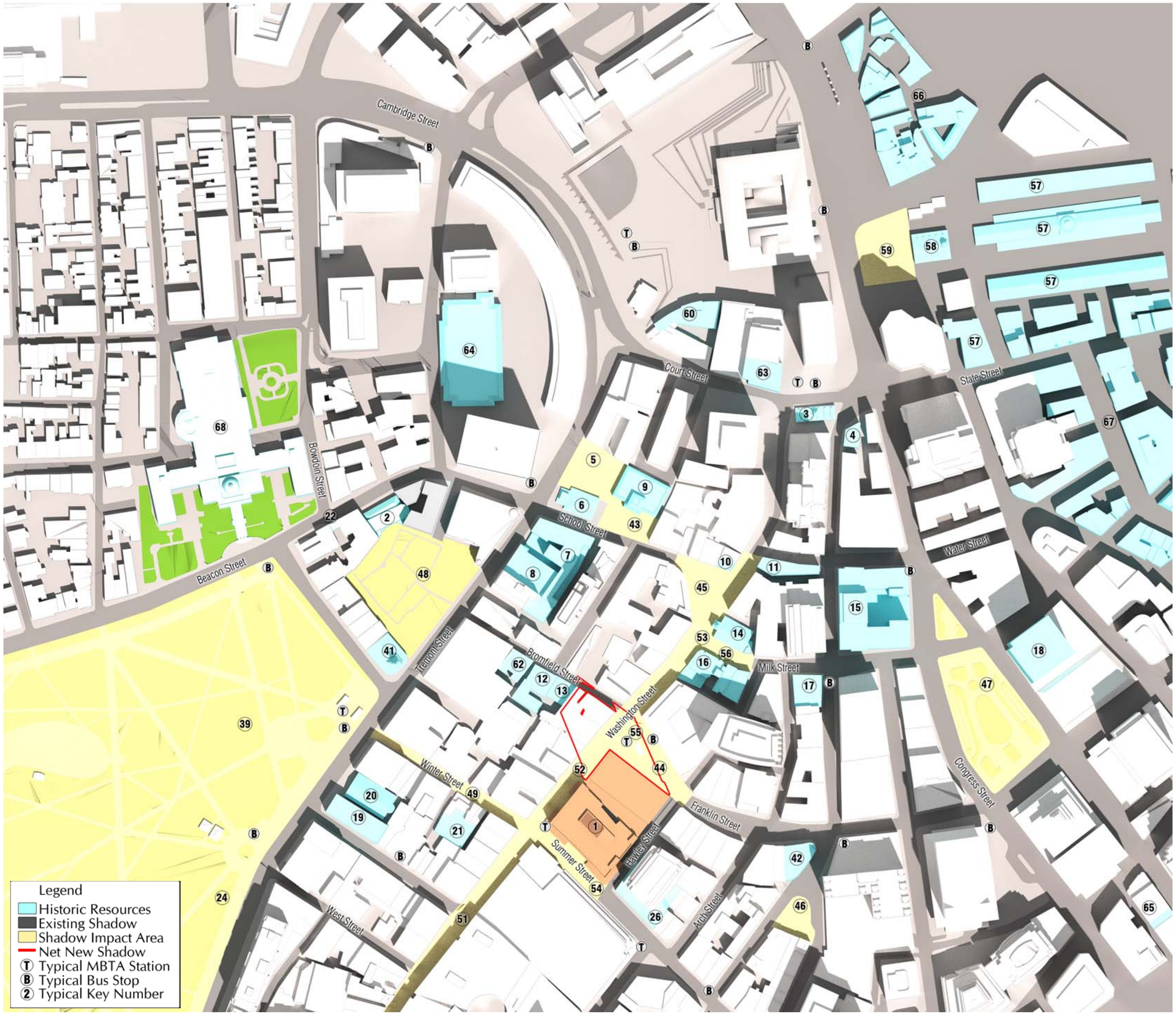
HANDEL ARCHITECTS LLP

Washington Street (between Bromfield & Milk) - 11:28 AM, March 21st



Millennium Tower and Burnham Building

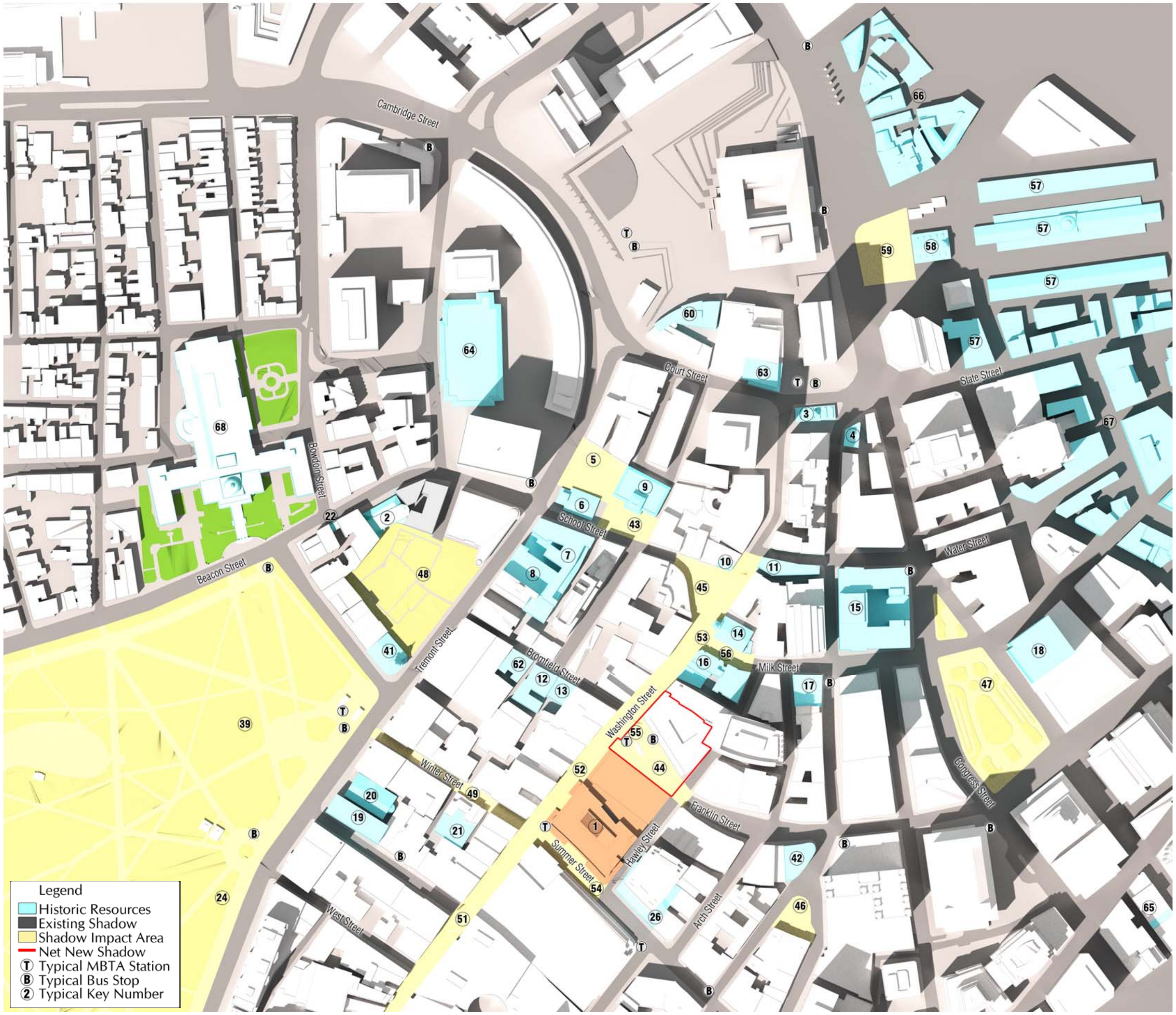
Washington Street (between Bromfield & Milk) - 2:30 PM, March 21st



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Washington Street (between Bromfield & Milk) - 12:12 PM, June 21st



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Washington Street (between Bromfield & Milk) - 1:50 PM, June 21st

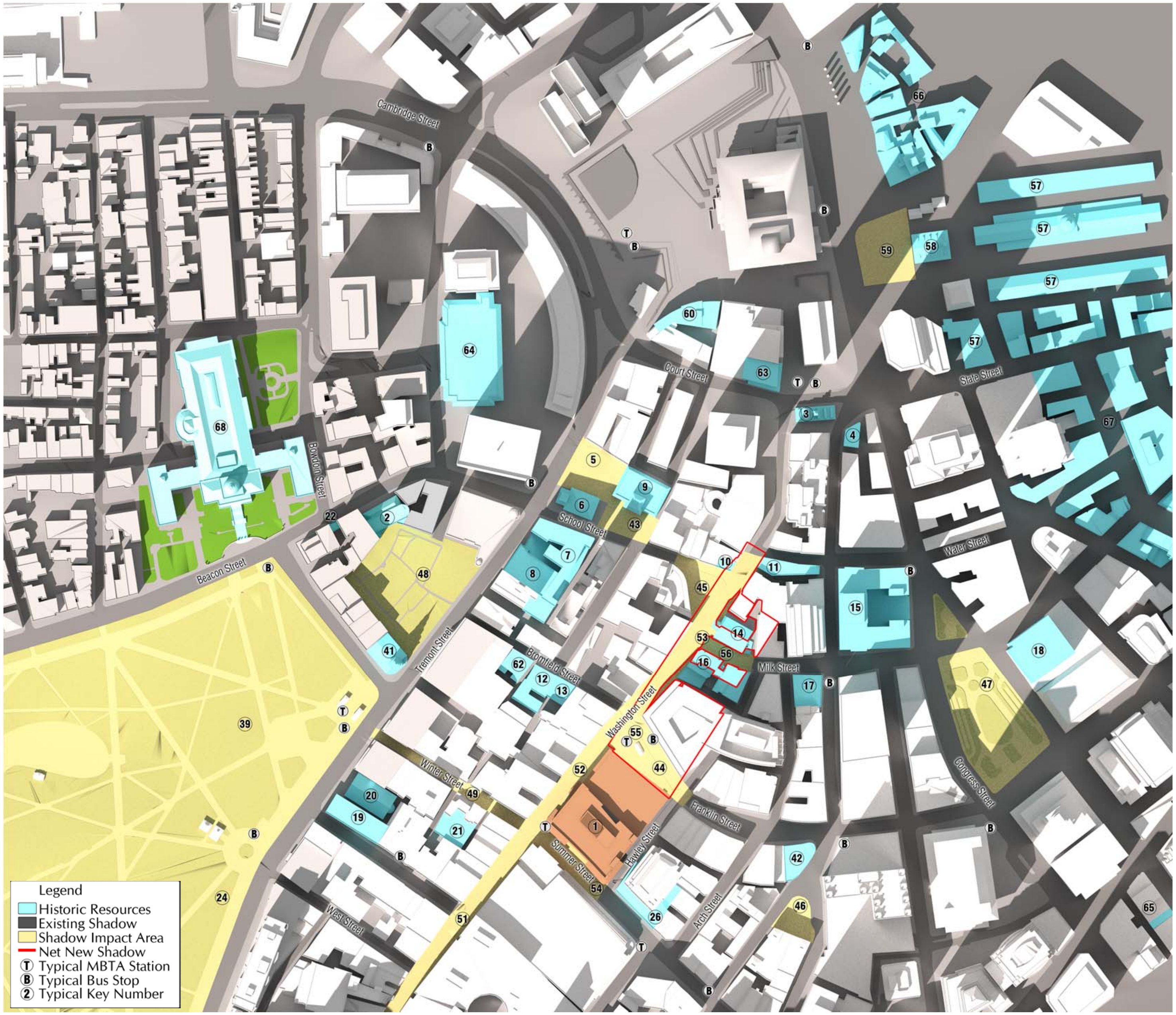
Millennium Tower and Burnham Building

Washington Street (between Bromfield & Milk) - 10:46 AM, October 21st

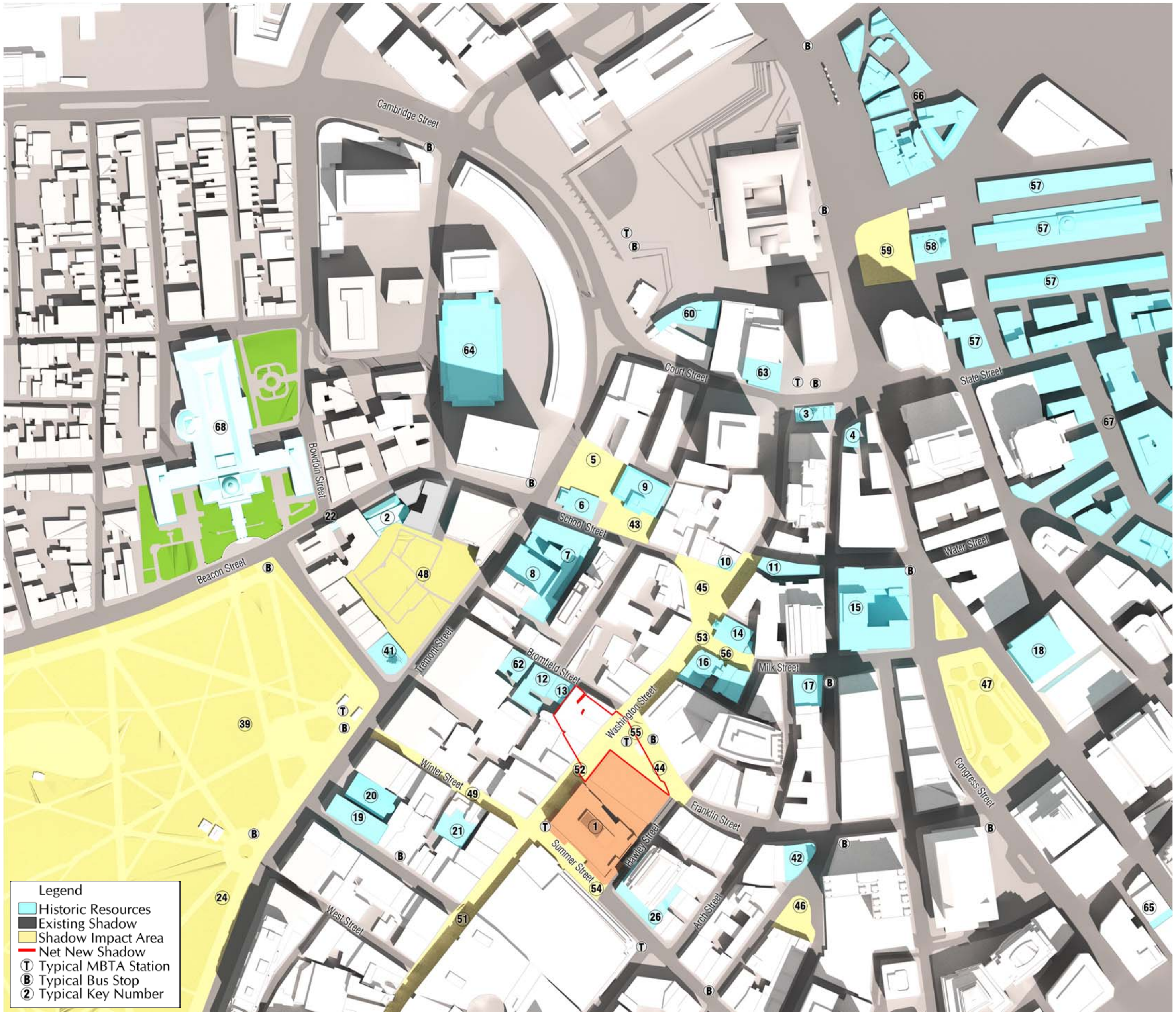
Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

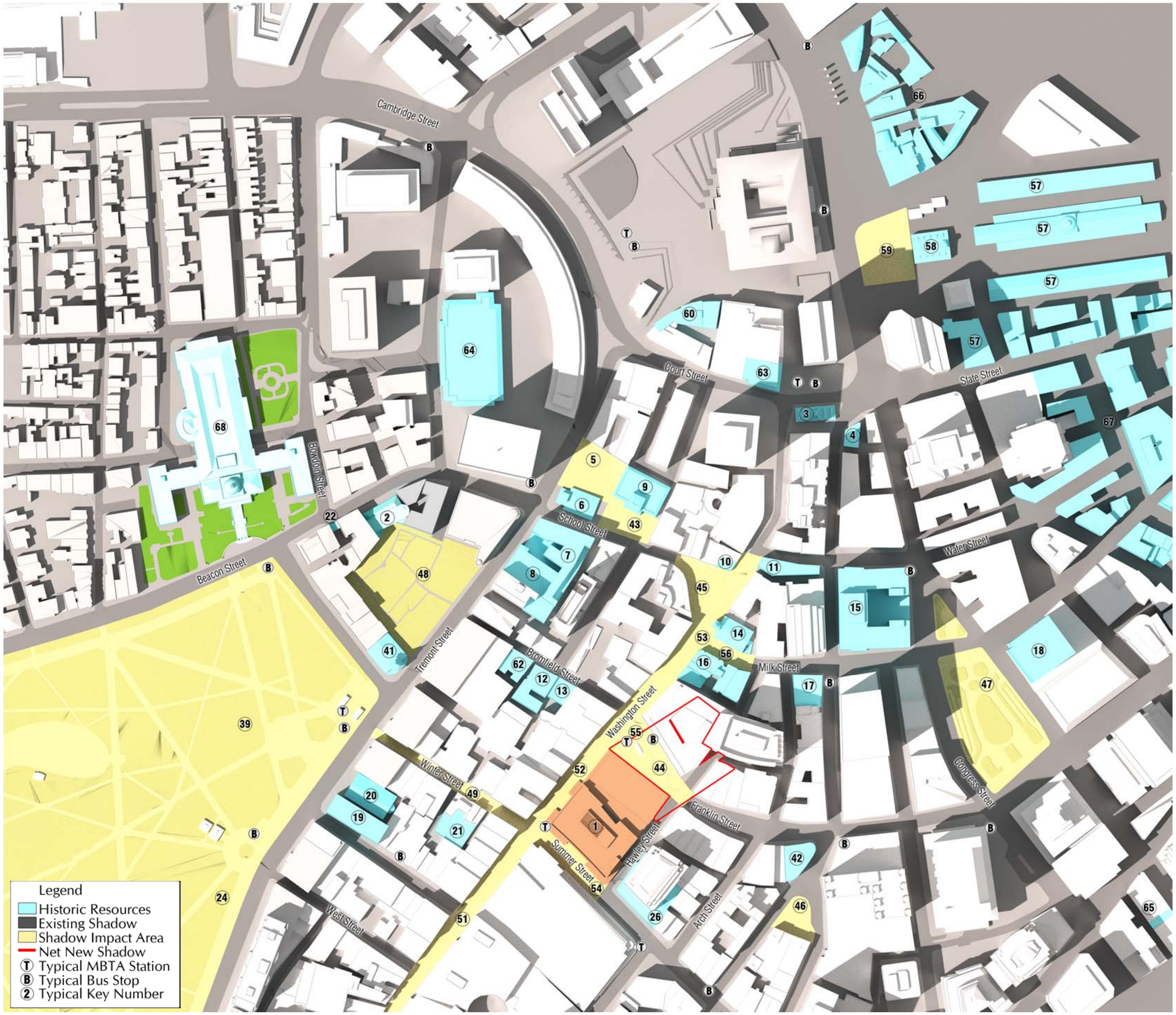
Franklin Street (between Washington & Hawley) - 11:38 AM, March 21st



Millennium Tower and Burnham Building



Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Franklin Street (between Washington & Hawley) - 2:30 PM, June 21st

Millennium Tower and Burnham Building

Franklin Street (between Washington & Hawley) - 10:48 AM, October 21st

Millennium Tower and Burnham Building

Franklin Street (between Washington & Hawley) - 2:30 PM, October 21st

Appendix C

LEED Checklists

LEED 2009 for Core and Shell Development

Project Checklist

Burnham Building

6/09/2012

Sustainable Sites — Possible Points: 28

Y	?	N			
20	1	7		Sustainable Sites	Possible Points: 28
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
1			Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
2			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	2
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
		2	Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
		1	Credit 6.1	Stormwater Design—Quantity Control	1
		1	Credit 6.2	Stormwater Design—Quality Control	1
		1	Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
	1		Credit 8	Light Pollution Reduction	1
1			Credit 9	Tenant Design and Construction Guidelines	1

Water Efficiency — Possible Points: 10

Y	?	N			
2	1	7		Water Efficiency	Possible Points: 10
Y			Prereq 1	Water Use Reduction—20% Reduction	
		4	Credit 1	Water Efficient Landscaping	2 to 4
		2	Credit 2	Innovative Wastewater Technologies	2
2	1	1	Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 37

Y	?	N			
10	3	24		Energy and Atmosphere	Possible Points: 37
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
4	3	14	Credit 1	Optimize Energy Performance	3 to 21
		4	Credit 2	On-Site Renewable Energy	4
2			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
		3	Credit 5.1	Measurement and Verification—Base Building	3
		3	Credit 5.2	Measurement and Verification—Tenant Submetering	3
2			Credit 6	Green Power	2

Materials and Resources — Possible Points: 13

Y	?	N			
8	3	2		Materials and Resources	Possible Points: 13
Y			Prereq 1	Storage and Collection of Recyclables	
4	1		Credit 1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 5
2			Credit 2	Construction Waste Management	1 to 2
		1	Credit 3	Materials Reuse	1
1	1		Credit 4	Recycled Content	1 to 2
1	1		Credit 5	Regional Materials	1 to 2
		1	Credit 6	Certified Wood	1

Indoor Environmental Quality — Possible Points: 12

Y	?	N			
8	1	3		Indoor Environmental Quality	Possible Points: 12
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
		1	Credit 2	Increased Ventilation	1
1			Credit 3	Construction IAQ Management Plan—During Construction	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
		1	Credit 6	Controllability of Systems—Thermal Comfort	1
1			Credit 7	Thermal Comfort—Design	1
	1		Credit 8.1	Daylight and Views—Daylight	1
		1	Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

Y	?	N			
4	2			Innovation and Design Process	Possible Points: 6
1			Credit 1.1	Innovation in Design: Specific Title	1
1			Credit 1.2	Innovation in Design: Specific Title	1
1			Credit 1.3	Innovation in Design: Specific Title	1
	1		Credit 1.4	Innovation in Design: Specific Title	1
	1		Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

Y	?	N			
2	1	1		Regional Priority Credits	Possible Points: 4
1			Credit 1.1	Regional Priority: Specific Credit	1
1			Credit 1.2	Regional Priority: Specific Credit	1
	1		Credit 1.3	Regional Priority: Specific Credit	1
		1	Credit 1.4	Regional Priority: Specific Credit	1

Total — Possible Points: 110

Y	?	N		
54	12	44	Total	Possible Points: 110

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

LEED 2009 for New Construction and Major Renovations

Project Checklist

Millennium Tower

06/09/2012

Sustainable Sites — Possible Points: 26

Y	?	N			
16	3	7		**Sustainable Sites**	
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
		1	Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
		1	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
		2	Credit 4.4	Alternative Transportation—Parking Capacity	2
	1		Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
	1		Credit 6.1	Stormwater Design—Quantity Control	1
	1		Credit 6.2	Stormwater Design—Quality Control	1
		1	Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
		1	Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

Y	?	N			
2	3	5		**Water Efficiency**	
Y			Prereq 1	Water Use Reduction—20% Reduction	
	2	2	Credit 1	Water Efficient Landscaping	2 to 4
		2	Credit 2	Innovative Wastewater Technologies	2
2	1	1	Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

Y	?	N			
7	5	23		**Energy and Atmosphere**	
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
2	3	14	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
	2		Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
1		2	Credit 5	Measurement and Verification	3
2			Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

Y	?	N			
4	2	8		**Materials and Resources**	
Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

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

Indoor Environmental Quality — Possible Points: 15

Y	?	N			
10	3	2		**Indoor Environmental Quality**	
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
		1	Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
	1		Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
	1		Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
	1		Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
		1	Credit 8.1	Daylight and Views—Daylight	1
1			Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

Y	?	N			
3	3			**Innovation and Design Process**	
1			Credit 1.1	Innovation in Design: Specific Title	1
1			Credit 1.2	Innovation in Design: Specific Title	1
	1		Credit 1.3	Innovation in Design: Specific Title	1
	1		Credit 1.4	Innovation in Design: Specific Title	1
	1		Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

Y	?	N			
1	2	1		**Regional Priority Credits**	
1			Credit 1.1	Regional Priority: Specific Credit	1
	1		Credit 1.2	Regional Priority: Specific Credit	1
	1		Credit 1.3	Regional Priority: Specific Credit	1
		1	Credit 1.4	Regional Priority: Specific Credit	1

Total — Possible Points: 110

Y	?	N		Possible Points
43	21	46	**Total**	110

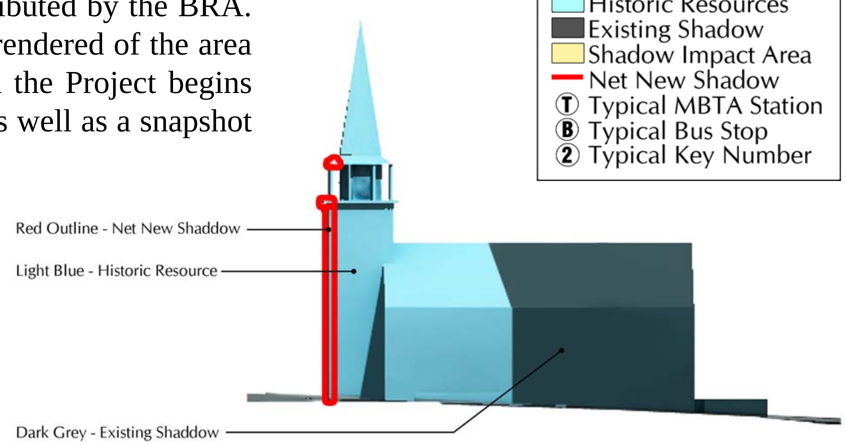
Certified 40 to 49 points   Silver 50 to 59 points   Gold 60 to 79 points   Platinum 80 to 110

Appendix D

MHC Shadow Analysis

For this shadow study, a 3D model of the Project was inserted into the 3D model of the City of Boston distributed by the BRA. Snapshot plans and façade images were then rendered of the area at the points when the net new shadow from the Project begins and ends its impact on the historic resource, as well as a snapshot of the shadow at its maximum impact. For reference, a context map showing historic resource locations is shown above. The 2007 daylight savings time was used in the analysis.

