



# 500 Huntington Avenue

Boston, Mission Hill, Massachusetts

## Supplemental Materials in Support of Development Plan for PDA No. 92

**June 24, 2013**

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**Boston Redevelopment Authority**

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Urban Planning   Environmental Consulting   Project Permitting

TRANSPORTATION STUDY

# *500 Huntington Avenue Planned Development Area*

Boston  
Massachusetts

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Prepared for **Wentworth Institute of Technology**  
**Boston, Massachusetts**

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June 2013

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# Introduction and Summary of Findings

This Transportation and Parking Management/Mitigation Plan evaluates the transportation impacts of the proposed future development of the Sweeney Field parcel (500 Huntington Avenue) and recommends transportation improvements to address the impacts on the transportation system serving the site and surrounding area. The three major chapters of this Transportation report include:

- Introduction and Summary of Findings;
- Existing Transportation Conditions; and
- Future Transportation Conditions.

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## Summary of Findings

This section highlights the expected impacts of the proposed 500 Huntington Avenue development on various transportation modes, including roadways; bus, subway and rail transit; pedestrian circulation; bicycle accommodation; transportation demand management (TDM); parking; and loading.

The Sweeney Field site is served by a transportation system which provides good vehicular and transit access, and pedestrian and bicycle accommodations. In addition, Wentworth provides a comprehensive transportation demand management (TDM) program to encourage use of alternative modes of travel instead of driving alone. The non-Wentworth development on the site will also provide a comprehensive TDM program.

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## Proposed Project

The proposed development for the three-acre Sweeney Field site will include office, research and development (R&D), and ground floor retail space with below grade parking. The 640,000 square foot (sf) program includes:

- 78,400 sf Wentworth Center for Innovation in Engineering and Technology
- 244,800 sf of non-institutional office space
- 301,800 sf of non-institutional research and development (R&D) space
- 15,000 sf of retail space
- 410 underground parking spaces



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## Traffic

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### Existing

The project site is a triangular shaped parcel bordered by Huntington Avenue, a major east-west corridor through the city; Ruggles Street, a major corridor that connects I 93 with the Longwood Medical and Academic Area (LMA); and Parker Street, which connects Huntington Avenue and Ruggles Street on the east side of the site.

Traffic operations were analyzed at nine signalized intersections and one unsignalized intersection adjacent to, and near, the project site. With the exception of Huntington Avenue at Longwood Avenue and Ruggles Street at Tremont Street, all other signalized intersections operate at acceptable levels of service (LOS D or better) during both morning and evening peak hours. At the unsignalized intersection of Ruggles Street at Albert Street, the critical eastbound left-turn movement operates at acceptable levels of service during both peak hours.

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### No-Build

Traffic operations for future conditions without the proposed project (No-Build conditions) were analyzed to establish a base for comparison with projected traffic conditions with the proposed project (Build conditions). Future 2020 traffic conditions established for the Wentworth Institutional Master Plan (IMP) were used for the No-Build analysis. These 2020 traffic volumes were based on an expected growth rate of 0.5 percent per year in general background traffic, traffic from several specific proposed developments in the area (including the LMA), and traffic associated with changes at Wentworth, including the Wentworth IMP projects.

The signalized intersections of Huntington Avenue at Longwood Avenue and Ruggles Street at Tremont Street will continue to operate at deficient levels of service under No-Build conditions. The intersection of Huntington Avenue at Louis Prang Street/ Ruggles Street will deteriorate to a deficient LOS E and LOS F during the morning and evening peak hours, respectively. All other signalized intersections will also experience a slight increase in delay, but will continue to operate at acceptable levels of service during both peak hours.

The unsignalized intersection of Ruggles Street at Albert Street will decline from LOS D to a deficient LOS F during the morning peak hour. The high traffic volumes on Ruggles Street during the morning peak hour make it difficult for traffic exiting Albert Street to find gaps to make left-turns onto Ruggles Street.



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## Build

The Build condition adds traffic generated by the proposed project to the No-Build traffic described above. Person trip generation for the project was calculated by applying vehicle trip rates from *Trip Generation*, 8th Edition, Institute of Transportation Engineers (ITE), 2008 to the non-institutional building program. These vehicle trips were converted to person trips by dividing by an assumed vehicle occupancy rate (VOR) of 1.05. Project vehicle trips were calculated from the total person trips by applying the appropriate vehicle mode share (49.6 percent) and VOR (1.22) for the area (based on census journey-to-work data). Approximately 310 vehicles are projected to be generated by the project in each peak hour.

The signalized intersection of Huntington Avenue at Louis Prang Street/Ruggles Street will deteriorate from LOS E to LOS F during the morning peak hour. Huntington Avenue at Parker Street/Forsyth Way will experience a decline in level of service from LOS D to LOS E during the evening peak hour. At the intersection of Ruggles Street at Parker Street, the level of service will decline from LOS C to LOS E during the evening peak hours. All other signalized intersections will experience a slight increase in delay, but will continue to operate at acceptable levels of service during both peak hours.

The eastbound left-turn movement from the site driveway will operate at LOS E during the evening peak hour under the Build Condition. The cause for the deficiency is the heavy volume of traffic on Parker Street, which provides a limited number of gaps for exiting traffic, especially for left-turning vehicles.

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## Mitigation

The project includes mitigation measures for the intersection of Ruggles and Parker Street. The proposed mitigation involves the widening of the northwest (Wentworth) side of Parker Street on the approaches to Ruggles Street. The roadway will be widened by 10 feet to provide an exclusive left-turn lane and a through/right-turn lane on each Parker Street approach to Ruggles Street. The proposed improvement will result in LOS C operations at the intersection in both the morning and evening peak hours. This improvement is consistent with the future bicycle accommodations on Parker Street proposed as part of the City's Emerald Necklace/Southwest Corridor Connector (bicycle).



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## Transit

The project site campus is readily accessible by public transportation, including rapid transit, bus service, and commuter rail. The Museum of Fine Arts stop on the E Branch of the Green Line is located in the median of Huntington Avenue directly in front of the project site. A mid-block crosswalk provides a direct connection across



eastbound Huntington Avenue between the project site and the Museum stop. Ruggles station, which is within a half-mile of the site provides access to the Orange Line, three commuter rail lines serving the south side, and about a dozen bus routes. Five of those bus routes travel along Ruggles Street past the project site.

About 210 transit trips are projected to be generated by the planned non-institutional uses in each peak hour. Between 175 and 180 transit riders will be moving in the peak direction toward the site in the morning and away from the site in the evening. Given the variety of transit modes available to the site and the geographic distribution of trips, the impact on any one transit mode will be small.

The proposed project will be set back from Ruggles Street and will have no impact on the corridor identified for the Urban Ring project.



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## Pedestrians and Bicycles

The Sweeney Field development will include pedestrian access across the site between Huntington Avenue and Parker Street and the provision of on-site bicycle accommodations.

The Sweeney Field site is bordered by sidewalks on all sides. Traffic signals at the three intersections of the three streets bordering the triangular site provide for protected pedestrian crossings of each street at all three locations. As noted above, a mid-block crossing of Huntington Avenue provides access to the Museum of Fine Arts Green Line stop as well as to the Museum itself on the opposite side of Huntington Avenue. The planned development will include a pedestrian path across the site between the Huntington Avenue crossing and the arch in Northeastern's West Village on Parker Street.

The existing Sweeney Field does not include any bicycle storage. The proposed development will include bicycle storage facilities and on-site showers and lockers for commuters.



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## Parking

The Project will provide a 410-space underground garage with the entrance on Parker Street. The garage will contain three card controlled gates on the first level. Two gates can be operated in the peak direction to assure that entering vehicles do not queue onto Parker Street. The proposed 410-space parking supply is consistent with the Boston Transportation Department guideline of .75 spaces per 1,000 square feet (sf) for office and research & development parking in the Fenway area.



Parking demand for Wentworth's Innovation Center will be accommodated in Wentworth parking facilities on its campus as described in its IMP. The staff of the Innovation Center will be relocated from the main campus and their parking demand has already been accounted for in Wentworth's IMP.