Legend
- Historic Resources
- Existing Shadow
- Shadow Impact Area
- Net New Shadow
- Ⓣ Typical MBTA Station
- Ⓑ Typical Bus Stop
- ② Typical Key Number



TYPICAL FACADE DIAGRAM

Massachusetts Historical Commission - Shadow Analysis

ASSET KEY	March	June	October	December
1 Filene's Department Store				
2 Boston Athenaeum				
3 Old State House				
4 Second Brazer Building				
5 King's Chapel Burial Ground				
6 King's Chapel				
7 Parker House				
8 Tremont Temple Baptist Church				
9 Old City Hall				
10 The Old Corner Bookstore				
11 Winthrop Building				
12 Wesleyan Association Building				
13 20-30 Bromfield Street				
14 Old South Meeting House				
15 John W. McCormack Federal Building & Courthouse				
16 Newspaper Row				
17 International Trust Company Building				
18 Federal Reserve Bank Building				
19 R.H. Stearns Building				
20 Saint Paul's Church				
21 Locke-Ober Restaurant				
22 Chester Harding House				
24 Tremont Street Subway				
26 Kennedy's Building				
28 Paramount Theatre				
30 Bedford Building				
31 83-87 Summer Street				
32 89-95 Summer Street				
34 United Shoe Machinery Corporation Building				
39** Boston Common				
41** Park Street Church				
42 Wigglesworth Building				
43** Old City Hall Plaza				
48** Old Granary Burial Ground				
57 Quincy Market				
58. Faneuil Hall				
59. Dock Square				
60 Sears Crescent-Court Street and City Hall Plaza (38-68 Cornhill St.)				
61. Tremont Street Block between Avery and Boylston (177 to 186				
62. Publicity Building 40-44 Bromfield Street				
63. Ames Building – 1 Court Street				
64. John Adams Courthouse – Pemberton Square				
65. Richardson Block – 107 -139 Pearl Street				
66. Blackstone Block Historic District - bounded by Union,				
67. Custom House District - bounded by Chatham St., Expressway,				
68. Massachusetts State House				

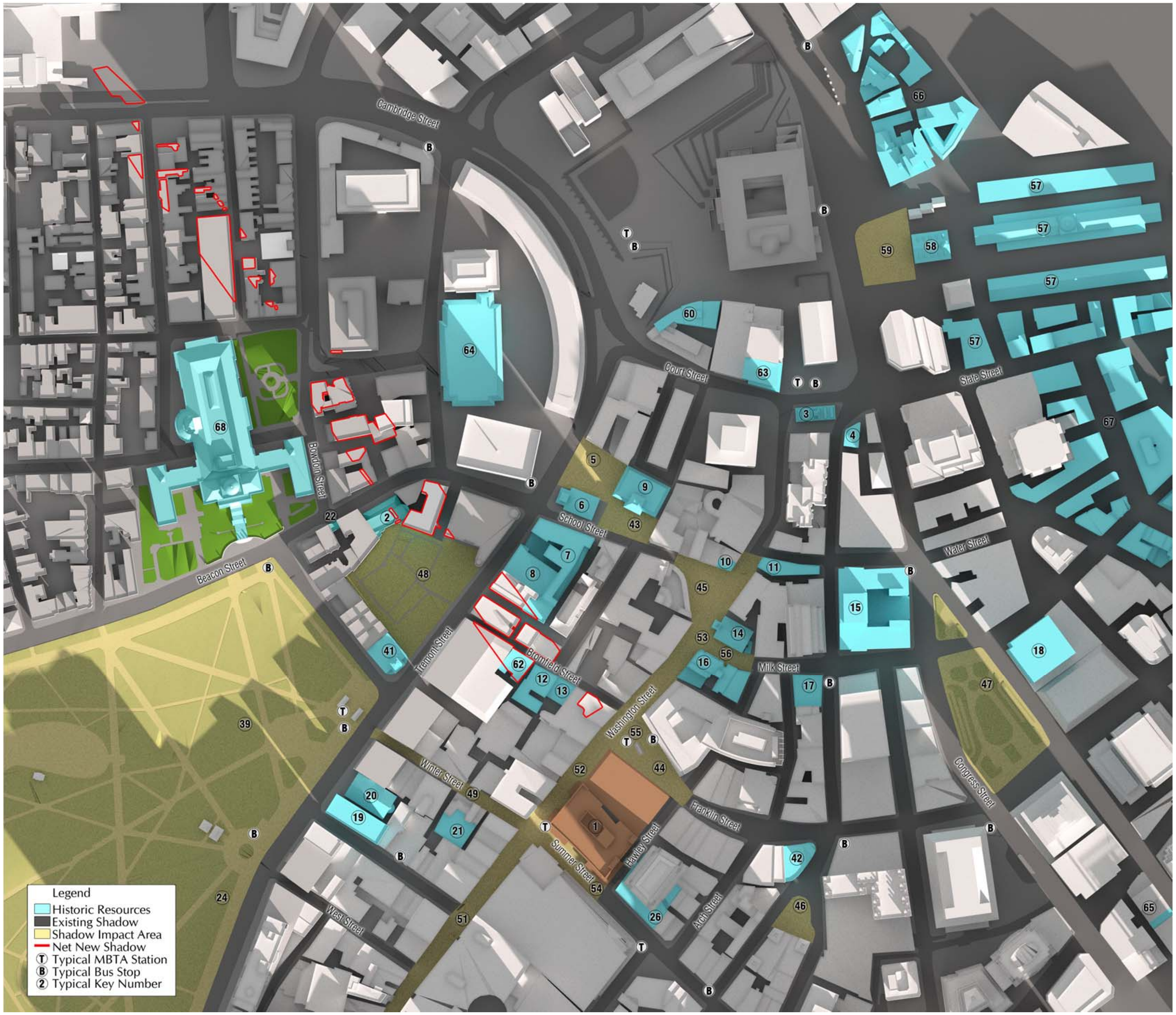
LEGEND	
	NO New Shadow
	New Shadow
	MHC ASSET
	MHC ASSET / SHADOW IMPACT AREA
	N/A

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Boston Athanaeum - 8:18 AM, December 21st



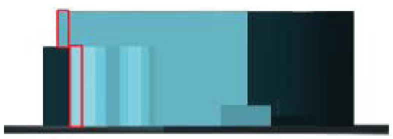
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

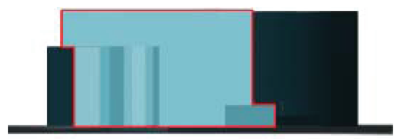
Boston Athanaeum - 9:10 AM, December 21st

October 21

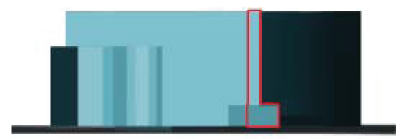
02 Boston Athanaeum



9:30AM
Secondary Facade
South Elevation



9:56AM
Secondary Facade
South Elevation

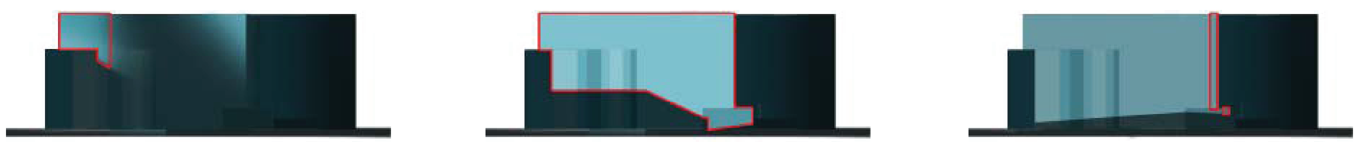


10:18AM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

December 21

02 Boston Athanaeum

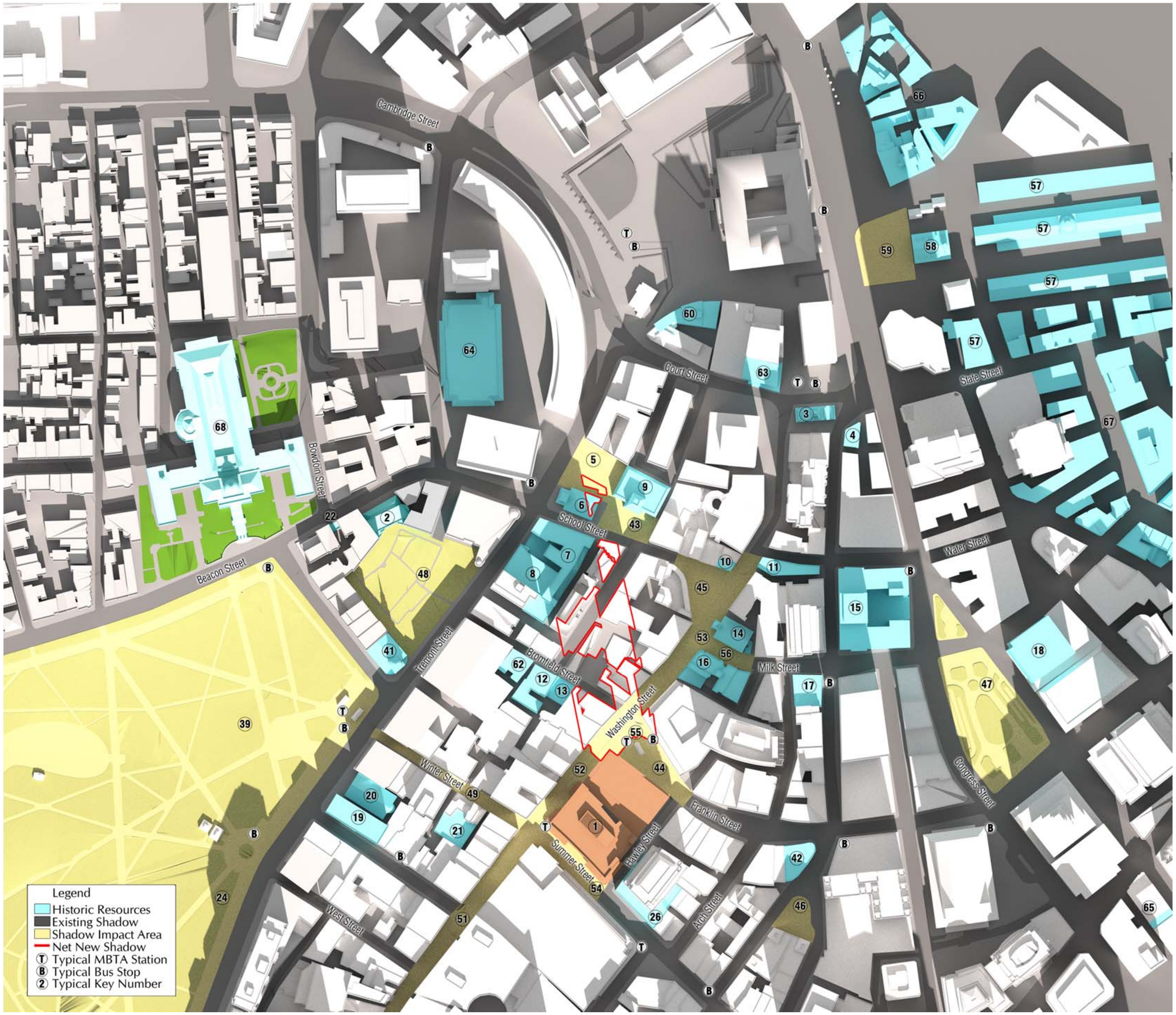


8:18AM
Secondary Facade
South Elevation

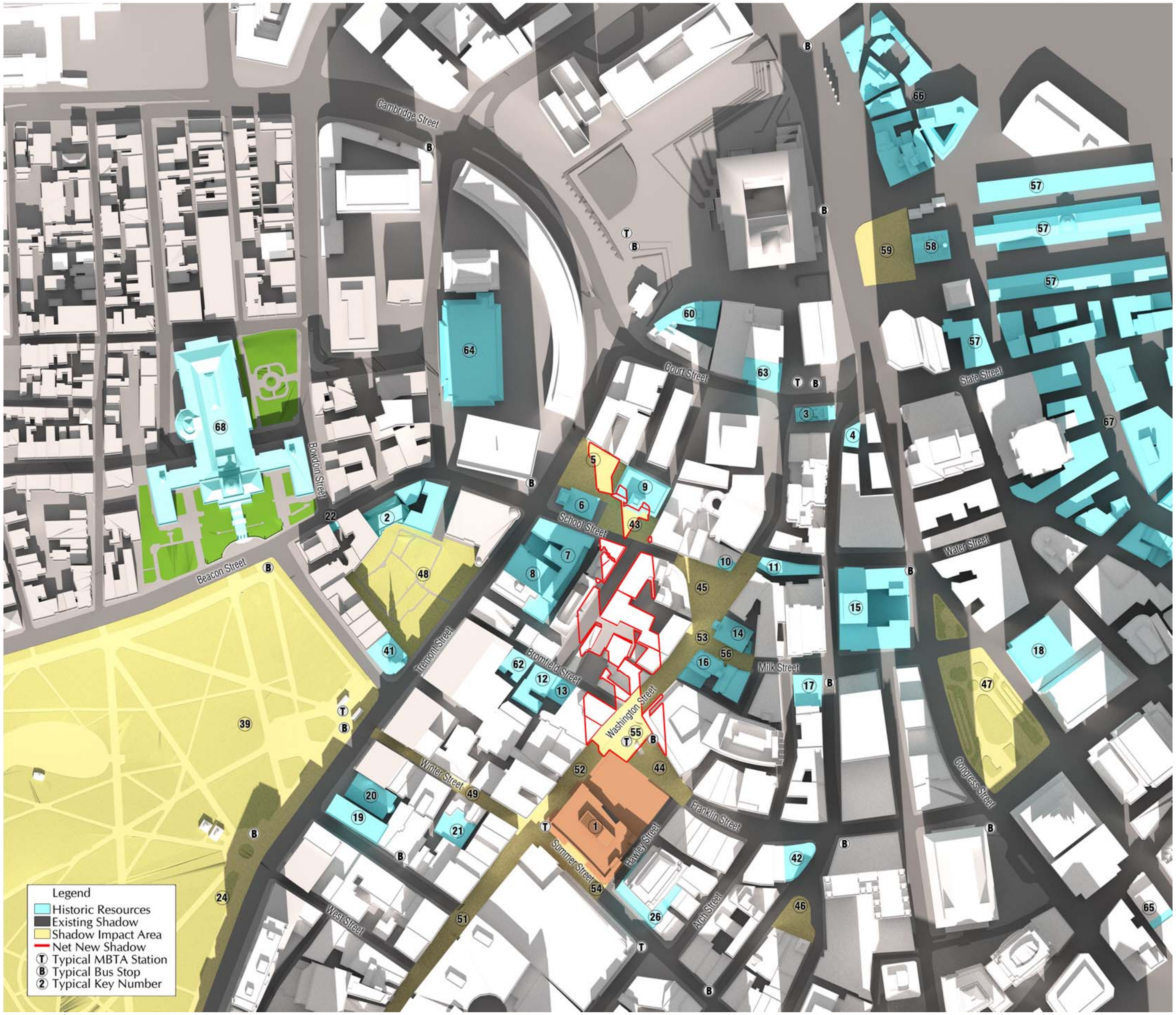
8:46AM
Secondary Facade
South Elevation

9:10AM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

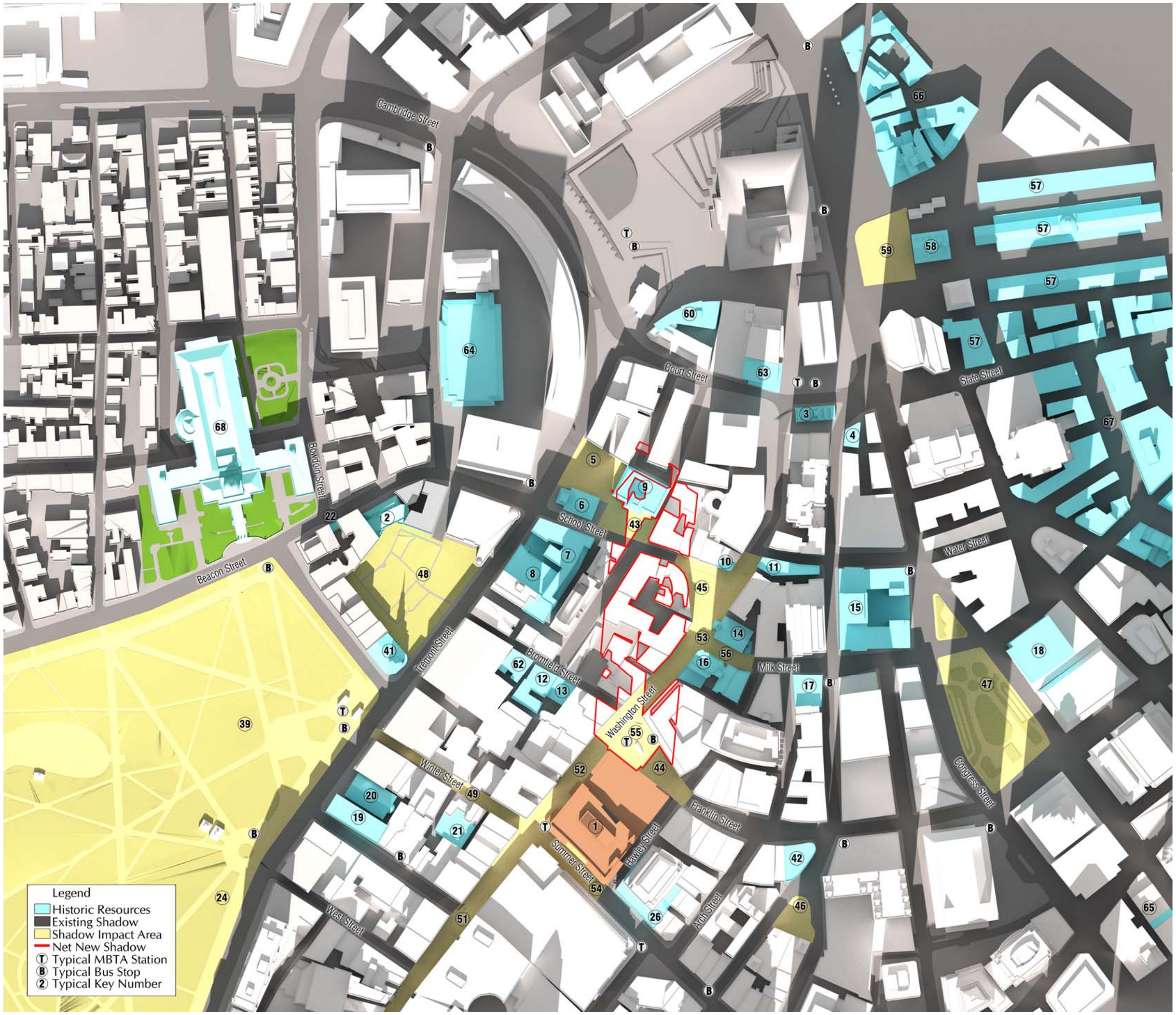


Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

King's Chapel Burial Ground - 12:15 PM, October 21st



Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

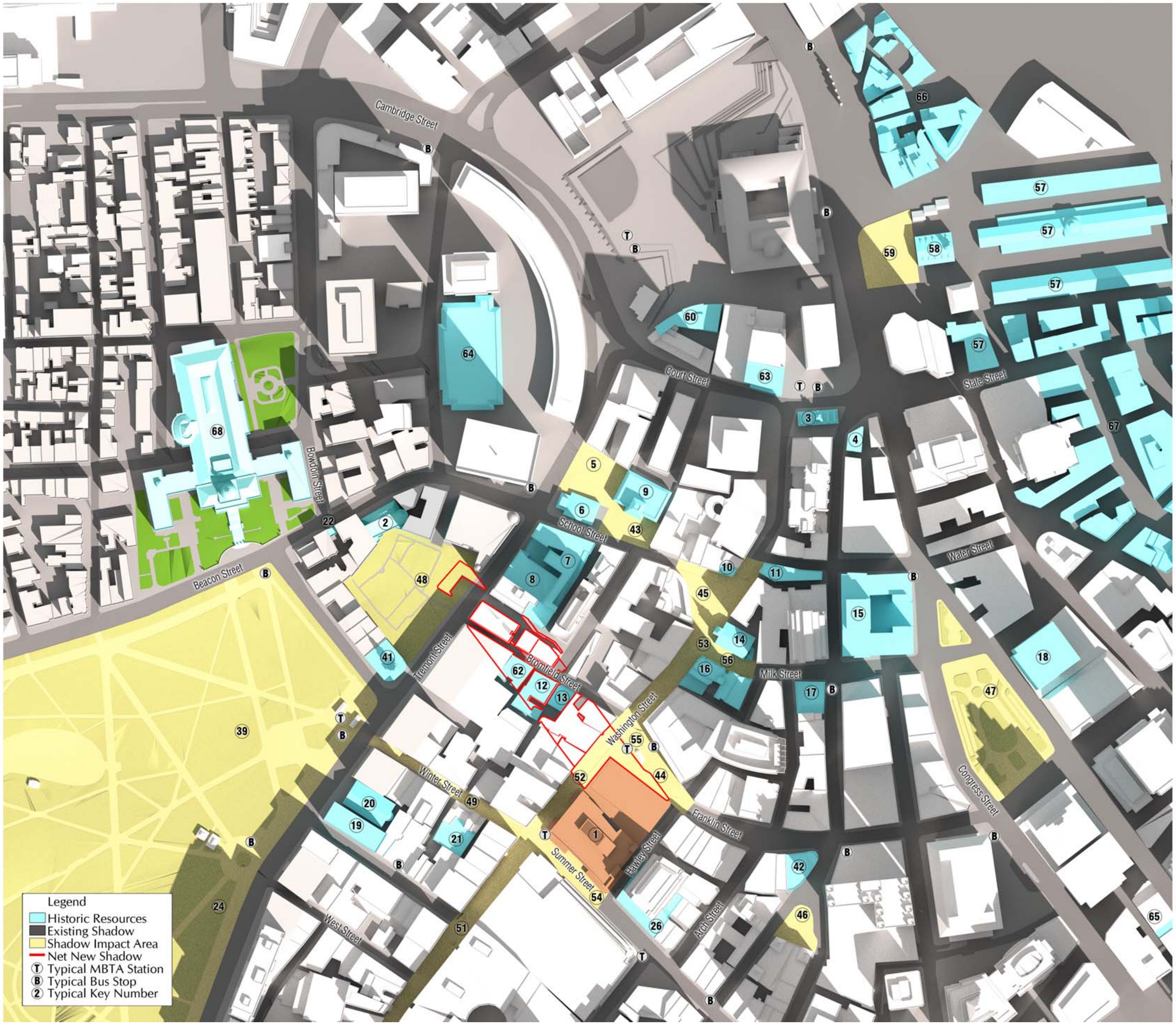
King's Chapel Burial Ground - 10:42 AM, December 21st

Millennium Tower and Burnham Building

King's Chapel Burial Ground - 11:15 AM, December 21st

Millennium Tower and Burnham Building

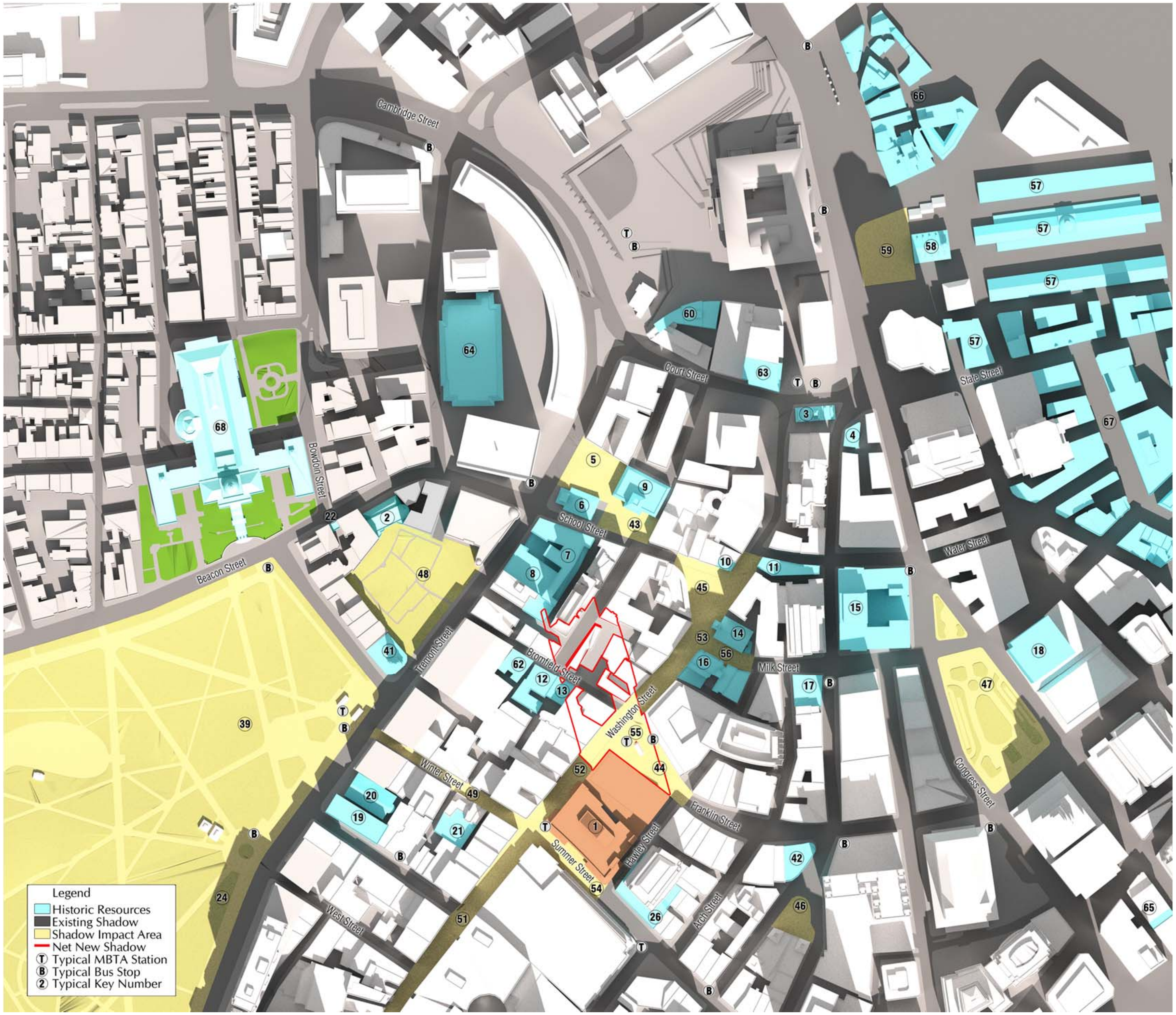
King's Chapel Burial Ground - 12:11 PM, December 21st