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## Transportation Demand Management

The 78,400 sf Center for Innovation will be part of Wentworth, which has an extensive program of transportation demand management (TDM) measures, including the following, which will be available to employees in the Center:

- A \$72 per month MBTA Charlie Card subsidy to employees
- Participation in the MBTA Corporate Pass Program, providing tax-free withholding from employees' pay for transit passes
- Membership in the MASCO Transportation Management Association (TMA)
- Financial support for MASCO shuttle service to campus
- Carpool/vanpool matching through MASCO TMA
- Preferential parking for carpools/vanpools
- Participation in the Bike Week Commuter Challenge
- Posting transit schedules and routes
- Provisions for motorcycle parking
- Emergency Ride Home via MASCO's Commute Works Program
- Although there are no car sharing spaces on campus, there are four Zipcars near the campus: two at the Museum of Fine Arts and two at Vancouver and Ward streets

The proponent will encourage tenants to adopt an extensive TDM program for their employees.



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## Loading

The loading area for 500 Huntington Avenue will be located off Parker Street and will provide four loading bays. All vehicles using the loading area will be able to maneuver inside the loading bay, allowing them to drive directly in and out. The loading area will accommodate service vehicles and deliveries for the office, R&D, and retail space, and for the Center for Innovation.

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## Study Methodology

The transportation assessment was conducted in three stages. The first stage involved an assessment of existing transportation systems serving the Sweeney Field site and the Wentworth campus. This included traffic, parking, transit, pedestrian



and bicycle accommodations, and transportation demand management. The traffic and parking inventory included existing roadway geometry and traffic volumes; peak period intersection turning movement counts; traffic operations analysis and review of vehicular crash data.

The second stage of the study established the framework for evaluating the transportation impacts of the proposed project. Specific travel demand forecasts for the proposed project were assessed along with future traffic demands on the study area roadways, including transportation demand associated with Wentworth IMP projects.

The third and final stage involved conducting traffic analyses of projected future roadway capacities and demands with (Build) and without (No Build) the proposed Sweeney Field development. Comparison of the Build and No Build conditions provides an assessment of the likely traffic impacts associated with the proposed project. Possible impacts on other transportation systems were also analyzed and, where warranted, potential mitigation measures were explored and identified.

# Existing Transportation Conditions

This section provides a description of the existing transportation system serving the Sweeney Filed site (see Figure 5-1), including roadways, parking, transit, bicycle accommodations, and pedestrian access. It includes an inventory of the infrastructure and services provided by each system as well as analyses of traffic operations and intersection levels of service.

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## Traffic

This traffic section describes existing roadways and intersections, traffic volumes, and traffic operations and levels of service. The description for the roadway network serving the Sweeney Field site includes number of lanes, traffic volumes from 48 hour traffic recorder counts, and circulation. Traffic volumes, and traffic operations and level of service analyses are presented for eleven intersections.

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## Roadway System

The roadways serving the Sweeney Field site include two regional arterial roadways and one collector roadway. These roadways are shown in Figure 1 and described below.

**Huntington Avenue** – Huntington Avenue is a four-lane median divided highway, which borders Sweeney Field on the north. It is designated as Route 9, which is a major east-west corridor between downtown Boston, and communities to the west, including Brookline and Newton. The median contains the MBTA’s E Branch of the Green Line. Each side of the roadway provides two travel lanes and no parking is allowed on either side.

**Ruggles Street** – Ruggles Street is part of a major north-south corridor that connects I-93 to the south with the Longwood Medical and Academic Area to the north. It separates the main part of the Wentworth campus on the west from Sweeney Athletic Field on the east. Adjacent to Sweeney Field and the Wentworth campus it provides three lanes, one in the southbound direction and two northbound. No parking is allowed on Ruggles Street.

**Parker Street** – Parker Street is a two-way, two-lane roadway between Huntington Avenue and Tremont Street. It borders Sweeney Field and separates it from Northeastern University’s West Village. Metered parking is provided on both sides between Huntington Avenue and Ruggles Street. West of Ruggles Street unrestricted parking is generally allowed on both sides adjacent to the Wentworth campus.