Millennium Tower and Burnham Building

Parker House - 11:03 AM, March 21st

HANDEL ARCHITECTS LLP



Millennium Tower and Burnham Building

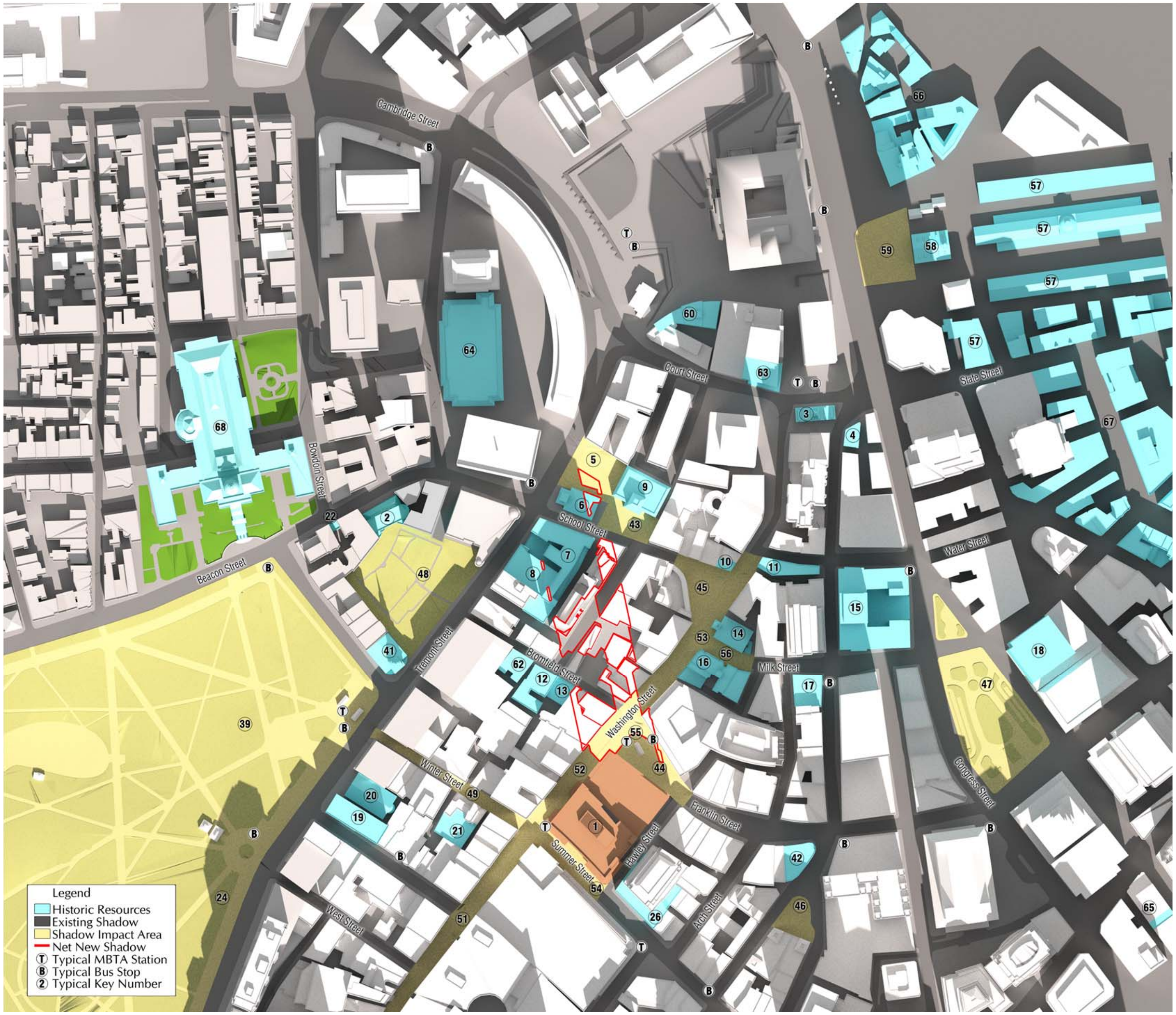
HANDEL ARCHITECTS LLP

Parker House - 12:08 PM, March 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

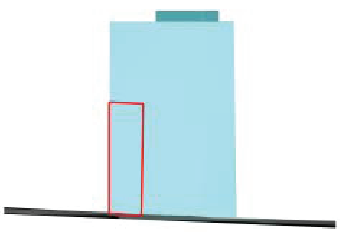
Parker House - 10:14 AM, October 21st



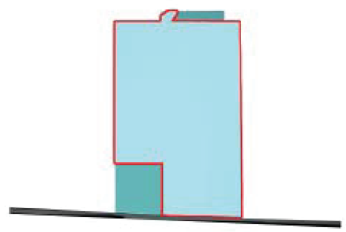
Millennium Tower and Burnham Building

March 21

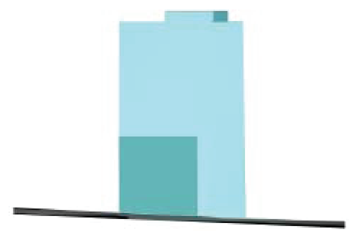
07 Parker House



11:03AM
Secondary Facade
South Elevation



11:45AM
Secondary Facade
South Elevation

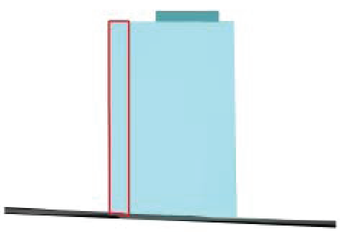


12:08PM
Secondary Facade
South Elevation

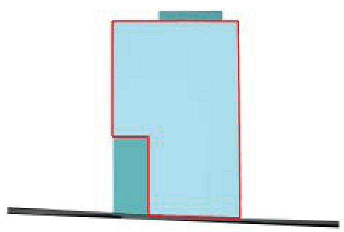
Note: Primary facade does not receive net new shadow.

October 21

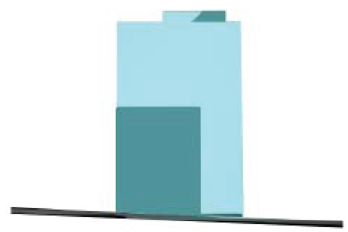
07 Parker House



10:14AM
Secondary Facade
South Elevation



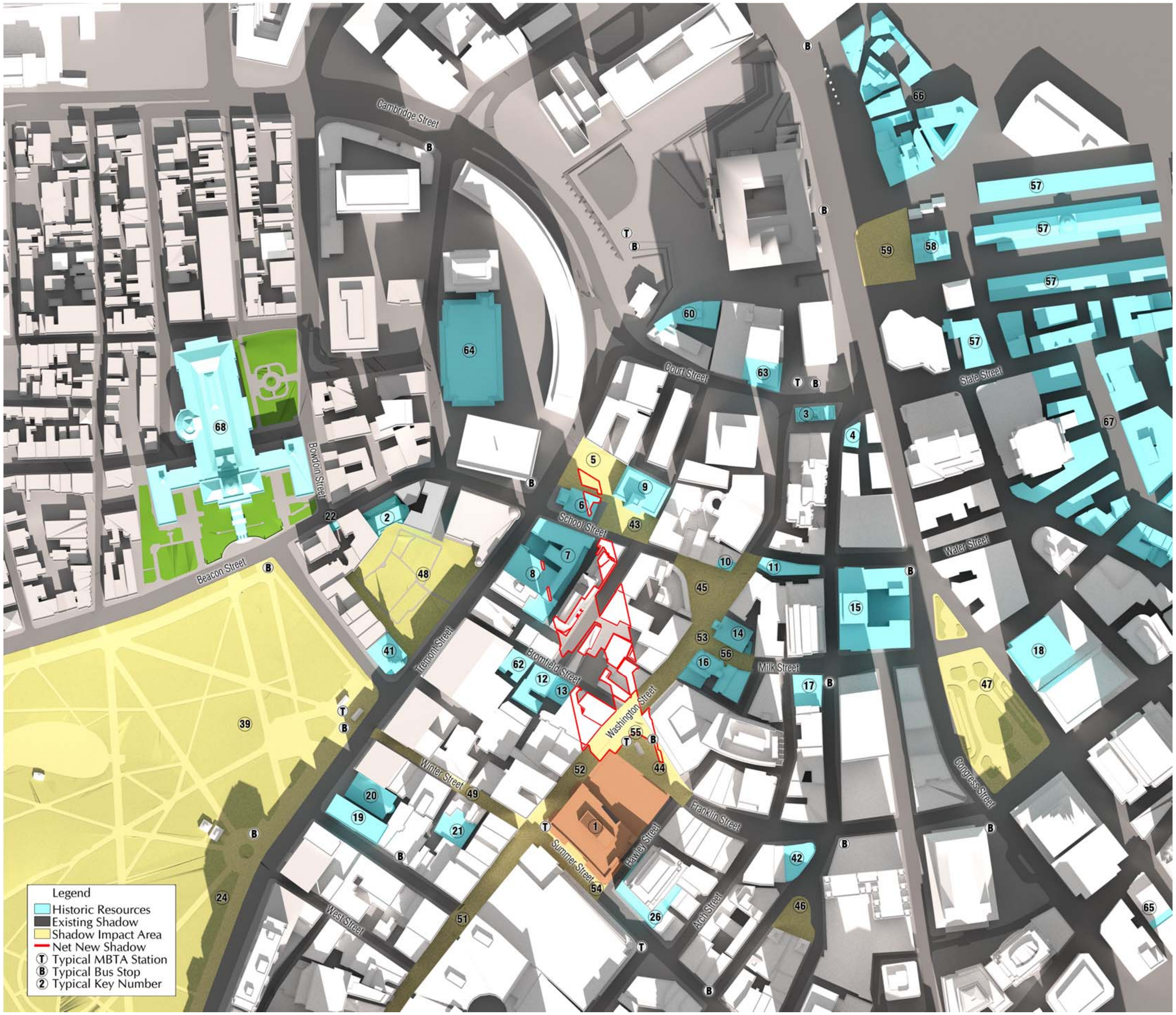
10:45AM
Secondary Facade
South Elevation



11:46AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

Note: Primary facade does not receive net new shadow.

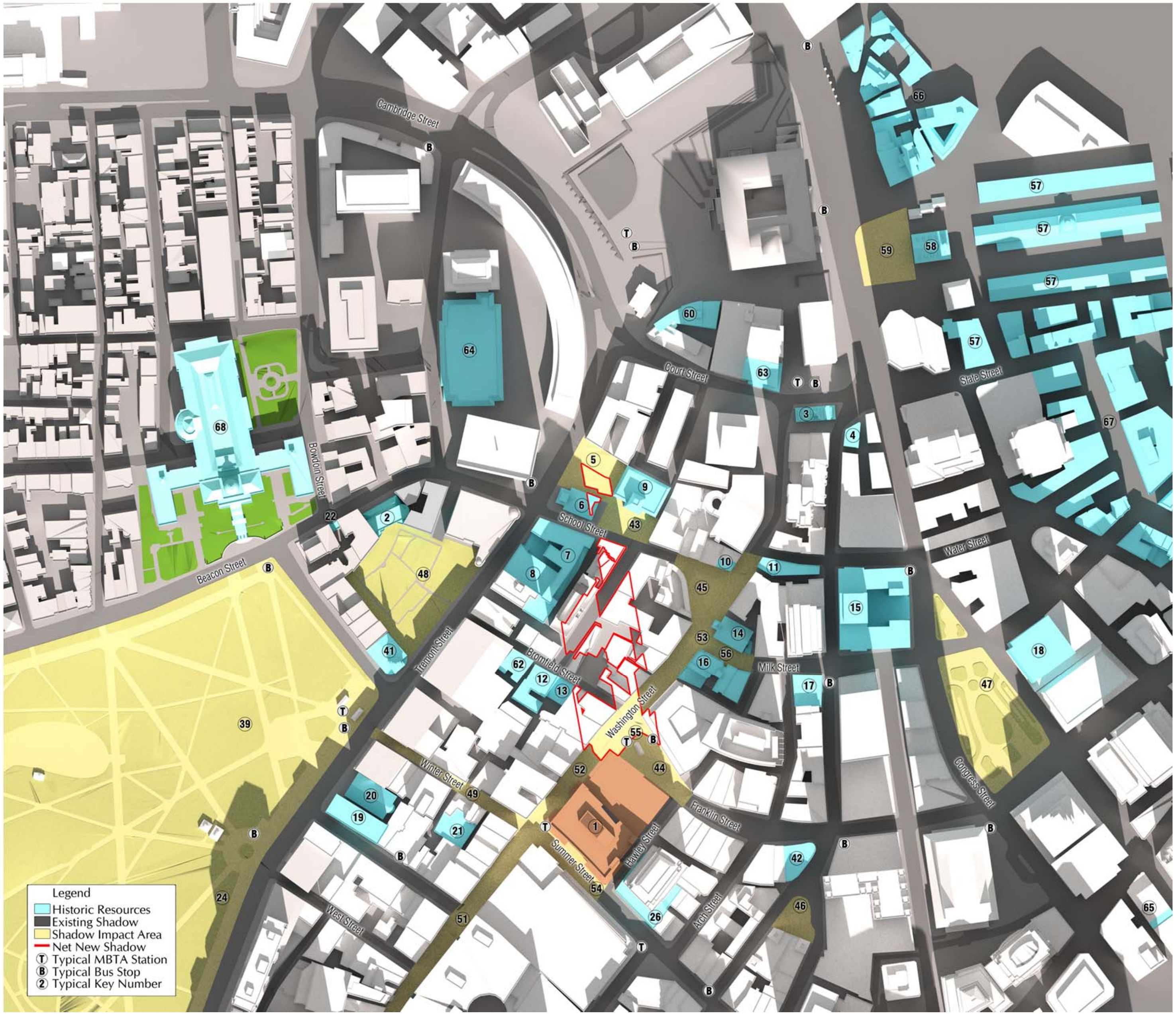
Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

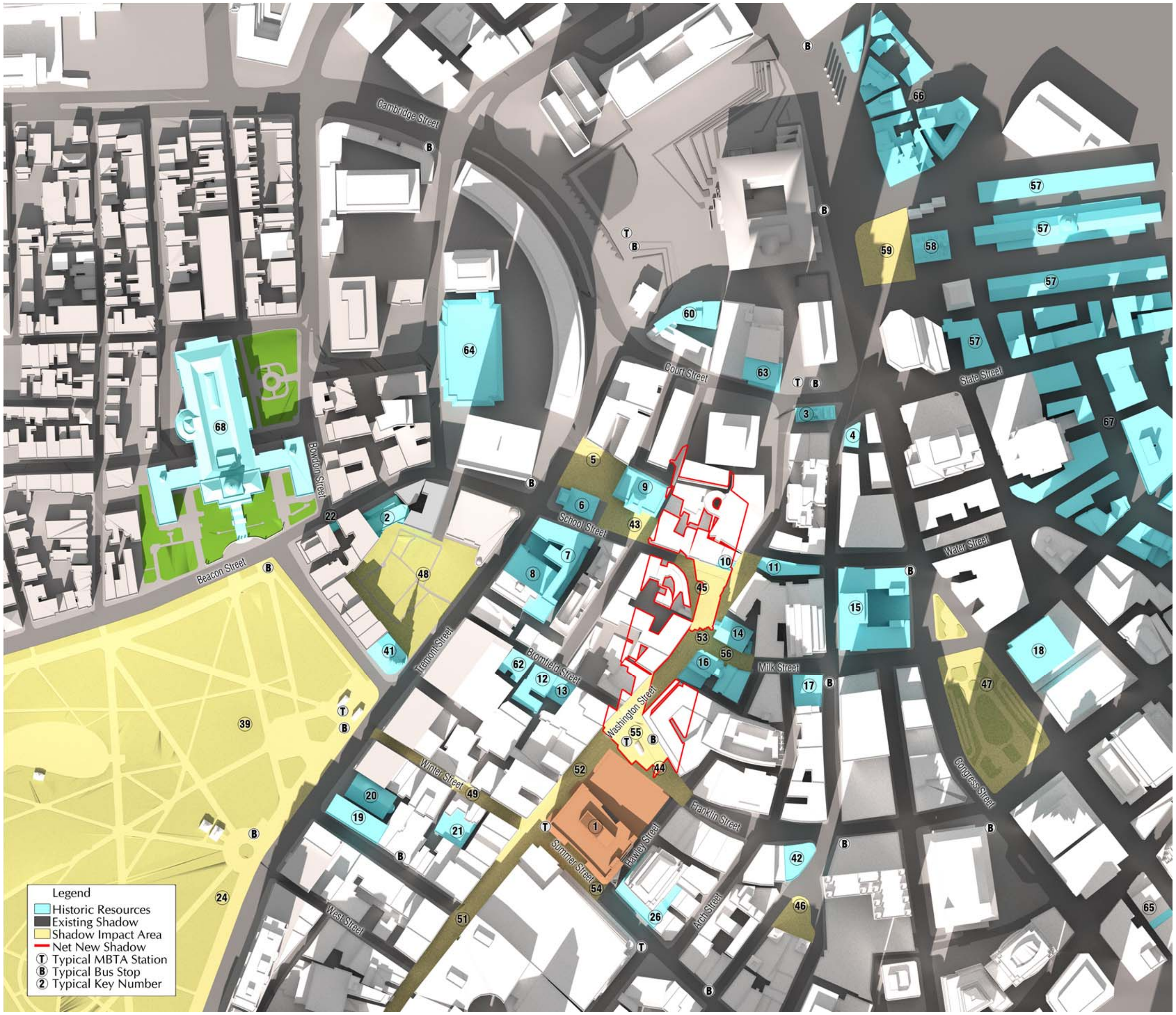
Tremont Temple Baptist Church - 11:46 AM, October 21st



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Old City Hall - 11:54 AM, October 21st



Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

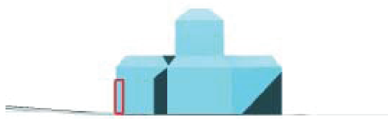
Old City Hall - 11:05 AM, December 21st

Millennium Tower and Burnham Building

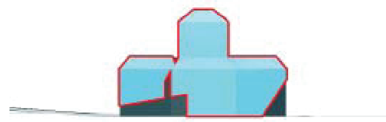
Old City Hall - 12:44 PM, December 21st

October 21

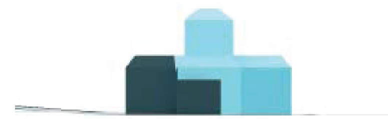
09 Old City Hall



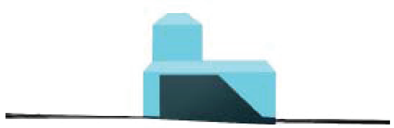
11:54AM
Primary Facade
South Elevation



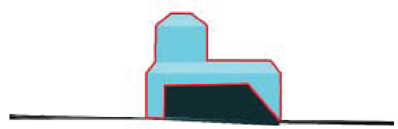
12:42PM
Primary Facade
South Elevation



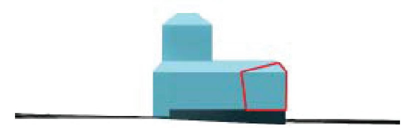
1:19PM
Primary Facade
South Elevation



11:54AM
Secondary Facade
East Elevation



12:42PM
Secondary Facade
East Elevation

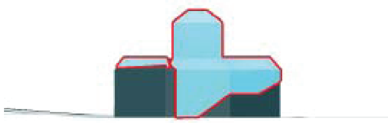


1:19PM
Secondary Facade
East Elevation

December 21

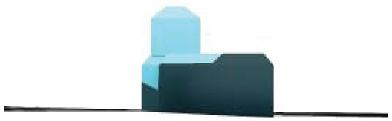
09 Old City Hall

11:05AM
Primary Facade
South Elevation

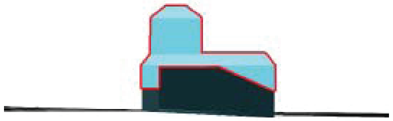


11:48AM
Primary Facade
South Elevation

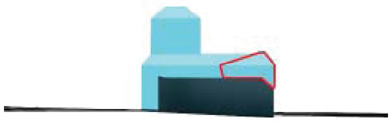
12:44PM
Primay Facade
South Elevation



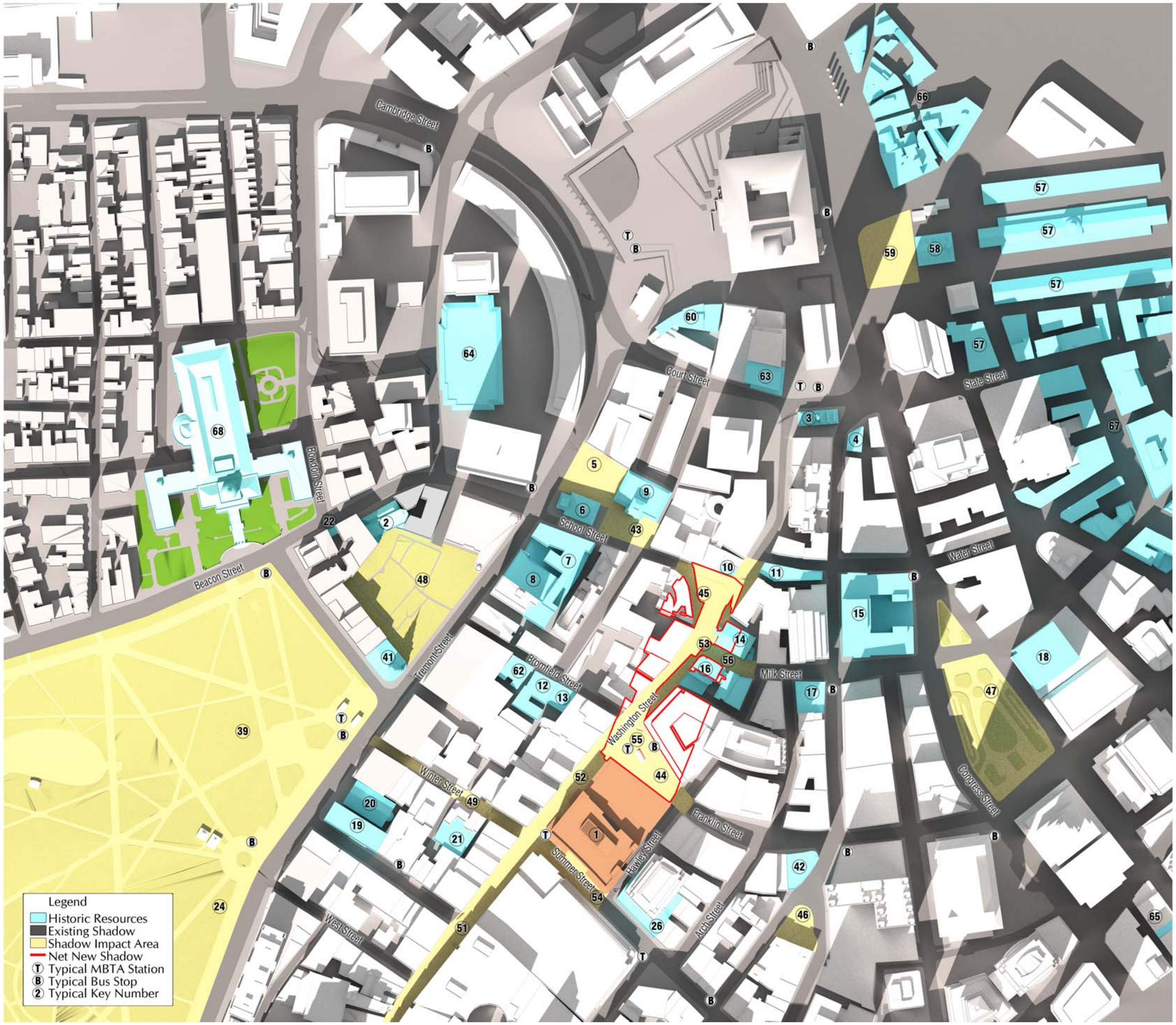
11:05AM
Secondary Facade
East Elevation



11:48AM
Secondary Facade
East Elevation



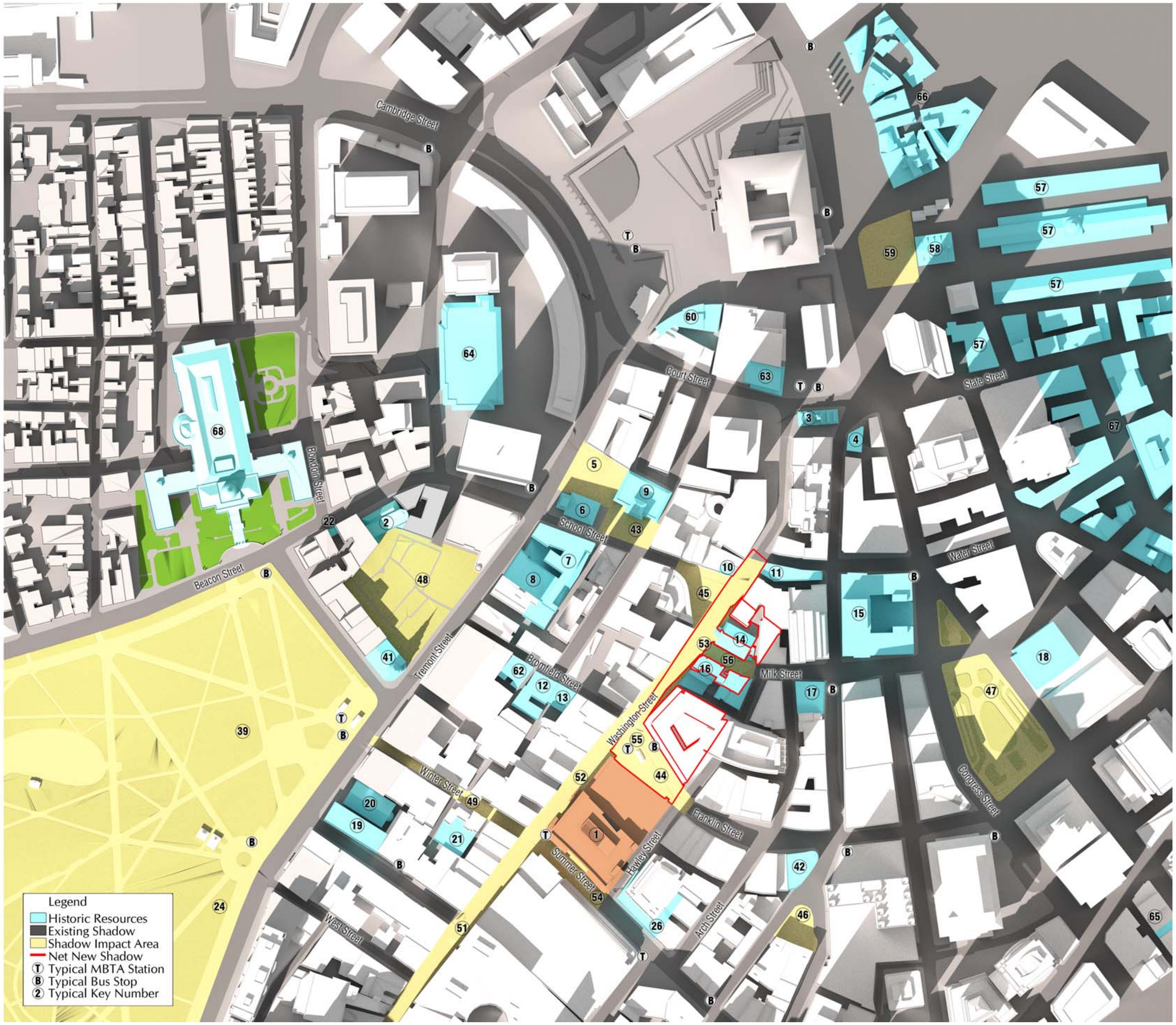
12:44PM
Secondary Facade
East Elevation



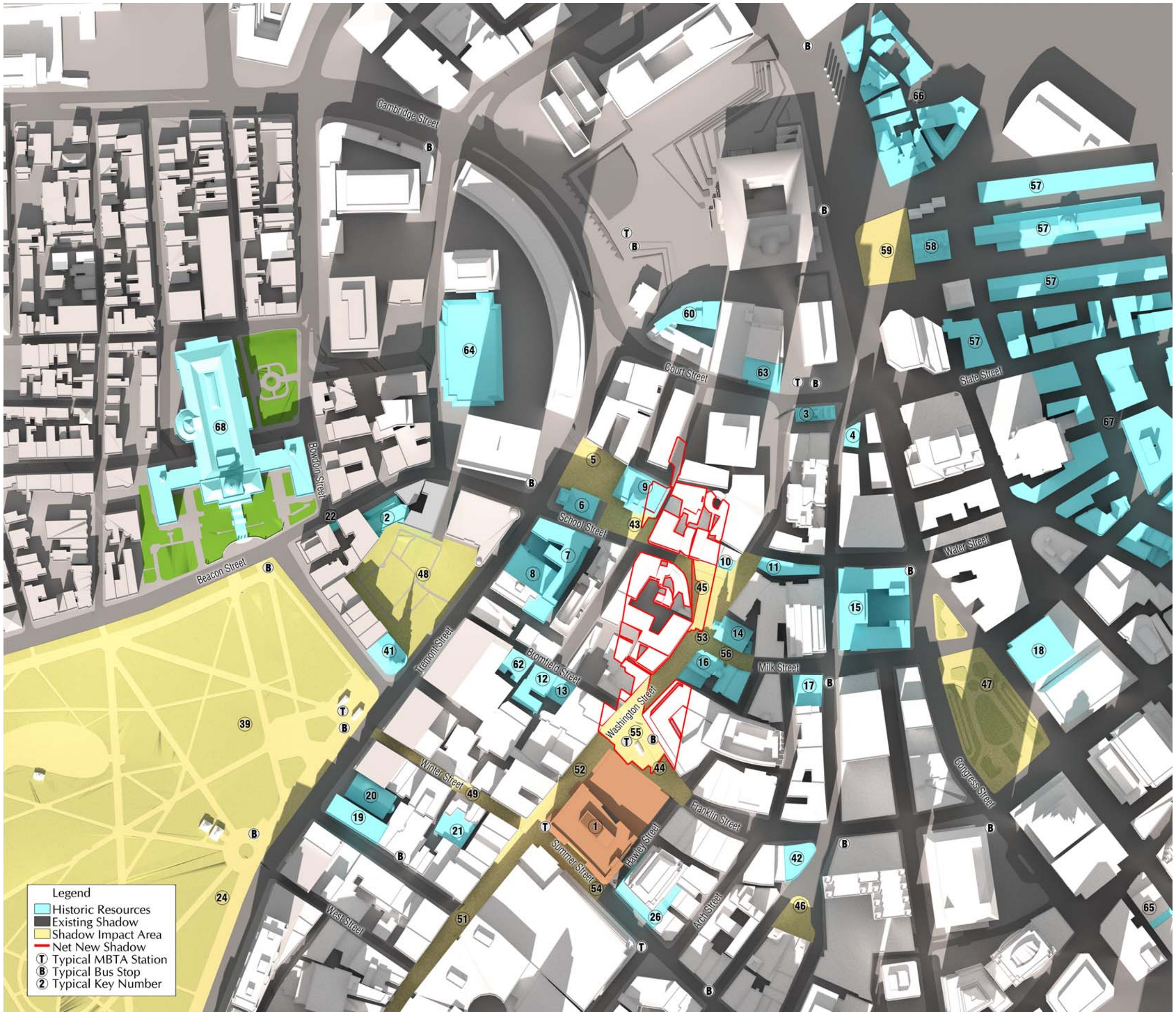
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

The Old Corner Bookstore - 1:51 PM, March 21st



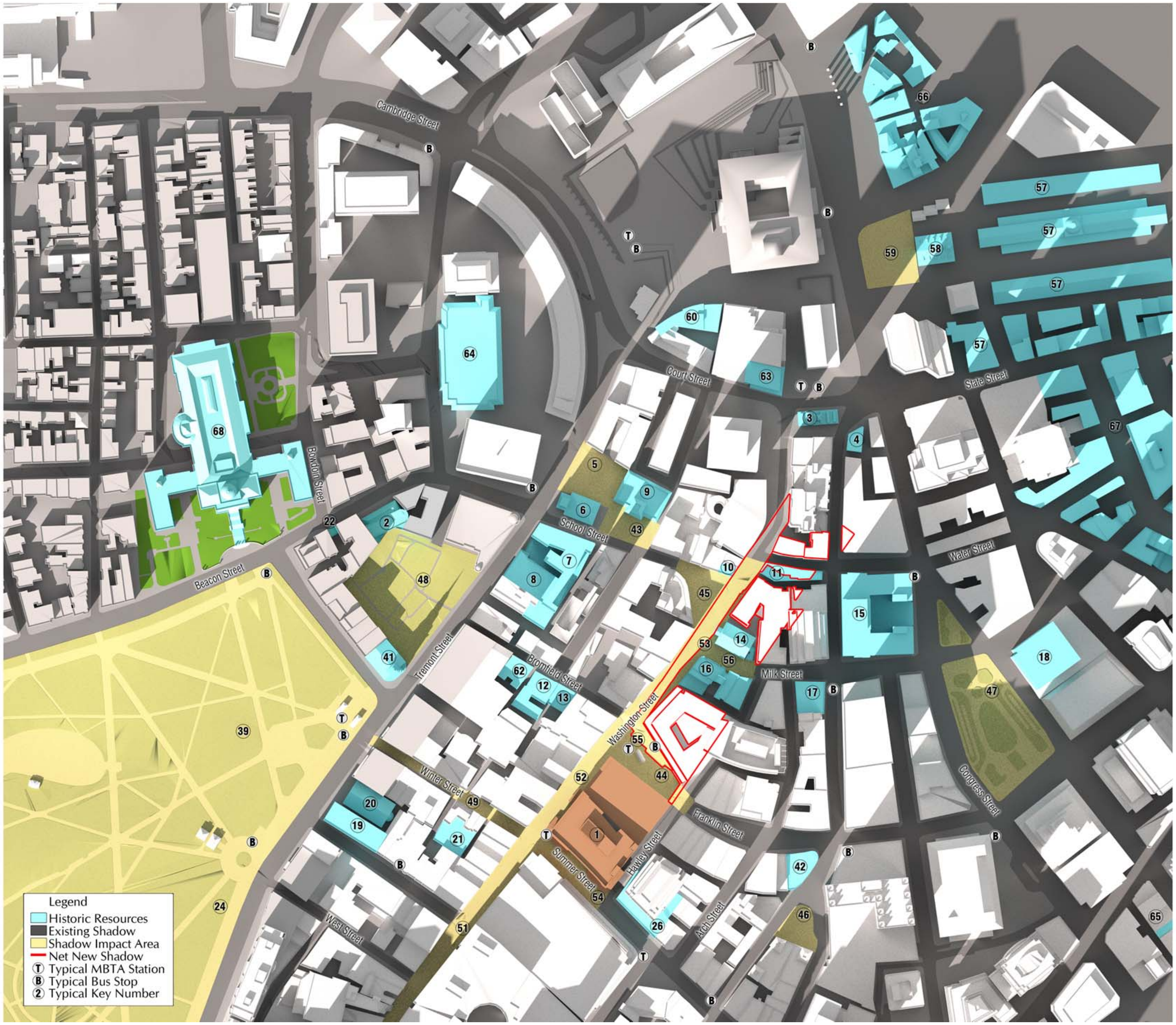
Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

The Old Corner Bookstore - 1:08 PM, October 21st



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

The Old Corner Bookstore - 2:28 PM, October 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

The Old Corner Bookstore - 12:32 PM, December 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

The Old Corner Bookstore - 2:07 PM, December 21st

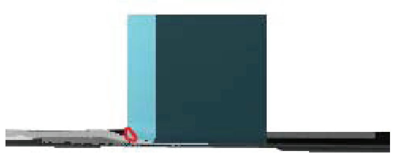
March 21

10 The Old Corner Bookstore

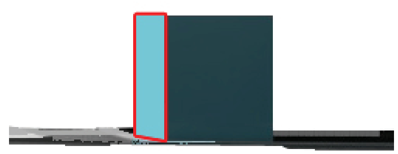
1:51PM
Primary Facade
South Elevation

2:15PM
Primary Facade
South Elevation

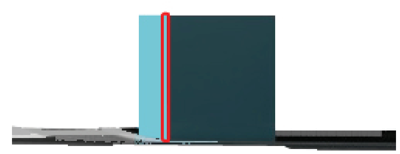
2:28PM
Primary Facade
South Elevation



1:51PM
Secondary Facade
East Elevation



2:15PM
Secondary Facade
East Elevation



2:28PM
Secondary Facade
East Elevation

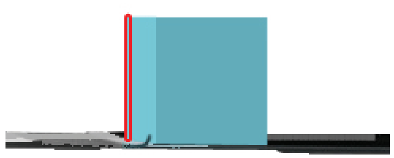
October 21

10 The Old Corner Bookstore

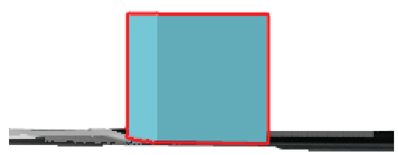
1:08PM
Primary Facade
South Elevation

1:34PM
Primary Facade
South Elevation

2:28PM
Primary Facade
South Elevation



1:08PM
Secondary Facade
East Elevation



1:34PM
Secondary Facade
East Elevation

2:28PM
Secondary Facade
East Elevation

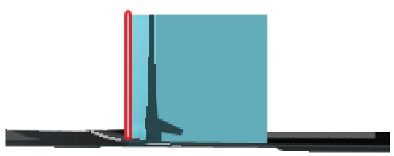
December 21

10 The Old Corner Bookstore

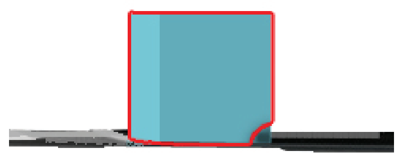
12:32PM
Primary Facade
South Elevation

1:06PM
Primary Facade
South Elevation

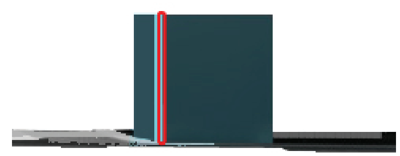
2:07PM
Primary Facade
South Elevation



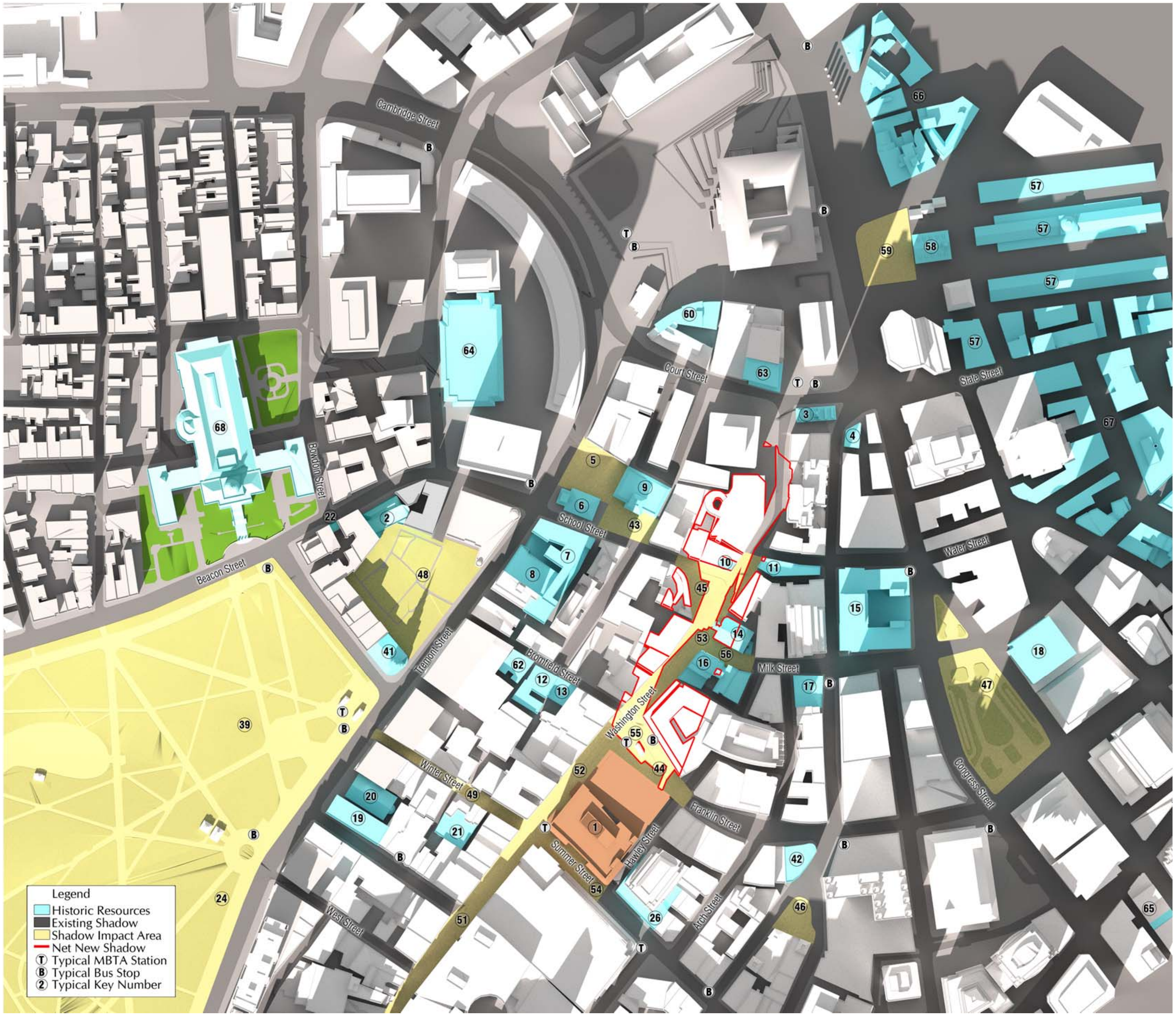
12:32PM
Secondary Facade
East Elevation



1:06PM
Secondary Facade
East Elevation



2:07PM
Secondary Facade
East Elevation



Millennium Tower and Burnham Building

Winthrop Building - 1:43 PM, October 21st

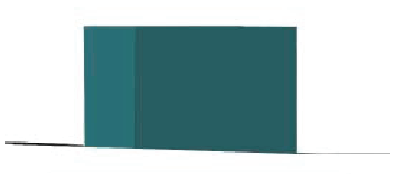
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

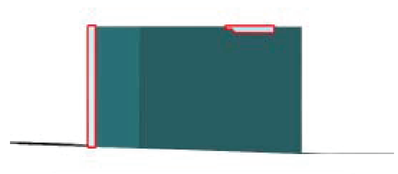
Winthrop Building - 3:28 PM, October 21st

October 21

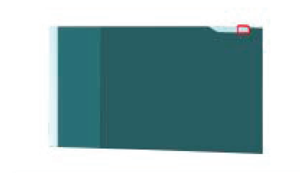
11 Winthrop Building



1:43PM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof



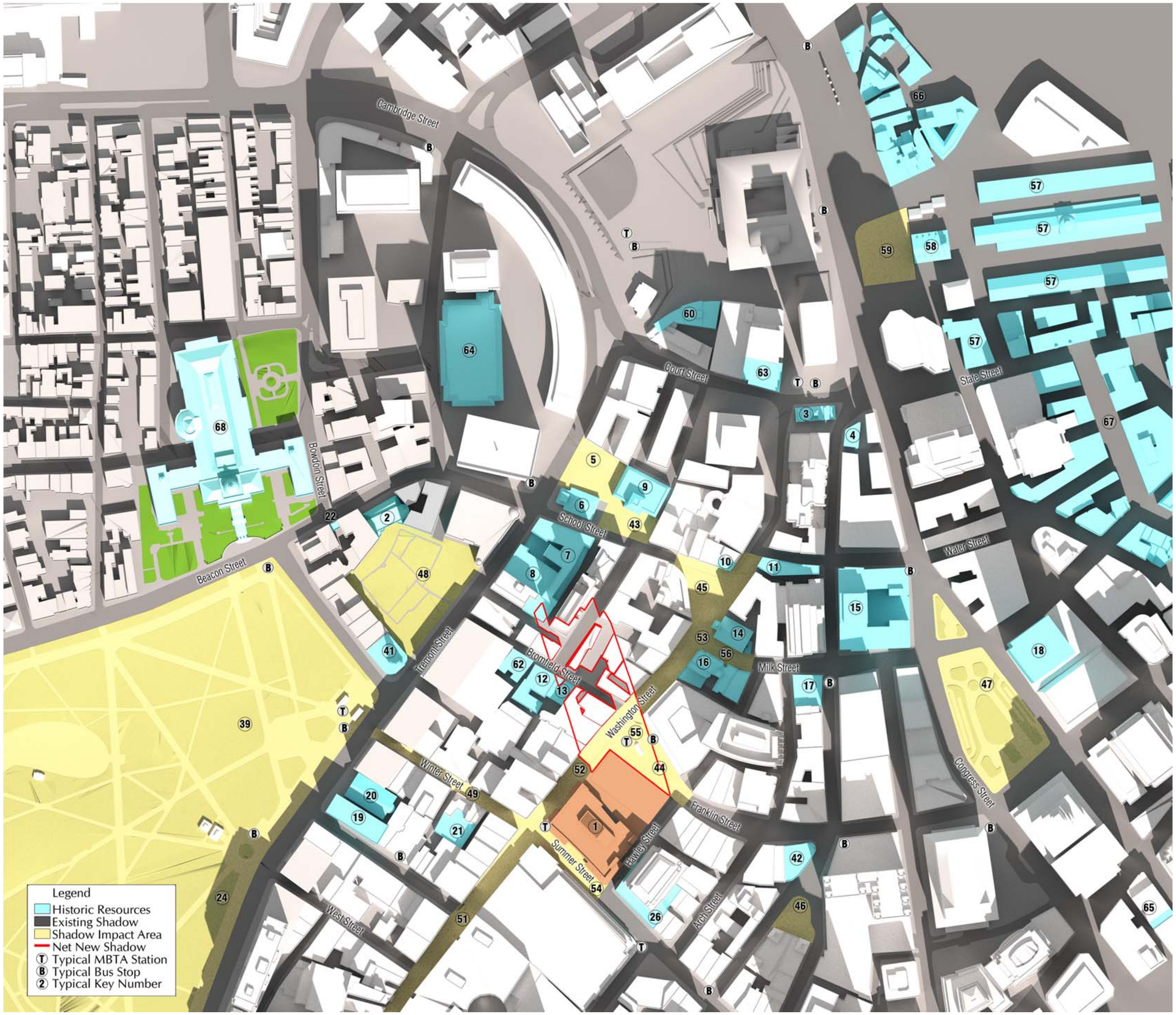
2:40PM
Secondary Facade
South Elevation



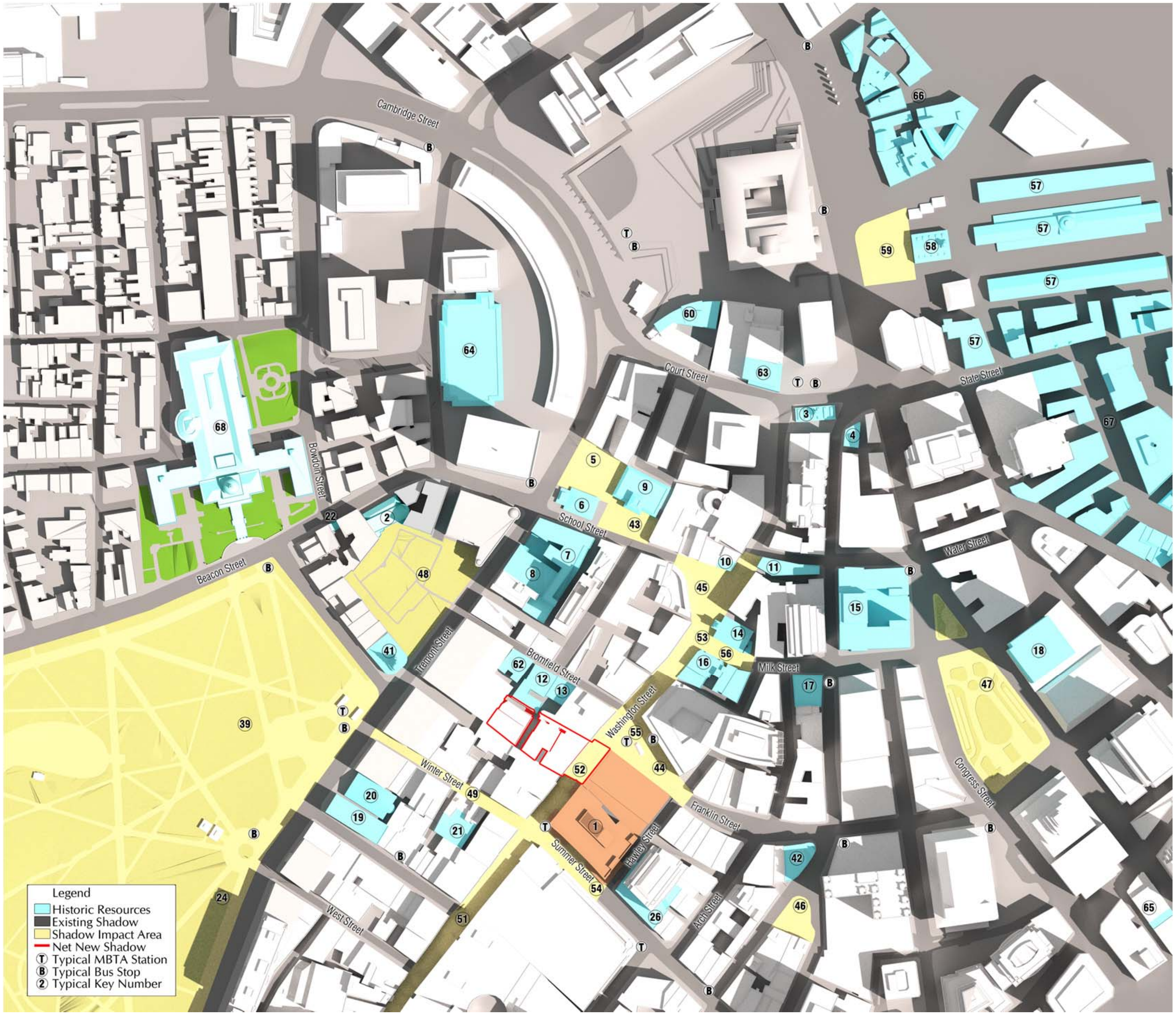
3:28PM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

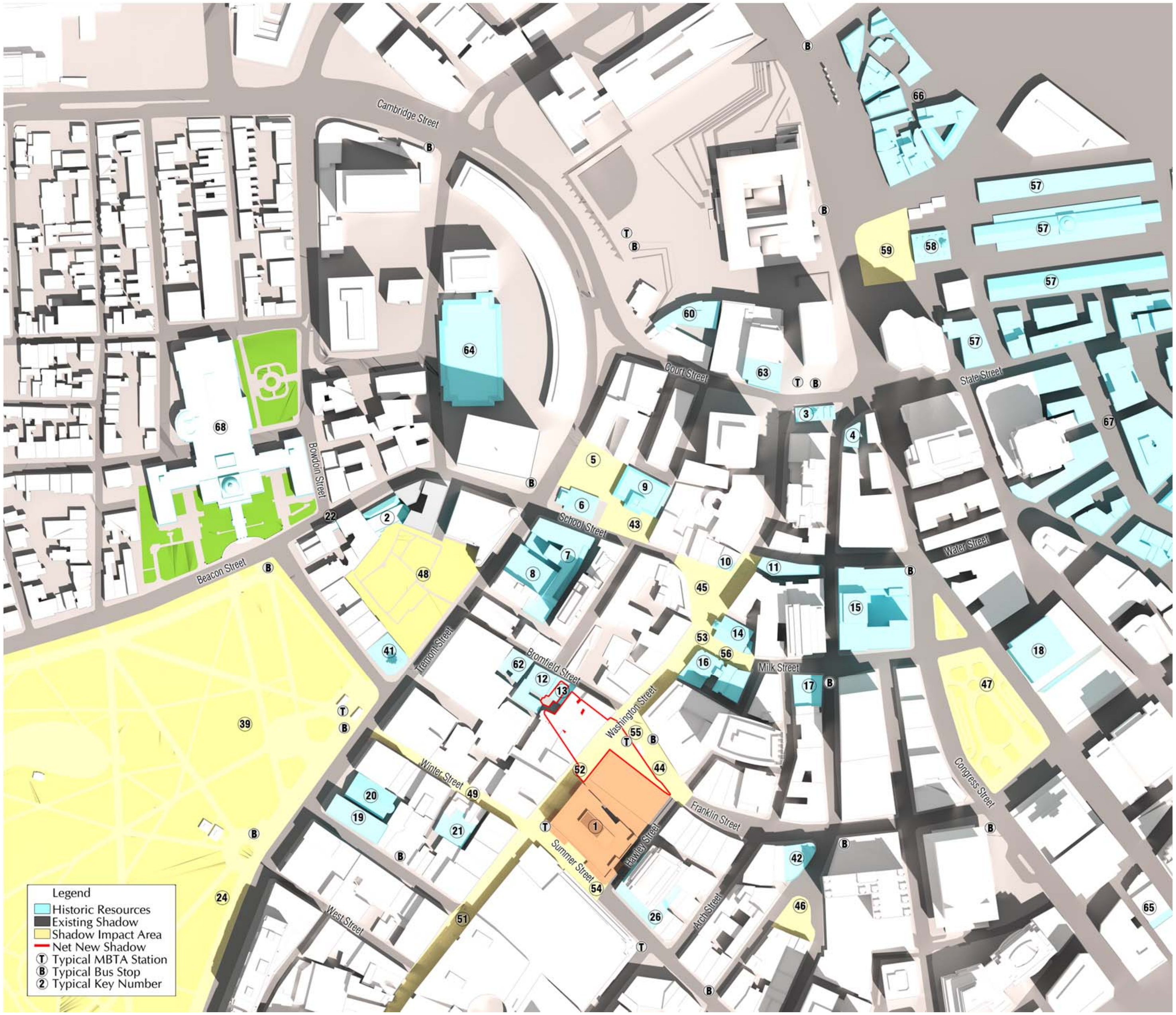
Millennium Tower and Burnham Building



Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

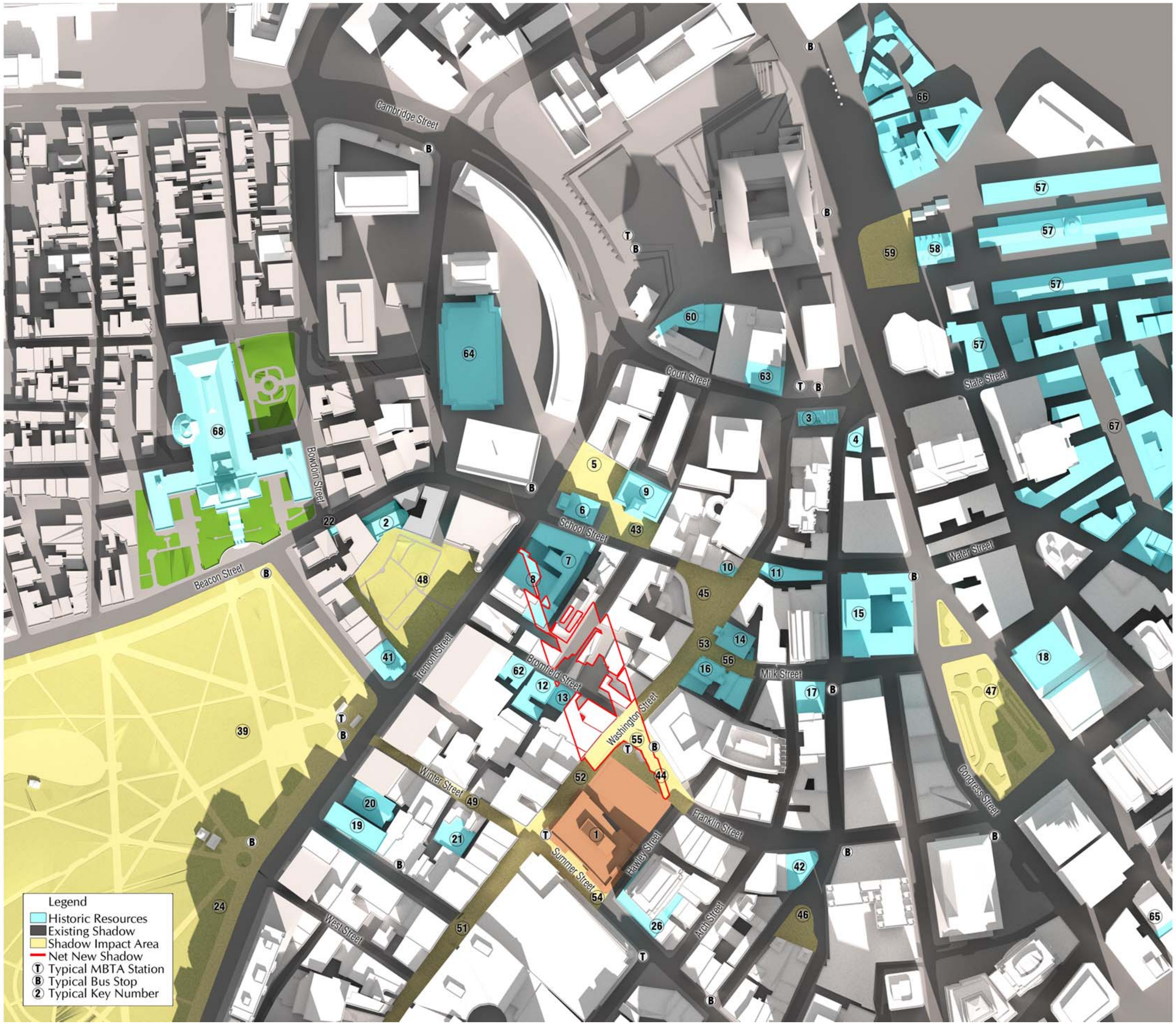


Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Wesleyan Association Building - 11:53 AM, June 21st

Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

Wesleyan Association Building - 11:26 AM, October 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Wesleyan Association Building - 9:26 AM, December 21st

Millennium Tower and Burnham Building

March 21

12 Wesleyan Association Building

9:32AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

10:52AM
Secondary Facade
South Elevation

12:02PM
Secondary Facade
South Elevation

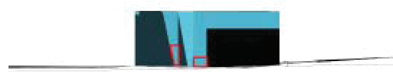
Note: Primary facade does not receive net new shadow.