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## Traffic Volumes

Forty-eight hour Automatic traffic recorder (ATR) counts were taken in October 2012 at four locations near Sweeney Field:

- Huntington Avenue east of Parker Street
- Huntington Avenue west of Ruggles Street
- Parker Street south of Huntington Avenue
- Ruggles Street south of Huntington Avenue

The total daily and peak hour traffic volumes by direction for each location are presented in Table 1. Count data sheets are included in the Appendix. In April 2009, automatic traffic recorder counts were conducted as part of the Wentworth Institutional Master Plan. These counts are also included in Table 1 for comparison.

Huntington Avenue is the busiest roadway in the area, averaging between 20,450 and 22,300 vehicles per day in both directions. Volumes are nearly balanced in each direction in both peak hours. Ruggles Street is the next busiest roadway with approximately 14,000 vehicles north of Parker Street. The busiest morning hour was 7:00 to 8:00 except for Huntington Avenue, which peaked between 8:00 and 9:00. At all locations, the evening peak hour volume occurred between 5:00 and 6:00.





Table 1 Existing Daily and Peak Hour Traffic Volumes<sup>1</sup>

Location	Daily <sup>2</sup>	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
		Volume <sup>3</sup>	K <sup>4</sup>	Peak Direction	Volume <sup>3</sup>	K <sup>4</sup>	Peak Direction
<i>Huntington Avenue – West of Louis Prang Street</i>							
<i>April 2009</i>	25,379	1,576	6%	51% EB	1,705	7%	51% EB
<i>October 2012</i>	22,341	1,324	6%	54% EB	1,410	6%	55% EB
<i>Huntington Avenue – East of Parker Street</i>							
<i>October 2012</i>	20,461	1,141	6%	55% WB	1476	7%	51% WB
<i>Ruggles Street – South of Huntington Avenue (Route 9)</i>							
<i>April 2009</i>	16,938	1,251	7%	58% NB	1,148	7%	53% NB
<i>December 2009</i>	16,555	1,155	7%	52% SB	1,077	7%	51% SB
<i>October 2012</i>	13,862	779	6%	55% NB	783	6%	51% NB
<i>Ruggles Street – Between Leon Street and Parker Street</i>							
<i>April 2009</i>	17,837	1,281	7%	56% NB	1,317	7%	50% NB/SB
<i>Parker Street – Between Ruggles Street and Huntington Avenue (Route 9)</i>							
<i>October 2012</i>	9,328	643	7%	54% NB	696	7%	54% WB

1. Based on automatic traffic recorder
2. Vehicles per day
3. Vehicles per peak hour
4. Percentage of daily traffic that occurs during the peak hour

## Traffic Operations

The relationship between the capacity of an intersection and the demands placed on it is a fundamental consideration in evaluating how well an intersection accommodates the traveling public. The assessment of traffic operations provides a technical evaluation of the operational qualities of intersections using procedures documented in the 2000 Highway Capacity Manual.

Level of service (LOS) is the term used to denote the different operating conditions which occur at an intersection under various traffic volume loads. It is a qualitative measure of the effect of a number of factors including roadway geometry, speed, and travel delay. Level of service provides an index to the operational qualities of an intersection with level of service designations ranging from A to F. LOS A represents the best operating conditions and LOS F represents the worst operating conditions. Levels of service A through D are considered acceptable conditions in urban areas. Levels of service E and F are considered deficient.

LOS designation is reported differently for signalized and unsignalized intersections. For signalized intersections, the analysis considers the operation of each lane or lane group entering the intersection and provides a LOS designation for each approach as well as for the overall intersection. For unsignalized intersections, the analysis assumes that traffic on the main street is not affected by traffic on the side streets.



Level of service is determined only for left turns from the main street into the minor street and for all movements from the minor street. The intersection LOS designation is for the most critical (i.e., worst) minor movement, which is often the left-turn movement from the side street.