June 21

12 Wesleyan Association Building

10:50AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

11:33AM
Secondary Facade
South Elevation



11:53AM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

October 21

12 Wesleyan Association Building

8:55AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

9:48AM
Secondary Facade
South Elevation

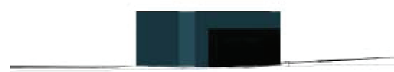
11:26AM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

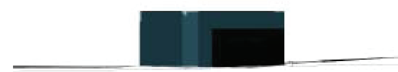
December 21

12 Wesleyan Association Building

9:26AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

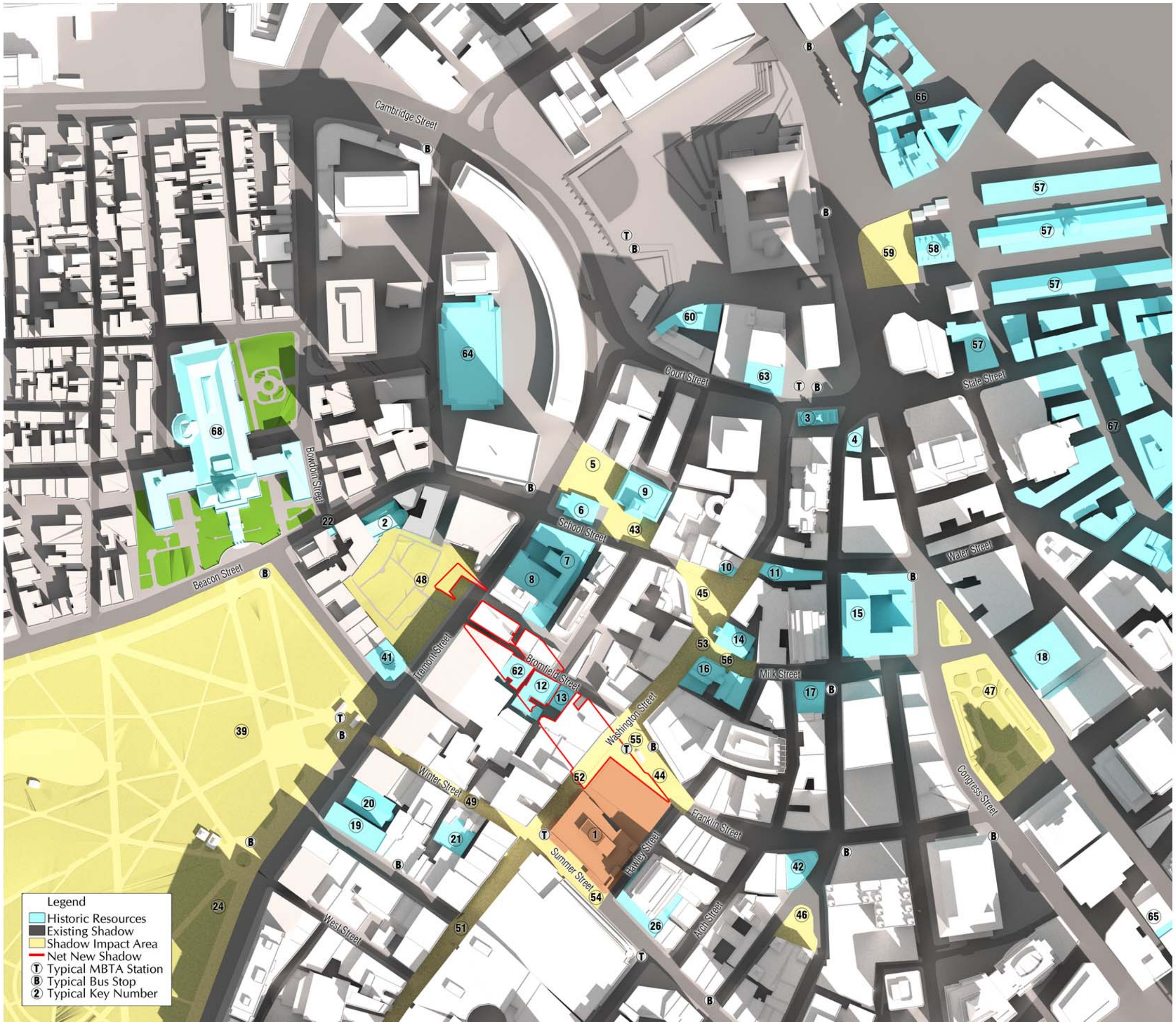


9:32AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

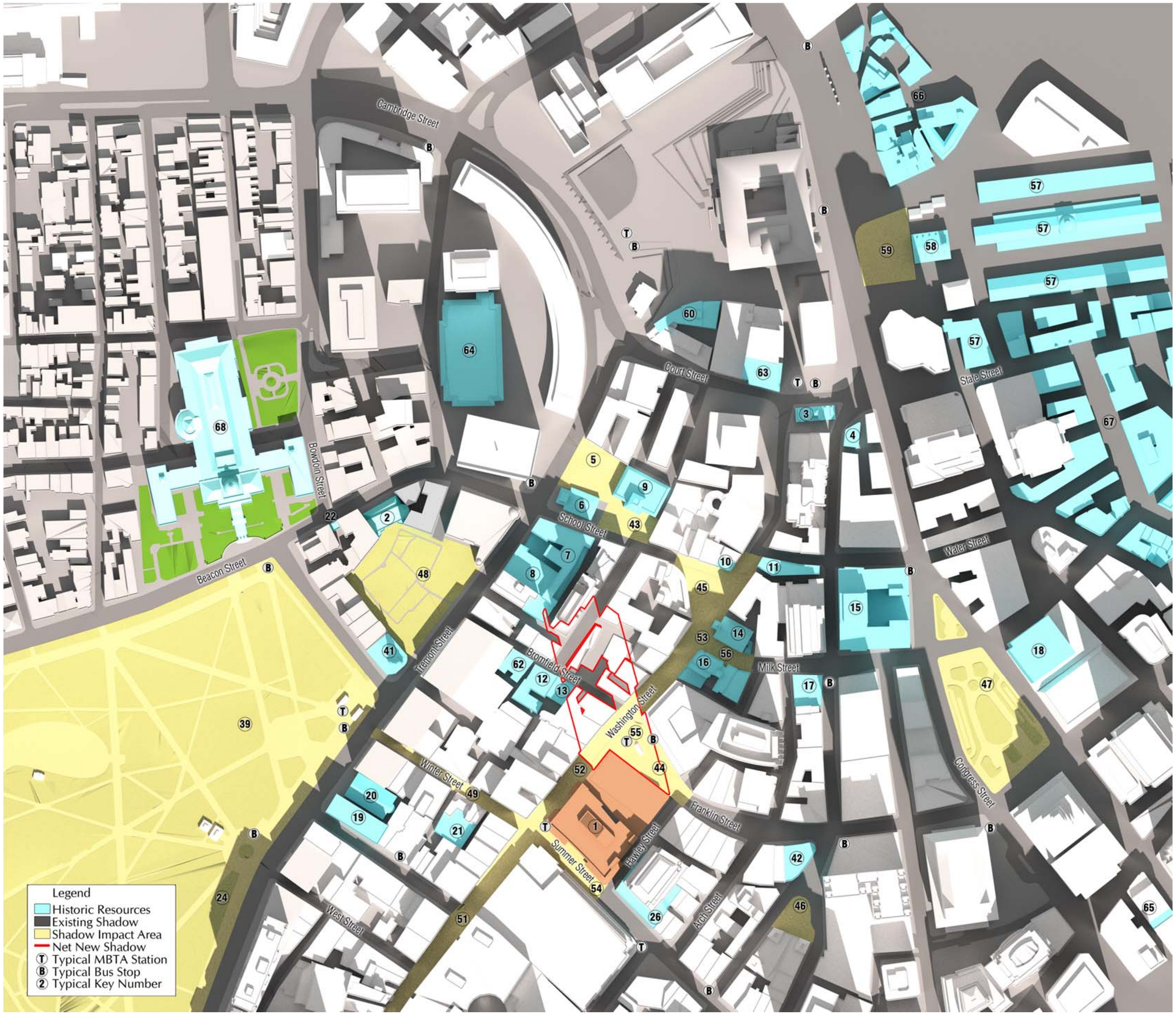


10:22AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

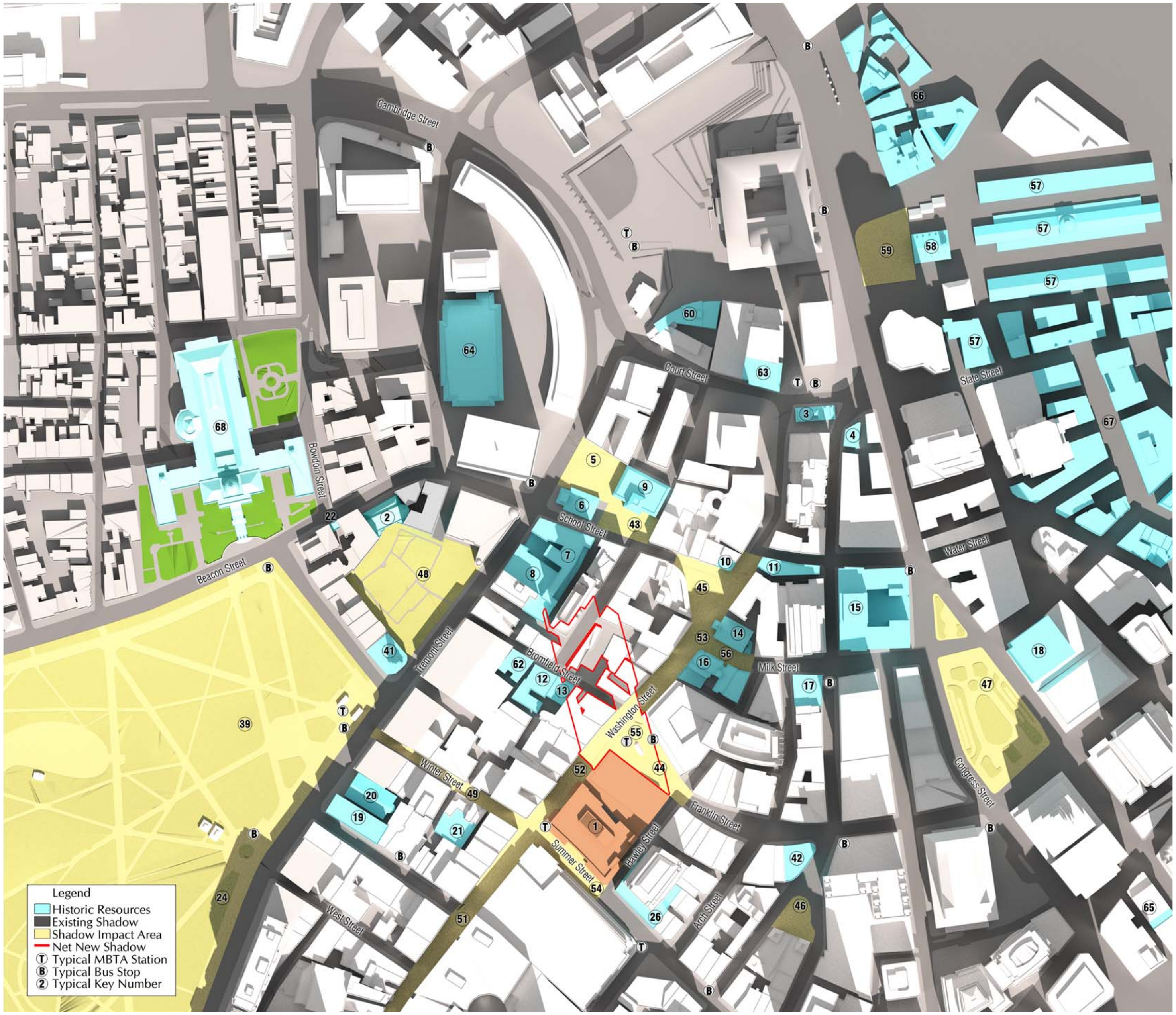
Note: Primary facade does not receive net new shadow.



Millennium Tower and Burnham Building



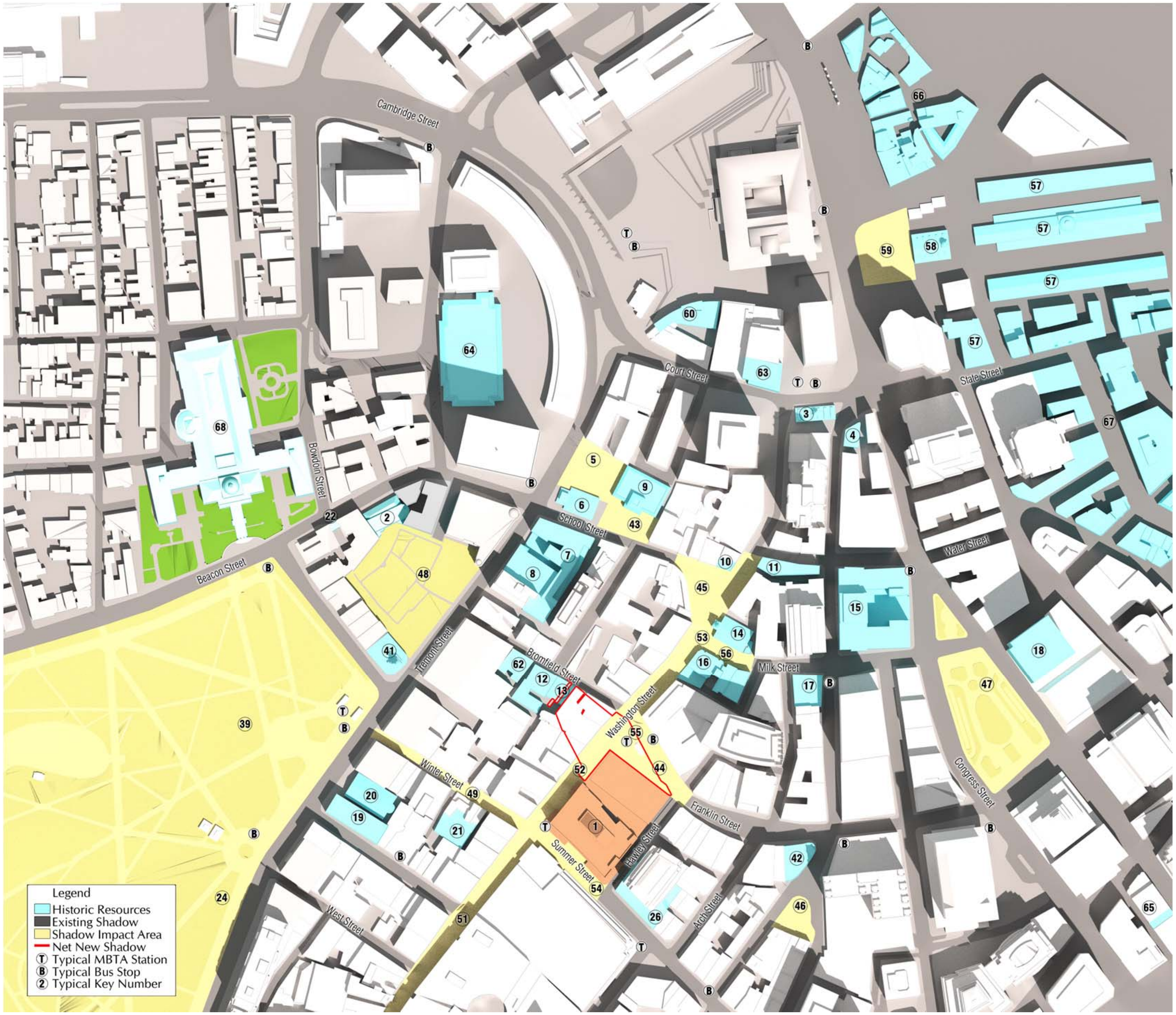
Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

20-30 Bromfield Street - 11:24 AM, June 21st



Millennium Tower and Burnham Building

March 21

13 20-30 Bromfield Street

11:00AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

11:34AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

12:10PM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

Note: Primary facade does not receive net new shadow.

June 21

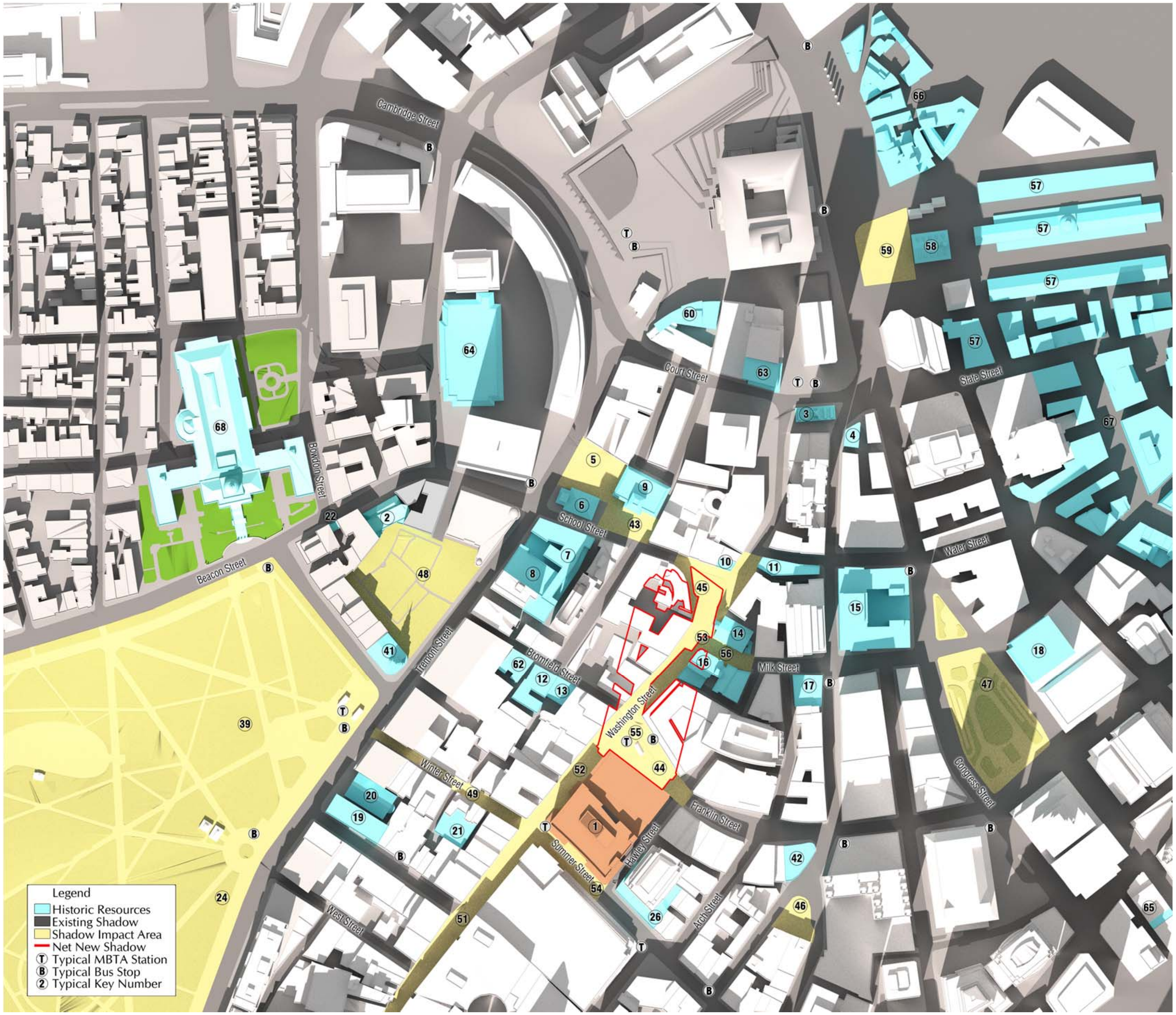
13 20-30 Bromfield Street

11:24AM
Secondary Facade
South Elevation

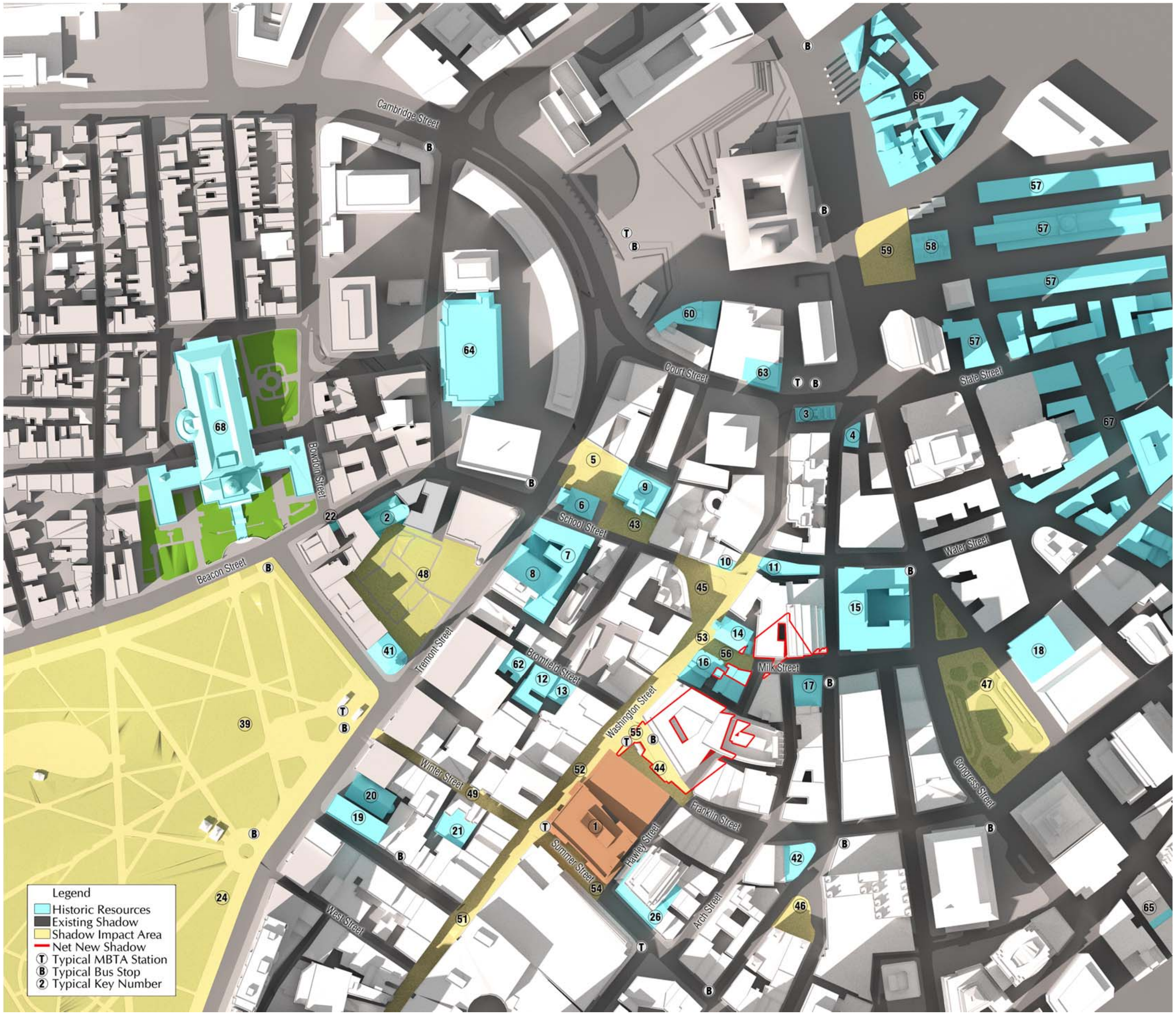
11:47AM
Secondary Facade
South Elevation

12:04PM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.



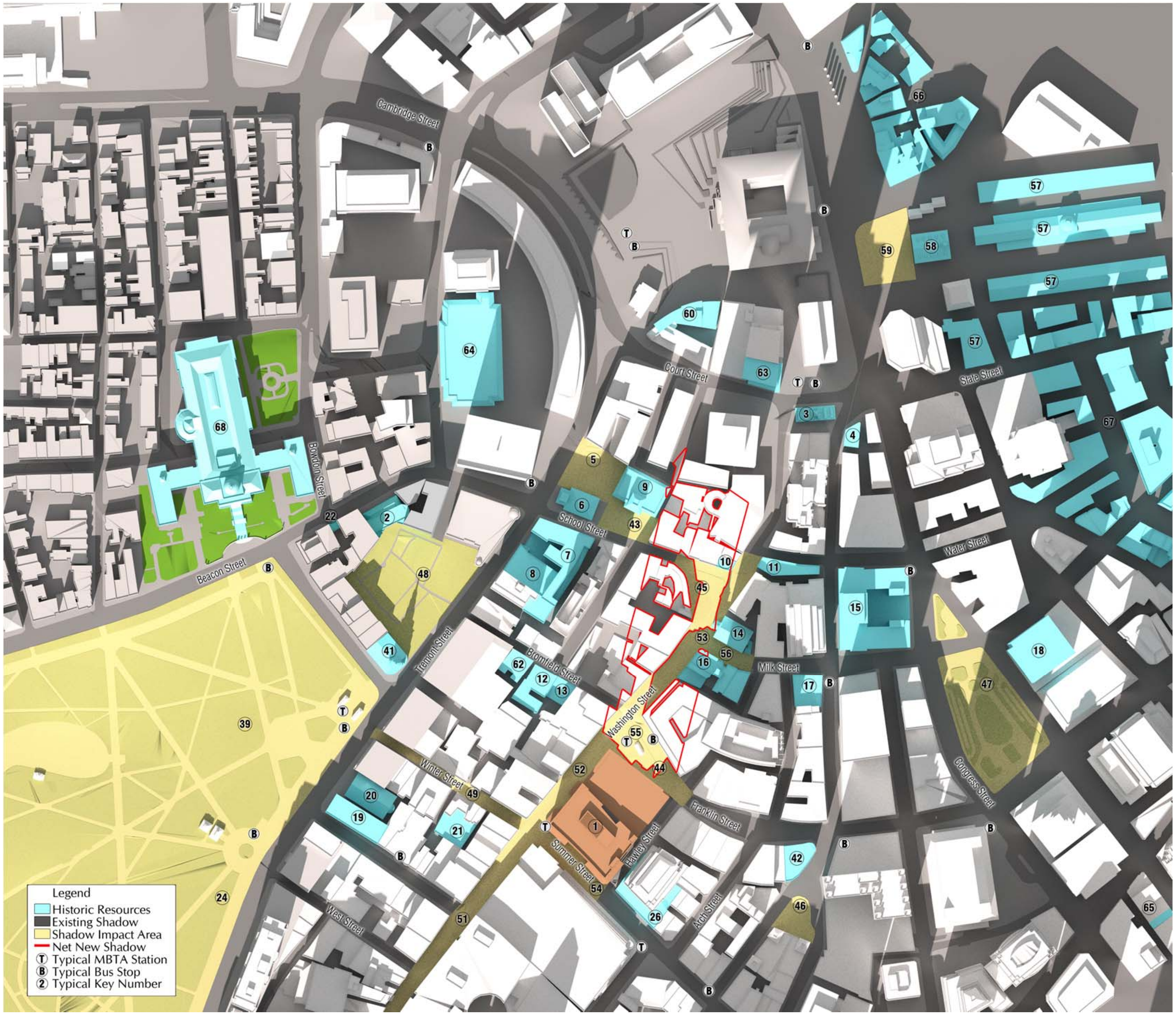
Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Old South Meeting House - 3:34 PM, March 21st



Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Old South Meeting House - 3:40 PM, October 21st

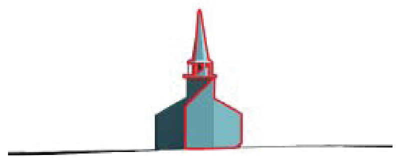
Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

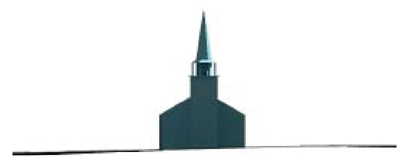
March 21

14 Old South Meeting House

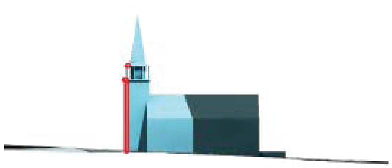
1:32PM
Primary Facade
West Elevation



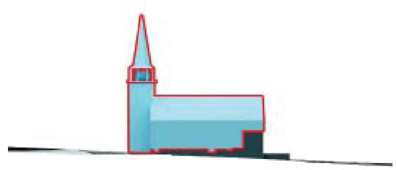
2:26PM
Primary Facade
West Elevation



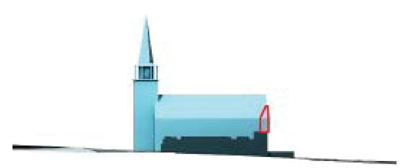
3:34PM
Primary Facade
West Elevation



1:32PM
Secondary Facade
South Elevation



2:26PM
Secondary Facade
South Elevation



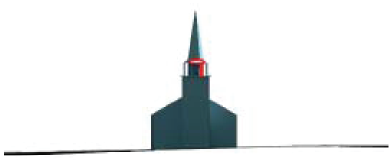
3:34PM
Secondary Facade
South Elevation

1:32PM
Secondary Facade
East Elevation

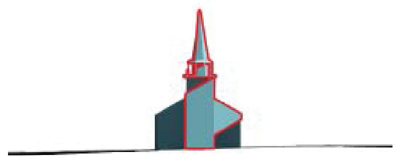
2:26PM
Secondary Facade
East Elevation

3:34PM
Secondary Facade
East Elevation

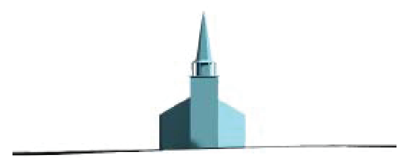
October 21 14 Old South Meeting House



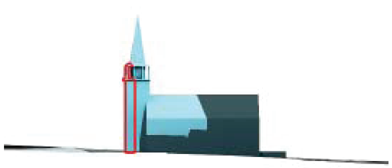
1:18PM
Primary Facade
West Elevation



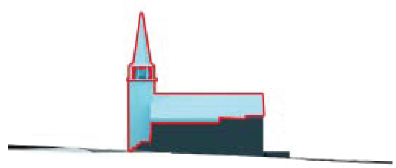
2:16PM
Primary Facade
West Elevation



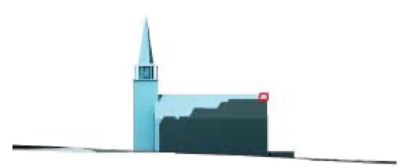
3:40PM
Primary Facade
West Elevation



1:18PM
Secondary Facade
South Elevation



2:16PM
Secondary Facade
South Elevation



3:40PM
Secondary Facade
South Elevation

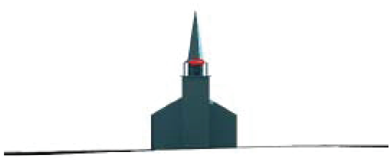
1:18PM
Secondary Facade
East Elevation

2:16PM
Secondary Facade
East Elevation

3:40PM
Secondary Facade
East Elevation

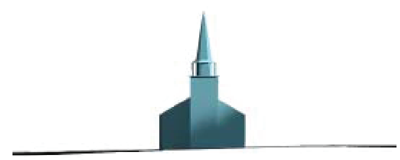
December 21

14 Old South Meeting House

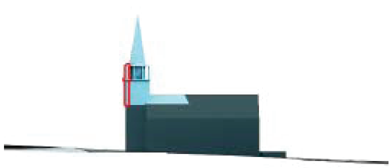


12:44PM
Primary Facade
West Elevation

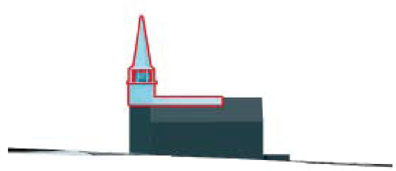
12:54PM
Primary Facade
West Elevation



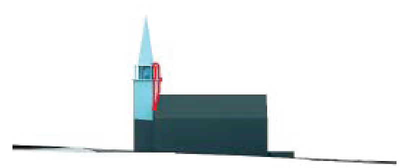
2:40PM
Primary Facade
West Elevation



12:44PM
Secondary Facade
South Elevation

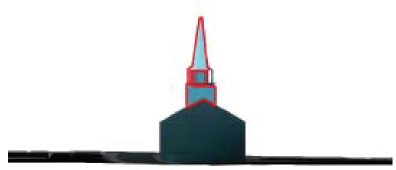


12:54PM
Secondary Facade
South Elevation

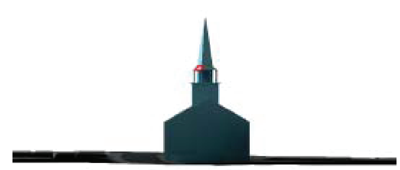


2:40PM
Secondary Facade
South Elevation

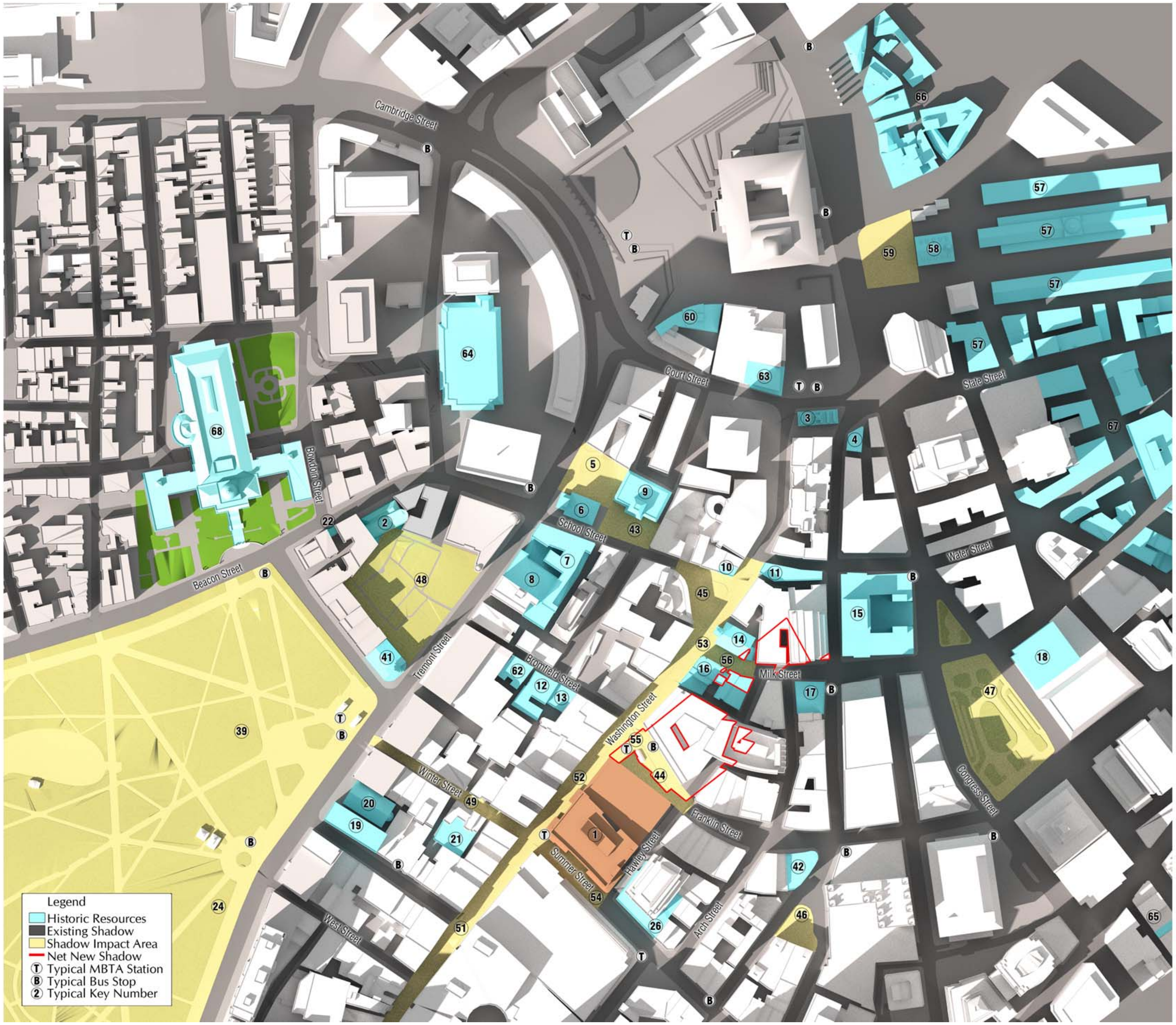
12:44PM
Secondary Facade
East Elevation



12:54PM
Secondary Facade
East Elevation



2:40PM
Secondary Facade
East Elevation



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

John W. McCormack Federal Building & Courthouse - 3:30 PM, March 21st

Millennium Tower and Burnham Building

John W. McCormack Federal Building & Courthouse - 5:00 PM, March 21st

Millennium Tower and Burnham Building

John W. McCormack Federal Building & Courthouse - 2:40 PM, October 21st

Millennium Tower and Burnham Building

John W. McCormack Federal Building & Courthouse - 2:22 PM, December 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

John W. McCormack Federal Building & Courthouse - 4:28 PM, December 21st

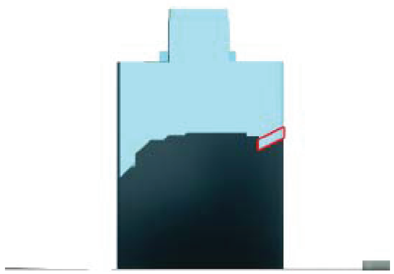
Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

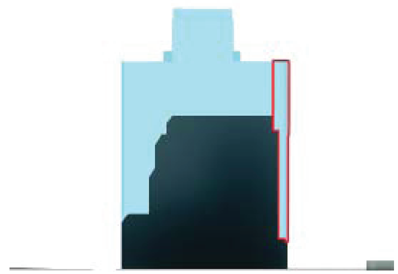
John W. McCormack Federal Building & Courthouse - 5:27 PM, October 21st

March 21

15 John W. McCormack Federal Building & Courthouse

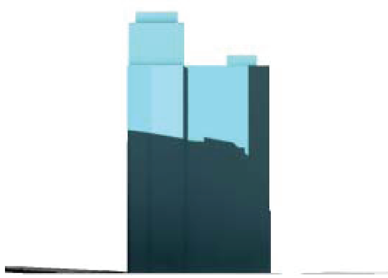


3:30PM
Secondary Facade
West Elevation

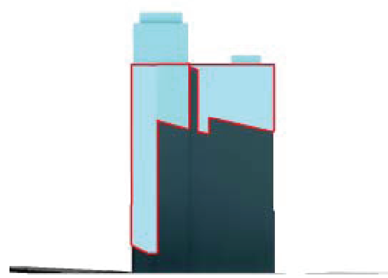


4:29PM
Secondary Facade
West Elevation

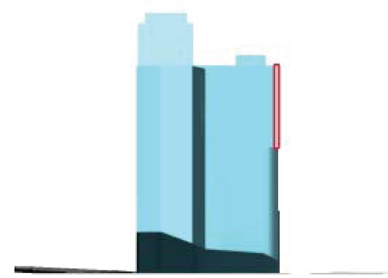
5:00PM
Secondary Facade
West Elevation



3:30PM
Secondary Facade
South Elevation



4:29PM
Secondary Facade
South Elevation

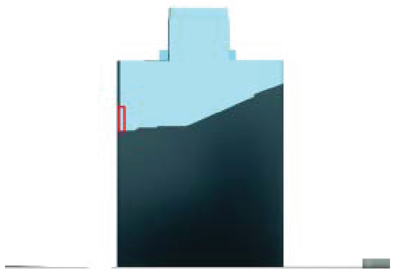


5:00PM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

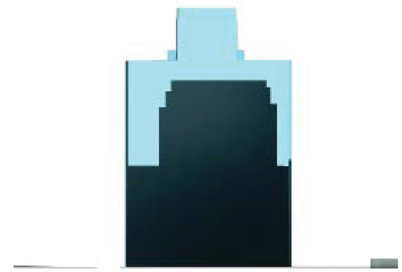
October 21

15 John W. McCormack Federal Building & Courthouse



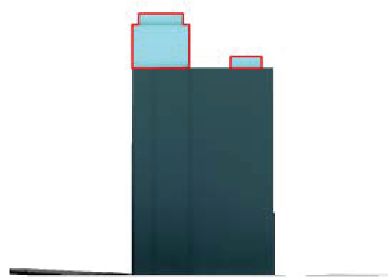
2:40PM
Secondary Facade
West Elevation

3:48PM
Secondary Facade
West Elevation

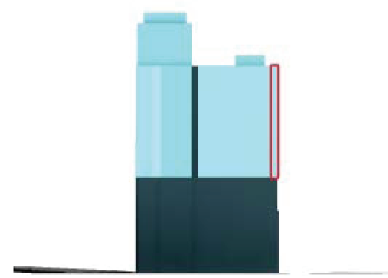


5:27PM
Secondary Facade
West Elevation

2:40PM
Secondary Facade
South Elevation



3:48PM
Secondary Facade
South Elevation



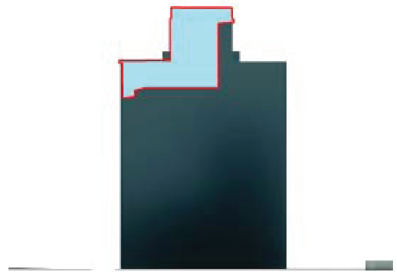
5:27PM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

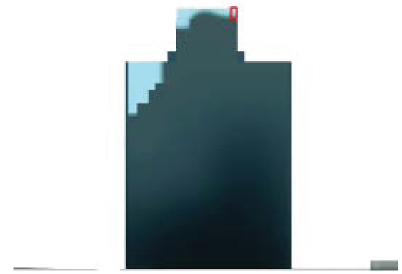
December 21

15 John W. McCormack Federal Building & Courthouse

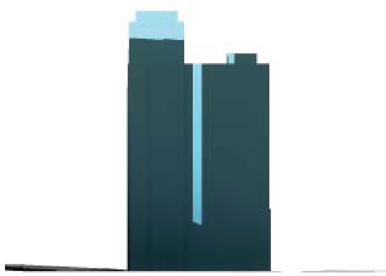
2:22PM
Secondary Facade
West Elevation



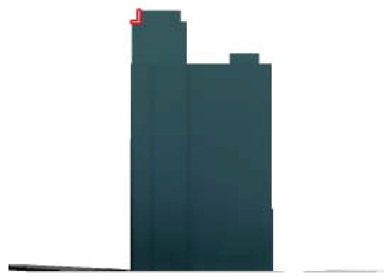
3:30PM
Secondary Facade
West Elevation



4:28PM
Secondary Facade
West Elevation



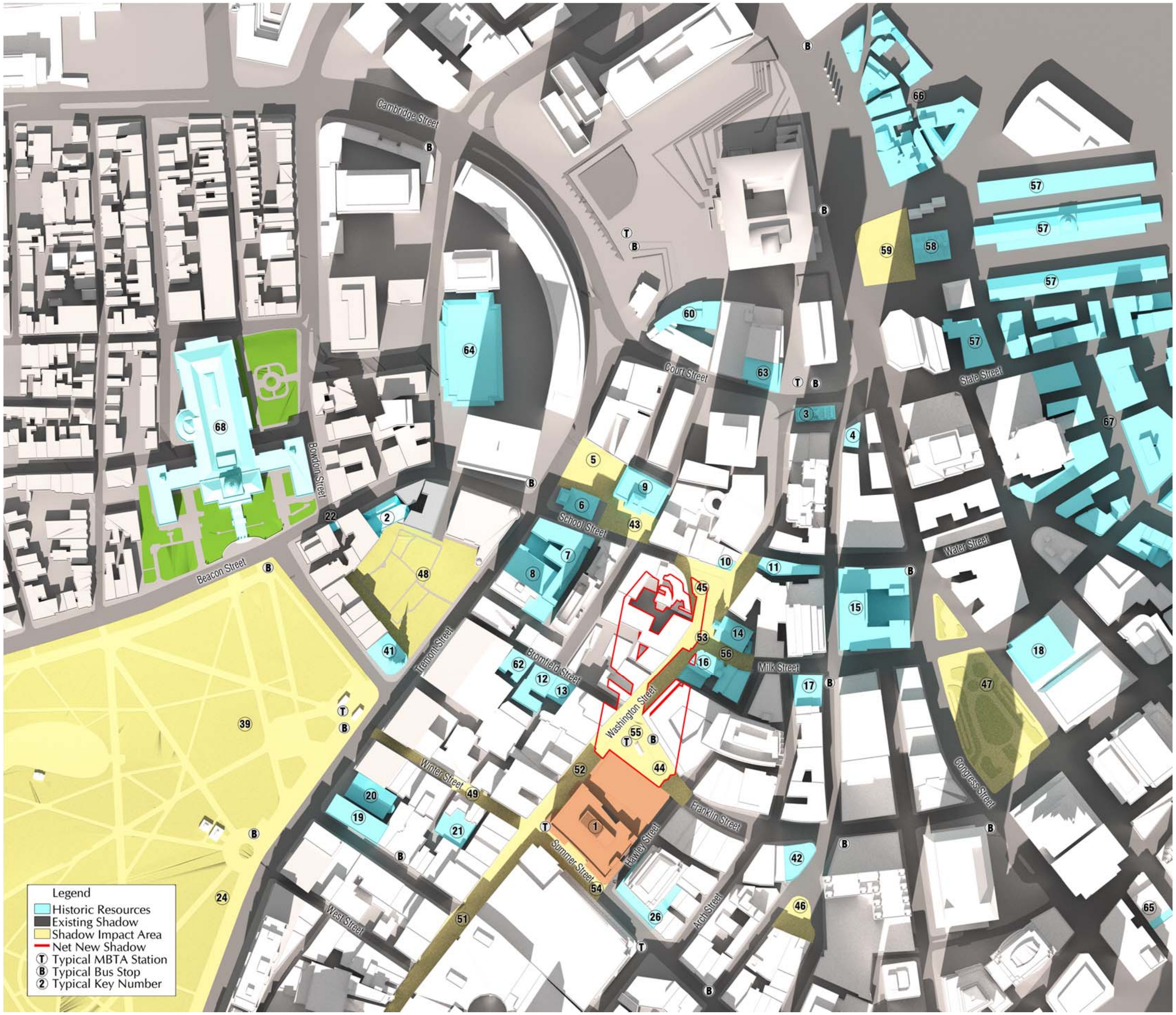
2:22PM
Secondary Facade
South Elevation



3:30PM
Secondary Facade
South Elevation

4:28PM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

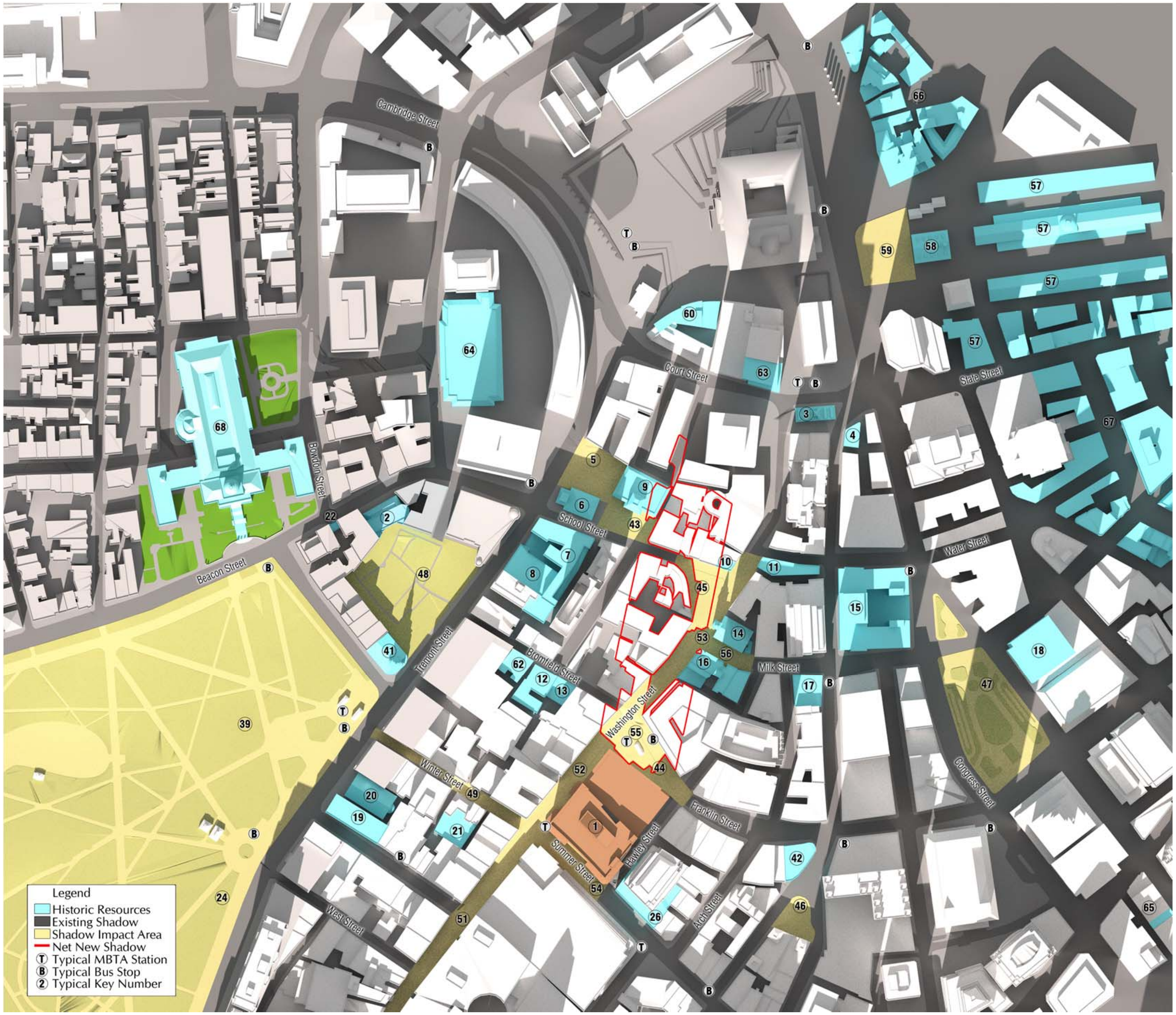


Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Newspaper Row - 1:21 PM, March 21st

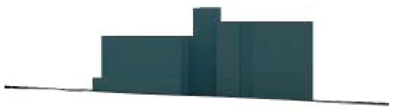
Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

October21 16 Newpaper Row



1:10PM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

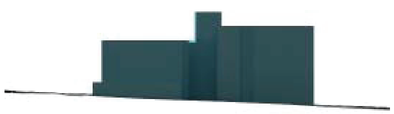
2:02PM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

2:56PM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

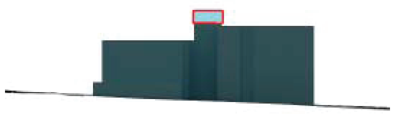
Note: Primary facade does not receive net new shadow.