Traffic operations at the following eleven intersections near the project site were analyzed:

- Huntington Avenue and Longwood Avenue
- Huntington Avenue and Evans Way
- Huntington Avenue and Ruggles Street/Louis Prang Street
- Huntington Avenue and Parker Street/Forsyth Way
- Huntington Avenue and Forsyth Street
- Ruggles Street and Parker Street
- Ruggles Street and Leon Street
- Ruggles Street and Albert Street
- Ruggles Street and Ruggles Station Bus Way
- Ruggles Street and Tremont Street/Whittier Street

With the exception of Ruggles Street at Albert Street, all of the intersections are signalized. Descriptions of the intersections, including traffic control, number of lanes, lane usage, turn restrictions, and signal phasing are provided in the Transportation Appendix.

Morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak period turning movement counts were conducted in October 2012. The morning peak hour (7:15 – 8:15 AM) and evening peak hour (5:00 – 6:00 PM) for the area were determined from the intersection counts. Morning and evening peak hour turning volumes at each intersection are shown in Figures 5-2 and 5-3, respectively.

Existing levels of service for each of the nine signalized intersections are presented in Table 2 for both the morning and evening peak hour. Results for the unsignalized intersection are presented in Table 3. With the exception of Huntington Avenue at Longwood Avenue and Ruggles Street at Tremont Street, all other signalized intersections operate at acceptable levels of service (LOS D or better) during both morning and evening peak hours. At the unsignalized intersection of Ruggles Street at Albert Street, the critical eastbound left-turn movement operates at acceptable levels of service during the morning and evening peak hours.

The deficiencies at the intersections of Huntington Avenue at Longwood Avenue and Ruggles Street at Tremont Street can likely be attributed to the high volume of left-turn traffic. Although the eastbound and westbound left-turns at the intersection of Huntington Avenue and Longwood Avenue operate under a protected phase, they operate at deficient levels of service because of insufficient time to process the high volume of traffic on those moves. Similarly, at the intersection of Ruggles Street at Tremont Street, even though the eastbound and southbound left-turns operate in a

protected phase, the deficiency might be due to insufficient time for to process the high left-turn demand. Westbound left-turns and U-turns at this intersection operate in a permissive phase. With a significant amount of eastbound through traffic, drivers have a difficult time making the left-turn.

**Table 2 Signalized Intersection Capacity Analysis Summary – 2012 Existing**

Signalized Intersection	Weekday Morning			Weekday Evening		
	V/C <sup>1</sup>	Delay <sup>2</sup>	LOS <sup>3</sup>	V/C	Delay	LOS
Huntington Ave. at Longwood Ave.	>1.20	>120	F	1.12	103	F
Huntington Ave. at Tetlow St./ Evans Way	0.67	27	C	0.53	13	B
Huntington Ave. at Louis Prang St./ Ruggles St.	0.94	41	D	0.97	51	D
Huntington Ave. at Parker St/ Forsyth Way	0.69	25	C	0.68	27	C
Huntington Ave. at Forsyth St.	0.49	21	C	0.69	18	B
Ruggles St. at Parker St.	0.95	43	D	0.83	26	C
Ruggles St. at Leon St.	0.61	4	A	0.59	9	A
Ruggles St. at -Ruggles Station bus way	0.81	15	B	0.64	8	A
Ruggles St. at Tremont S.t	>1.20	>120	F	>1.20	>120	F

Source: VHB, Inc. using Synchro 7 (Build 773) software.

1. Volume-to-capacity ratio. V/C ratios range from 1.0 when demand equals capacity to 0 when demand is zero. Values over 1.20 indicate demand in excess of capacity.
2. Average control delay per vehicle for all entering vehicles, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
3. Level of Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.

**Table 3 Unsignalized Intersection Capacity Analysis Summary – 2012 Existing**

Unsignalized Intersection	Critical Movement	Weekday Morning		Weekday Evening	
		Delay <sup>1</sup>	LOS <sup>2</sup>	Delay <sup>1</sup>	LOS <sup>2</sup>
Ruggles St. at Albert St.	EBL	32	D	14	B

Source: VHB, Inc. using Synchro 7 (Build 773) software.