March 21

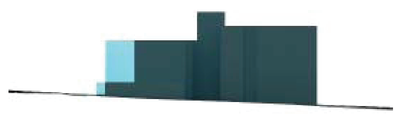
16 Newpaper Row



1:21PM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof



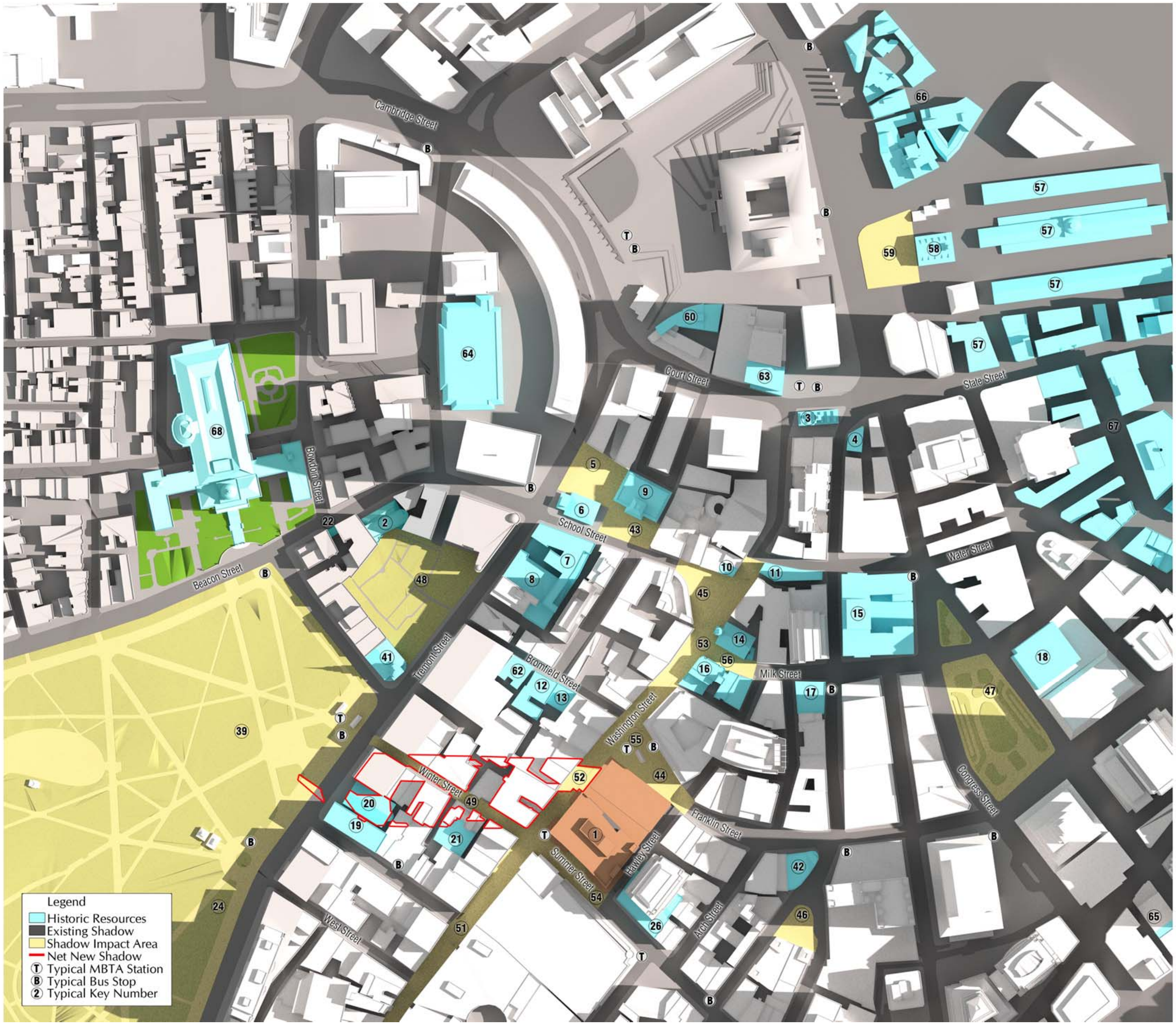
2:44PM
Secondary Facade
South Elevation



4:12PM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof

Note: Primary facade does not receive net new shadow.

Millennium Tower and Burnham Building



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

R.H. Sterns Building - 8:50 AM, June 21st

Millennium Tower and Burnham Building

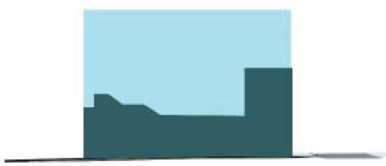
HANDEL ARCHITECTS LLP

Saint Paul's Church - 7:18 AM, June 21st

Millennium Tower and Burnham Building

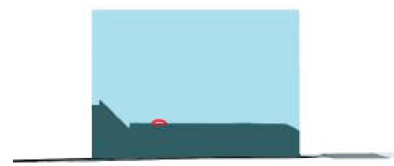
June 21

19 R.H. Sterns Building



6:40AM
Secondary Facade
North Elevation
Note: Net new shadow cast on roof

7:50AM
Secondary Facade
North Elevation



8:50AM
Secondary Facade
North Elevation

Note: Primary facade does not receive net new shadow.

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Locke-Ober Restaurant - 7:30 AM, June 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Locke-Ober Restaurant - 7:30 AM, June 21st

Millennium Tower and Burnham Building

Locke-Ober Restaurant - 8:52 AM, June 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Boston Common - 8:55 AM, March 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Boston Common - 6:10 AM, June 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Boston Common - 8:54 AM, October 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Park Street Church - 8:52 AM, March 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

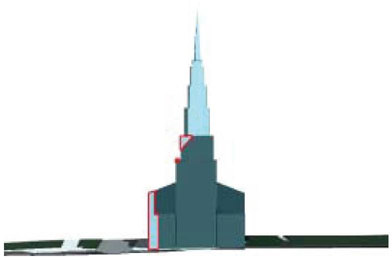
Park Street Church - 8:04 AM, October 21st

Millennium Tower and Burnham Building

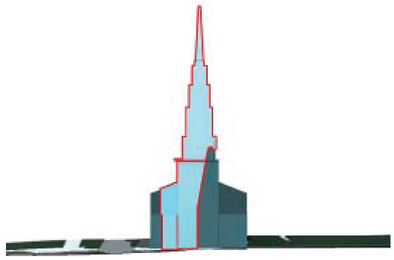
Park Street Church - 8:44 AM, October 21st

March 21

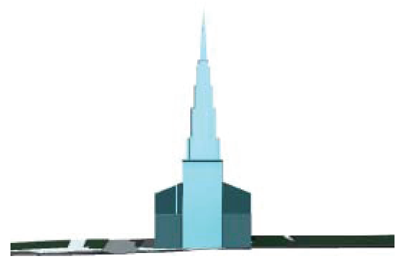
41 Park Street Church



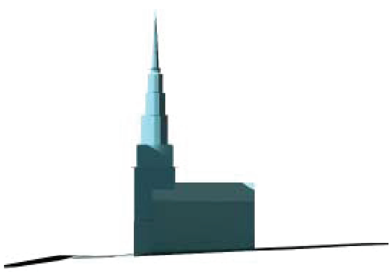
8:52AM
Primary Facade
East Elevation



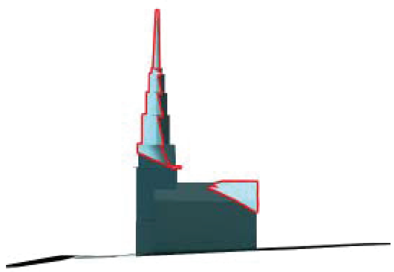
9:30AM
Primary Facade
East Elevation



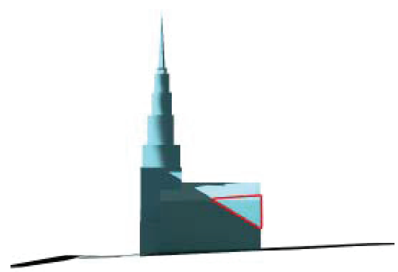
9:58AM
Primary Facade
East Elevation



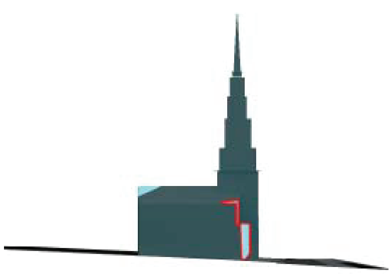
8:52AM
Secondary Facade
North Elevation



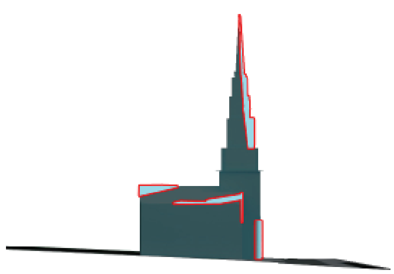
9:30AM
Secondary Facade
North Elevation



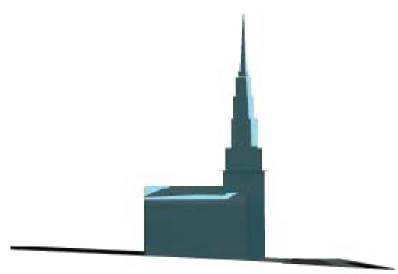
9:58AM
Secondary Facade
North Elevation



8:52AM
Secondary Facade
South Elevation



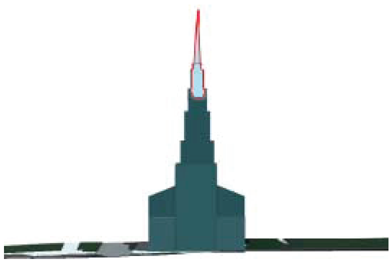
9:30AM
Secondary Facade
South Elevation



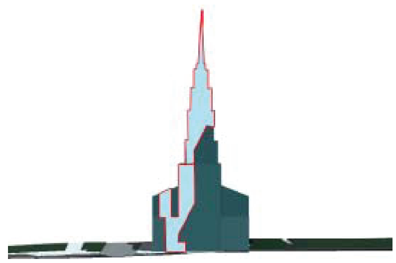
9:58AM
Secondary Facade
South Elevation

October 21

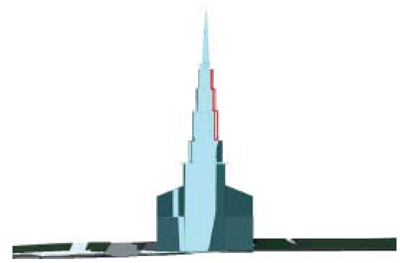
41 Park Street Church



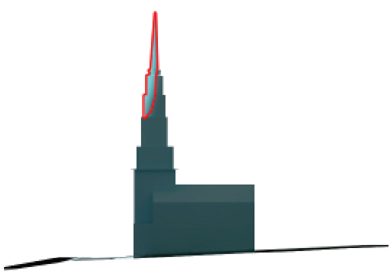
8:04AM
Primary Facade
East Elevation



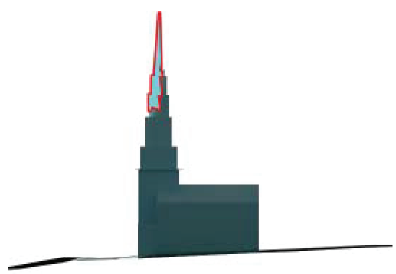
8:25AM
Primary Facade
East Elevation



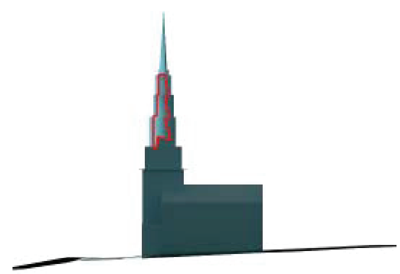
8:44AM
Primary Facade
East Elevation



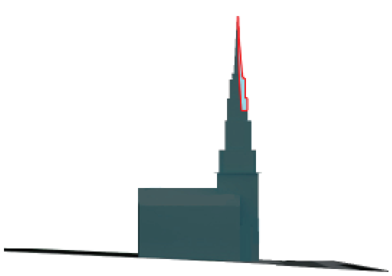
8:04AM
Secondary Facade
North Elevation



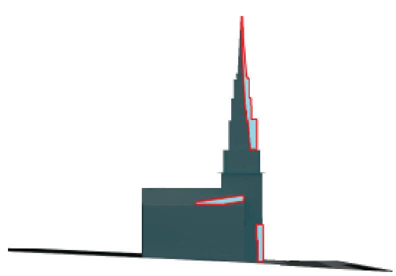
8:25AM
Secondary Facade
North Elevation



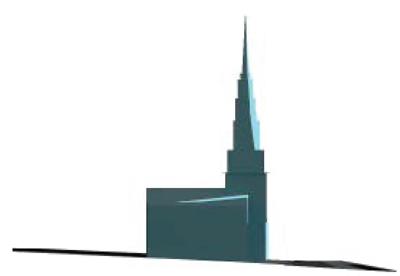
8:44AM
Secondary Facade
North Elevation



8:04AM
Secondary Facade
South Elevation



8:25AM
Secondary Facade
South Elevation



8:44AM
Secondary Facade
South Elevation

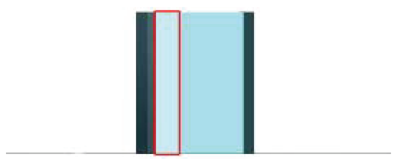
Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

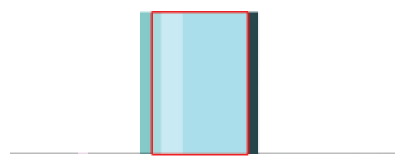
Wigglesworth Building - 7:54 PM, June 21st

June 21

42 Wigglesworth Building

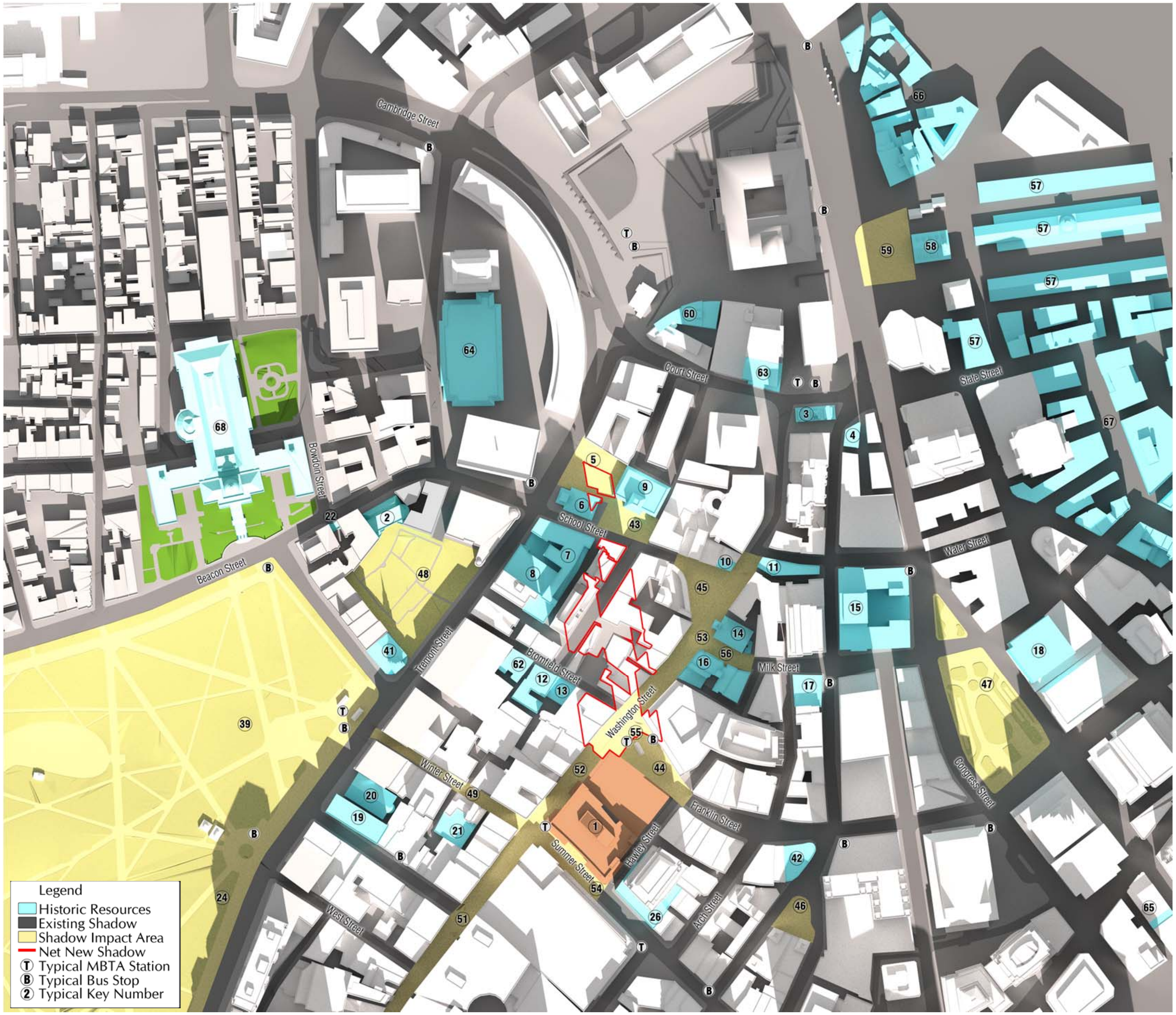


5:38PM
Primary Facade
North Elevation



6:20PM
Primary Facade
North Elevation

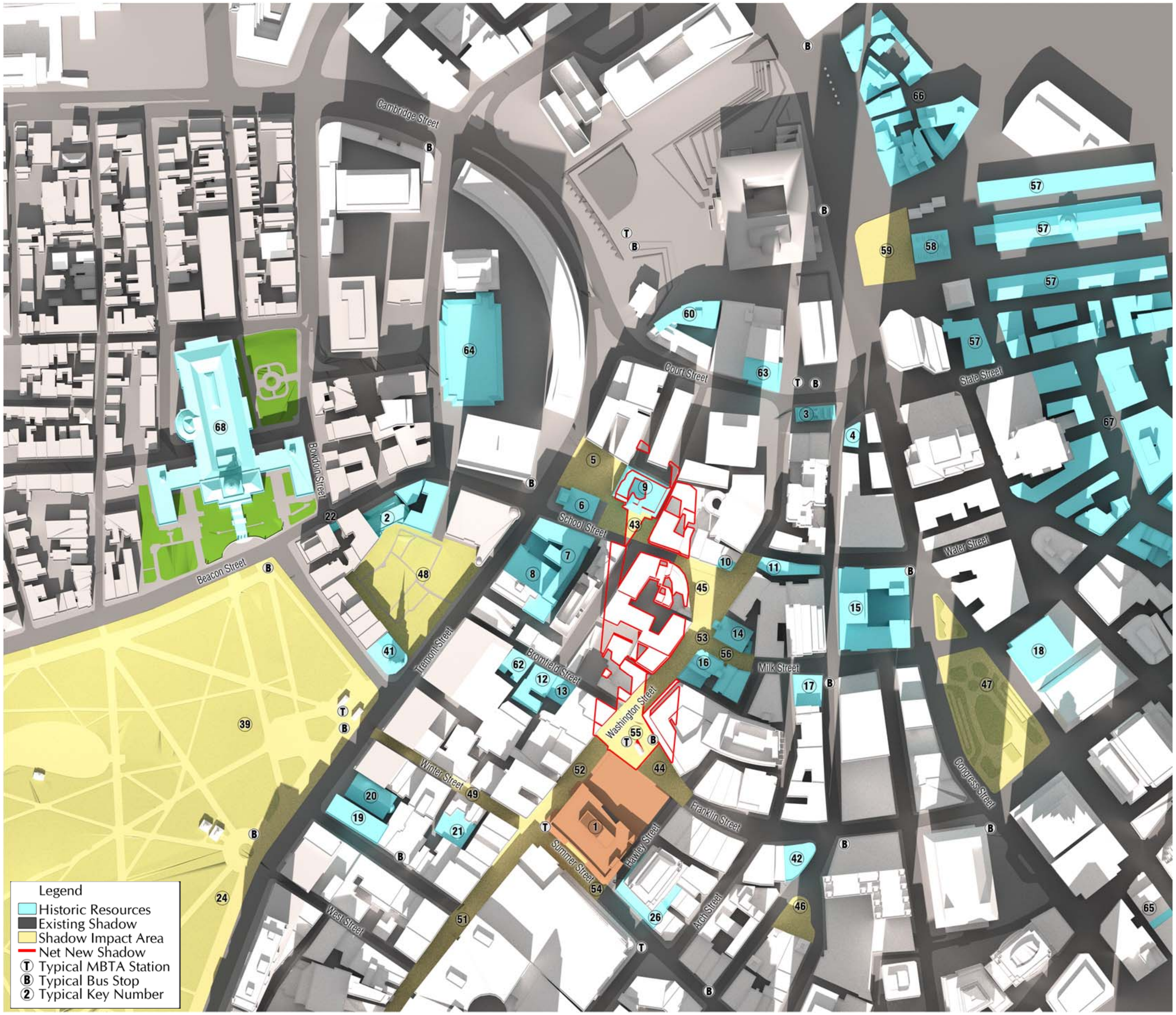
7:54PM
Primary Facade
North Elevation
Note: Net new shadow cast on roof



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

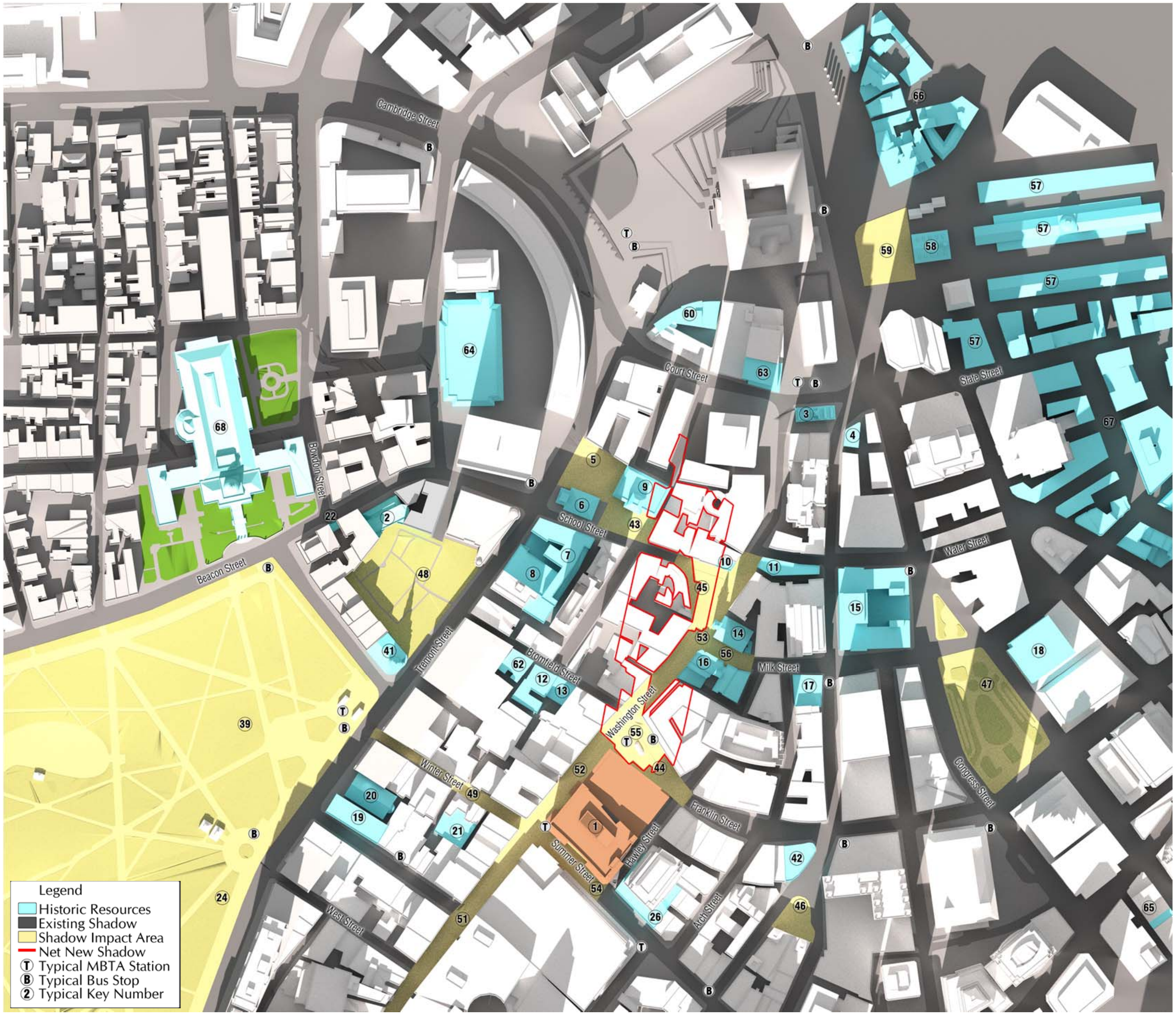
Old City Hall Plaza - 11:56 AM, October 21st



Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Old City Hall Plaza - 12:45 PM, October 21st



Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

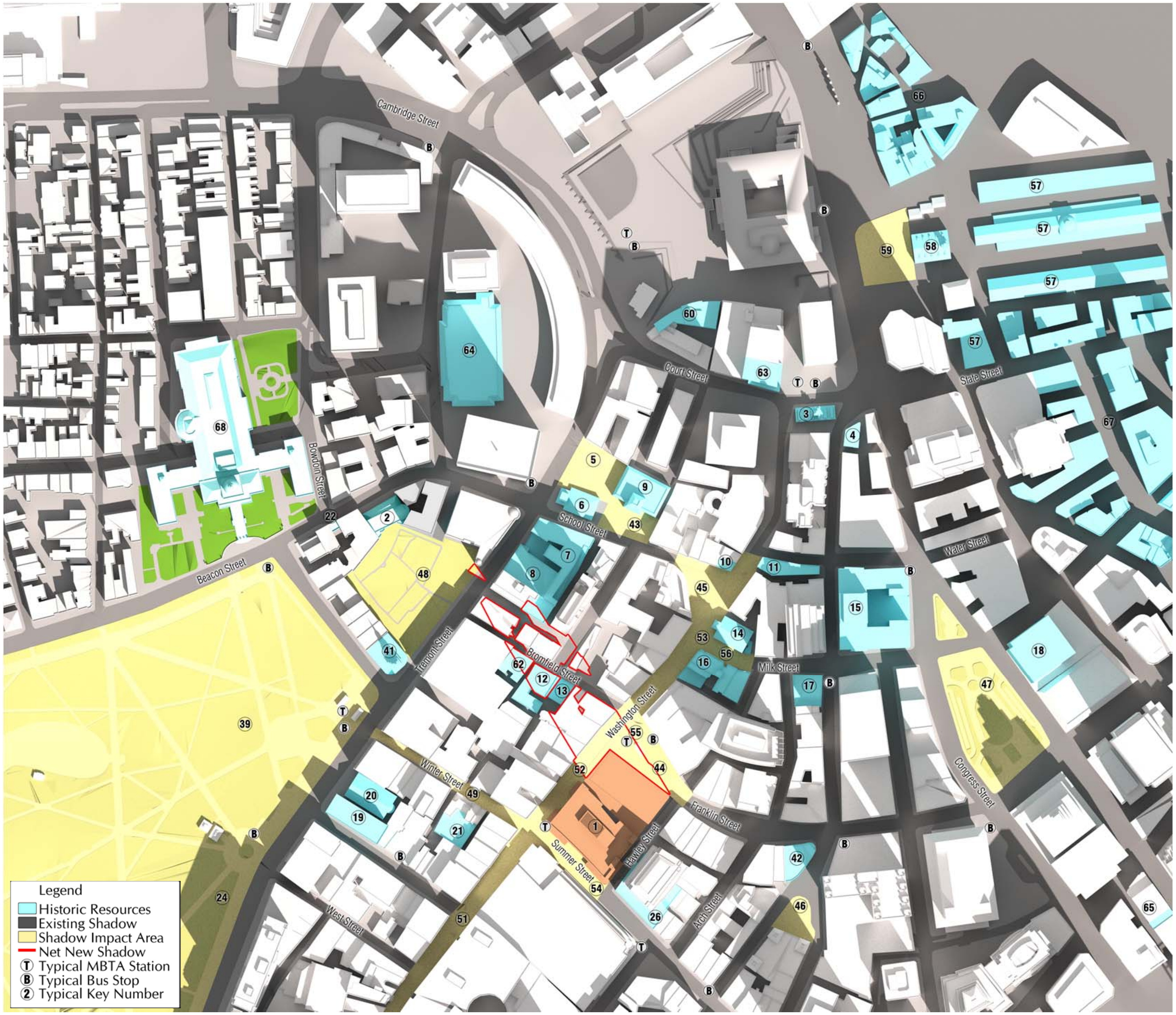
HANDEL ARCHITECTS LLP

Old Granary Burial Ground - 9:36 AM, March 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Old Granary Burial Ground - 10:15 AM, March 21st



Millennium Tower and Burnham Building

Old Granary Burial Ground - 11:20 AM, March 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Old Granary Burial Ground - 8:58 AM, October 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Old Granary Burial Ground - 10:50 AM, October 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

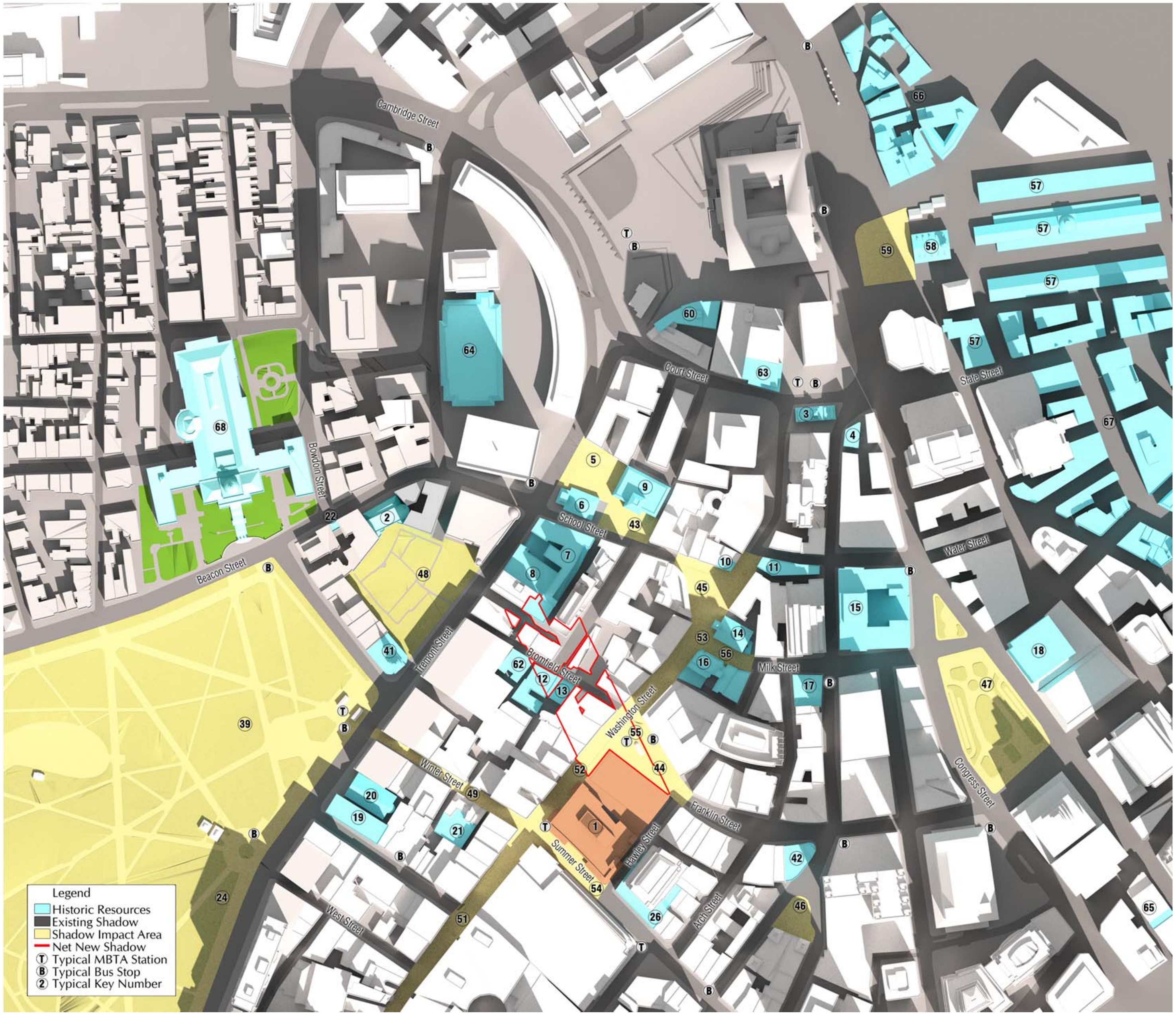
Quincy Market - 2:07 PM, December 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Publicity Building 40-44 Bromfield Street - 10:06 AM, March 21st



Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Publicity Building 40-44 Bromfield Street - 9:10 AM, October 21st

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

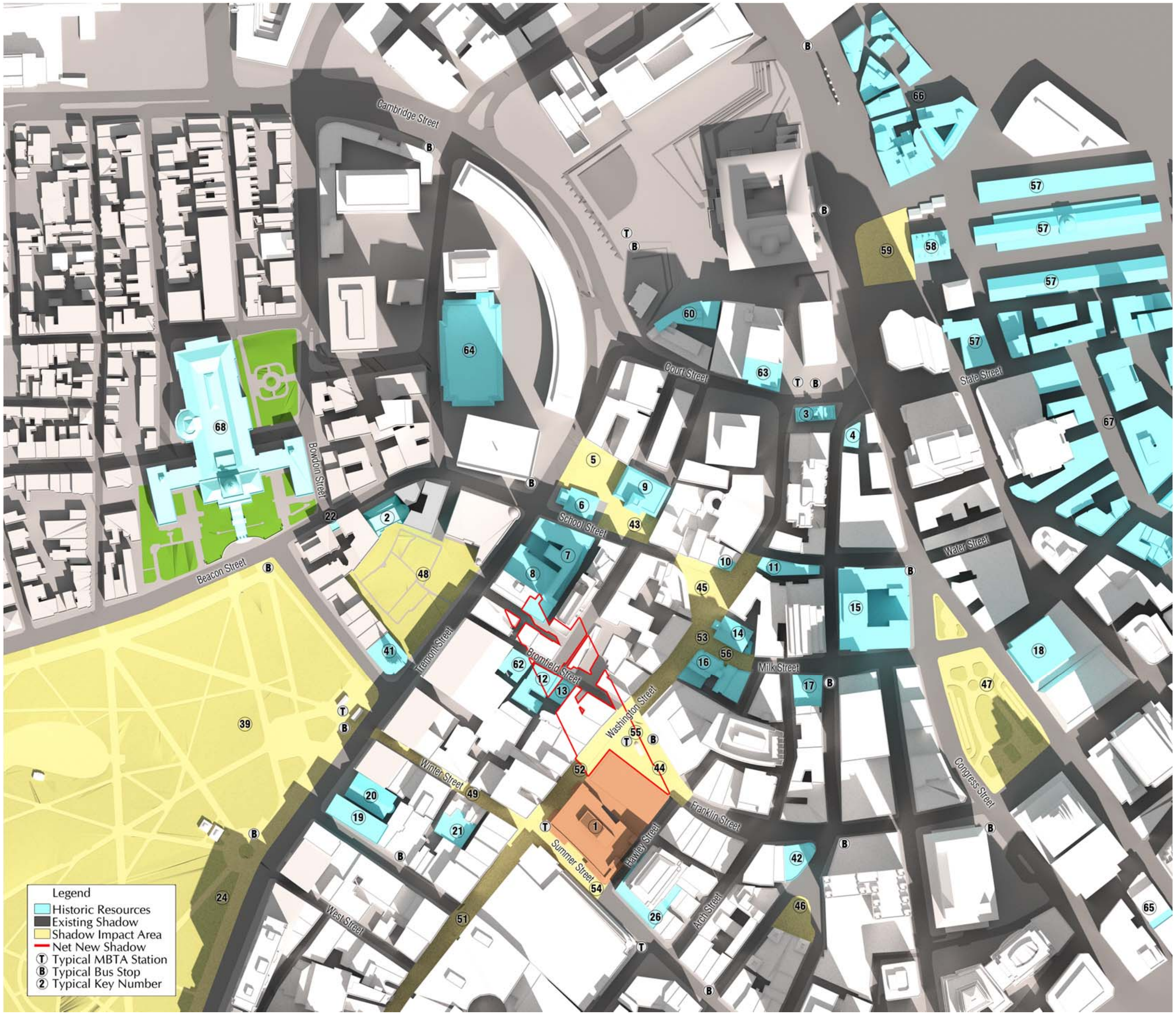
HANDEL ARCHITECTS LLP

Publicity Building 40-44 Bromfield Street - 9:56 AM, December 21st

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Publicity Building 40-44 Bromfield Street - 10:06 AM, March 21st



Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

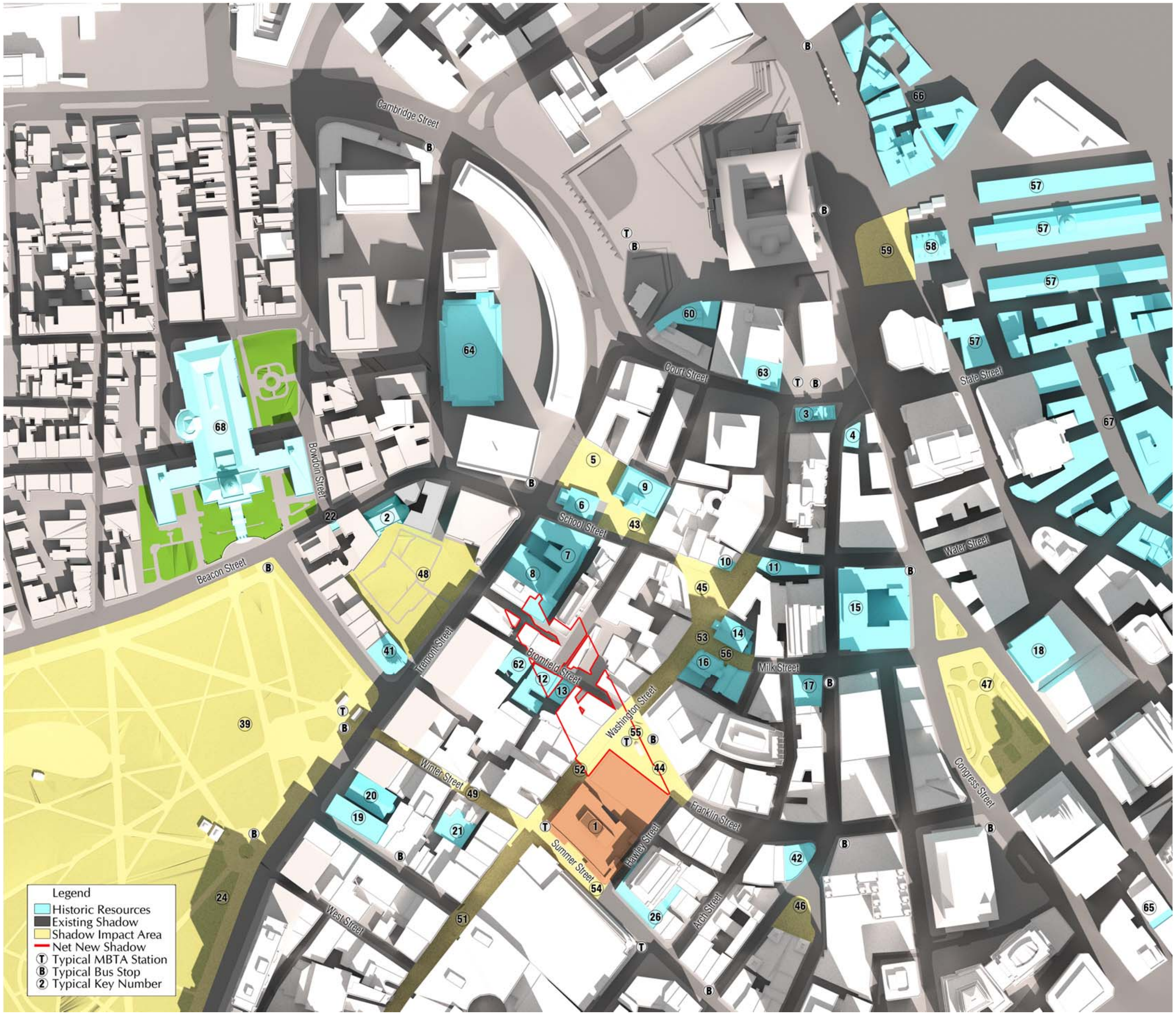
Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Publicity Building 40-44 Bromfield Street - 10:06 AM, March 21st



Millennium Tower and Burnham Building

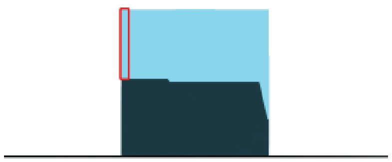
Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

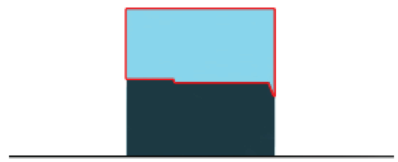
Millennium Tower and Burnham Building

March 21

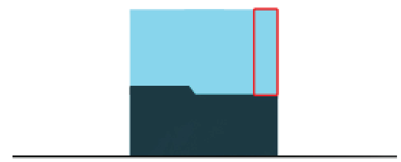
62 Publicity Building 40-44 Bromfield Street



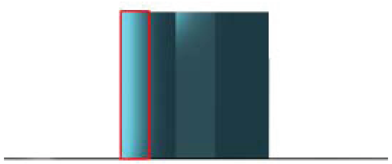
10:06AM
Secondary Facade
East Elevation



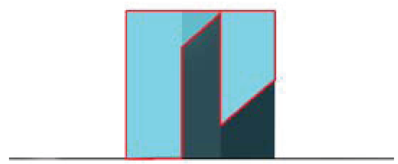
10:50AM
Secondary Facade
East Elevation



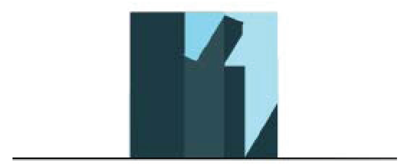
11:38AM
Secondary Facade
East Elevation



10:06AM
Secondary Facade
South Elevation



10:50AM
Secondary Facade
South Elevation

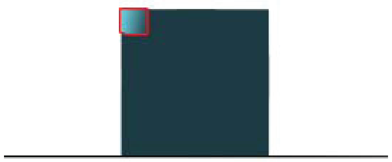


11:38AM
Secondary Facade
South Elevation

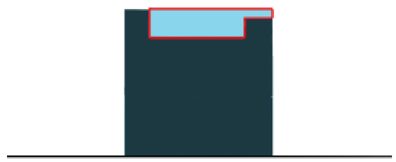
Note: Primary facade does not receive net new shadow.

December 21

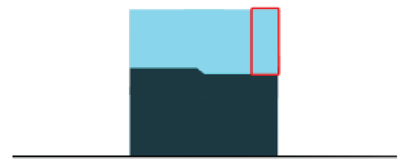
62 Publicity Building 40-44 Bromfield Street



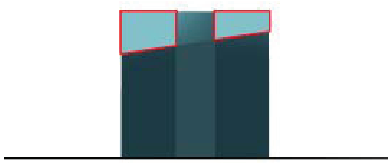
8:14AM
Secondary Facade
East Elevation



8:25AM
Secondary Facade
East Elevation

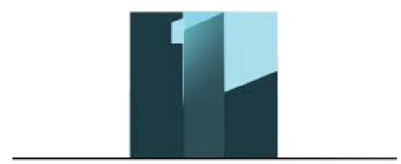


9:56AM
Secondary Facade
East Elevation



8:14AM
Secondary Facade
South Elevation

8:25AM
Secondary Facade
South Elevation

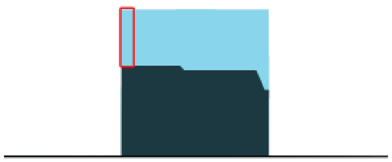


9:56AM
Secondary Facade
South Elevation

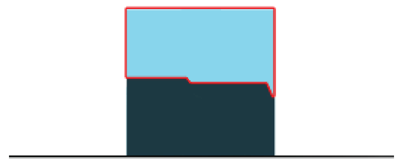
Note: Primary facade does not receive net new shadow.

October 21

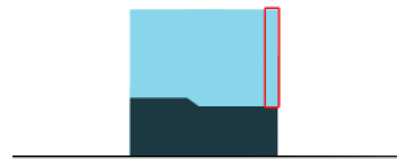
62 Publicity Building 40-44 Bromfield Street



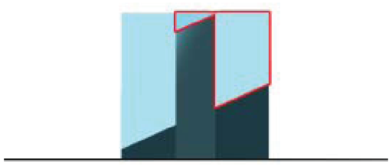
9:10AM
Secondary Facade
East Elevation



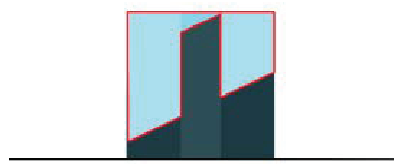
9:50AM
Secondary Facade
East Elevation



10:58AM
Secondary Facade
East Elevation



9:10AM
Secondary Facade
South Elevation



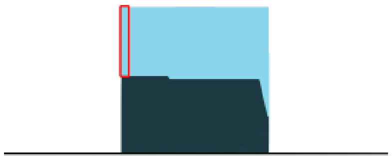
9:50AM
Secondary Facade
South Elevation

10:58AM
Secondary Facade
South Elevation

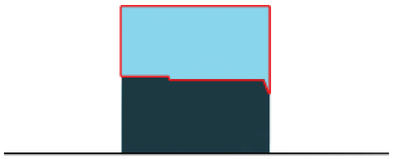
Note: Primary facade does not receive net new shadow.

March 21

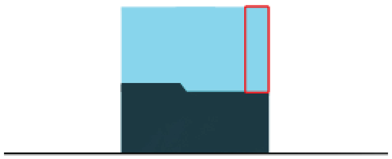
62 Publicity Building 40-44 Bromfield Street



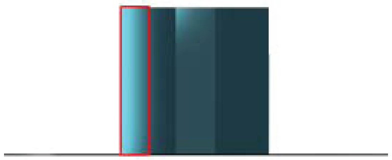
10:06AM
Secondary Facade
East Elevation



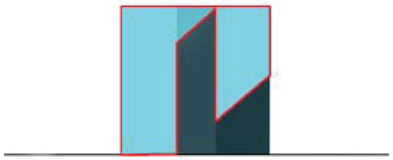
10:50AM
Secondary Facade
East Elevation



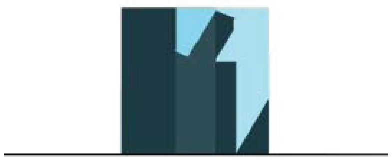
11:38AM
Secondary Facade
East Elevation



10:06AM
Secondary Facade
South Elevation



10:50AM
Secondary Facade
South Elevation

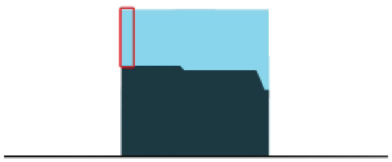


11:38AM
Secondary Facade
South Elevation

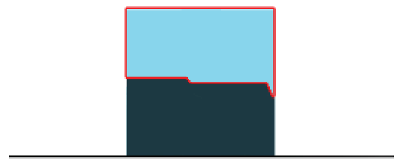
Note: Primary facade does not receive net new shadow.

October 21

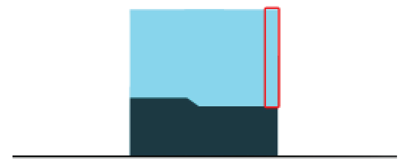
62 Publicity Building 40-44 Bromfield Street



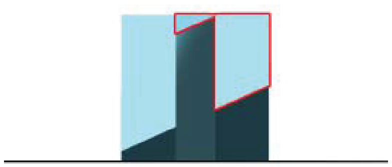
9:10AM
Secondary Facade
East Elevation



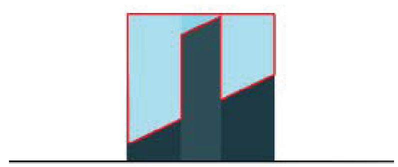
9:50AM
Secondary Facade
East Elevation



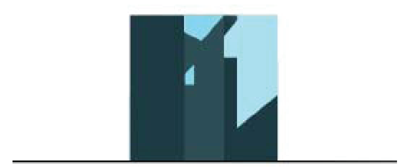
10:58AM
Secondary Facade
East Elevation



9:10AM
Secondary Facade
South Elevation



9:50AM
Secondary Facade
South Elevation

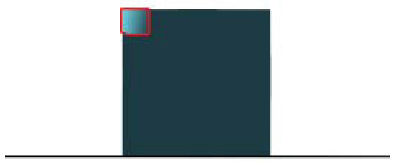


10:58AM
Secondary Facade
South Elevation

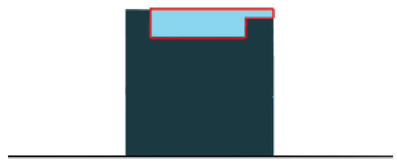
Note: Primary facade does not receive net new shadow.

December 21

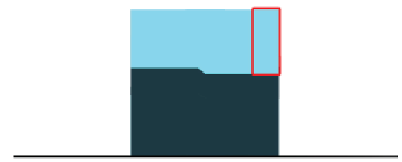
62 Publicity Building 40-44 Bromfield Street



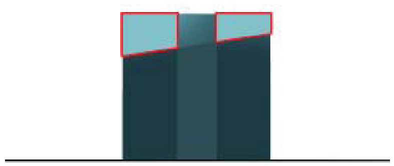
8:14AM
Secondary Facade
East Elevation



8:25AM
Secondary Facade
East Elevation

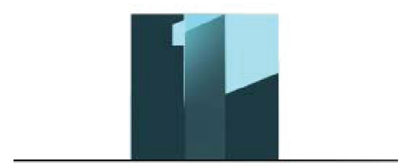


9:56AM
Secondary Facade
East Elevation



8:14AM
Secondary Facade
South Elevation

8:25AM
Secondary Facade
South Elevation



9:56AM
Secondary Facade
South Elevation

Note: Primary facade does not receive net new shadow.

Millennium Tower and Burnham Building

HANDEL ARCHITECTS LLP

Massachusetts State House - 8:14 AM, October 21st

Millennium Tower and Burnham Building

Massachusetts State House - 9:58 AM, October 21st

Millennium Tower and Burnham Building

Massachusetts State House - 8:00 AM, December 21st

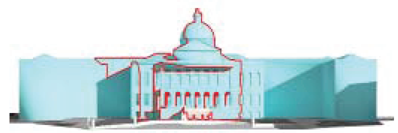
Millennium Tower and Burnham Building

Millennium Tower and Burnham Building

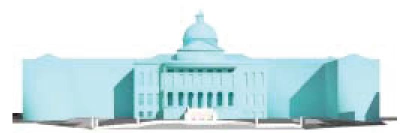
October 21

68 Massachusetts State House

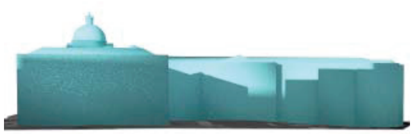
8:14AM
Primary Facade
East Elevation



9:02AM
Primary Facade
East Elevation



9:58AM
Primary Facade
East Elevation



8:14AM
Secondary Facade
South Elevation

9:02AM
Secondary Facade
South Elevation

9:58AM
Secondary Facade
South Elevation

December 21

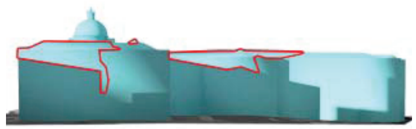
68 Massachusetts State House

8:00AM
Primary Facade
East Elevation
Note: Net new shadow cast on roof

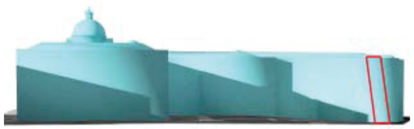
8:16AM
Primary Facade
East Elevation

8:56AM
Primary Facade
East Elevation

8:00AM
Secondary Facade
South Elevation
Note: Net new shadow cast on roof



8:16AM
Secondary Facade
South Elevation



8:56AM
Secondary Facade
South Elevation