1. Average control delay per vehicle for all entering vehicles, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
2. Level of Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.



## Crash Analysis

In order to identify crash trends, historical crash data were obtained from Massachusetts Department Of Transportation (MassDOT) for the most recent three-year period available (2008 - 2010) for the study area intersections. For each intersection included in the study area, vehicle crash data were broken down into specific crash factors such as crash date, crash type, severity, weather, and time of day. Table 4 presents the results of the crash analysis.

Crash rates were calculated based on the number of crashes at an intersection and the volume of traffic traveling through that intersection in a year. Crash rates are reported as the number of crashes per one million entering vehicles. Rates that exceed MassDOT crash rates could indicate safety or geometric issues at an intersection. The MassDOT District 6 crash rates are 0.77 for signalized intersections and 0.57 for signalized intersections.

Between 2008 and 2010, 62 crashes occurred at eight of the nine study area intersections. There were no crashes reported for the intersection of Ruggles Street at the Ruggles station bus way. The highest number of crashes occurred at the intersection of Huntington Avenue at Louis Prang Street/ Ruggles Street (17 crashes), followed by Huntington Avenue at Parker Street/Forsyth Way (11 crashes) and Ruggles Street at Tremont Street (9 crashes).

The majority of the 62 crashes were angle type crashes (22 crashes). Property damage crashes accounted for approximately 46 percent of the crashes and 36 percent of the crashes resulted in non-fatal injuries. More than half of the crashes occurred on weekdays, during off-peak hours (before 7:00 AM, from 9:00 AM to 4:00 PM, or after 6:00 PM). Approximately 65 percent of these collisions occurred during dry roadway conditions, indicating that weather is not often a factor in the collisions occurred at these intersections.

Four crashes involving non-motorists occurred at the intersections of Huntington Avenue at Ruggles Street and Ruggles Street at Tremont Street. The two crashes at Huntington Avenue and Ruggles Street involved a pedestrian and a bicyclist. Bicyclists were involved in both crashes at the intersection of Ruggles Street at Tremont Street.

As shown in Table 4, none of the intersections exceeds the Massachusetts Department of Transportation District 6 crash rates.

Table 4 Vehicular Crash Summary (2008 - 2010)

	Huntington Ave at Longwood Ave	Huntington Ave at Evans Way	Huntington Ave at Ruggles St/Louis Prang St	Huntington Ave at Parker St/Forsyth Way	Huntington Ave at Forsyth Street	Ruggles St at Parker St	Ruggles Street at Leon Street	Ruggles Street at Tremont Street
Signalized?	Yes	YES	Yes	Yes	Yes	Yes	Yes	Yes
Calculated Crash Rate	0.24	0.22	0.42	0.36	0.17	0.04	0.14	0.14
MassDOT Crash Rates (District 6)	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Exceeds?	No	No	No	No	No	No	No	No
<b>Year</b>								
2008	4	3	8	4	3	0	1	5
2009	2	1	3	4	0	3	0	2
2010	2	1	6	3	4	1	0	2
Total	8	5	17	11	7	4	1	9
Yearly Average	2.67	1.67	6.00	3.67	2.00	1.33	0.33	3.00
<b>Collision Type</b>								
Angle	1	0	8	3	5	3	0	1
Head-on	1	0	1	0	0	0	0	0
Rear-end	2	4	2	3	0	0	1	5
Rear-to-Rear	0	0	0	0	0	0	0	0
Sideswipe, opposite direction	0	0	2	0	0	1	0	0
Sideswipe, same direction	0	0	0	1	0	0	0	1
Single vehicle crash	1	0	1	2	1	0	0	1
Unknown	3	1	3	2	1	0	0	1
Total	8	5	17	11	7	4	1	9
<b>Crash Severity</b>								
Fatal injury	0	0	1	0	0	0	0	0
Non-fatal injury	4	1	8	4	2	1	0	4
Property damage only	3	3	6	6	3	1	0	3
Unknown	1	1	2	1	2	2	1	2
Total	8	5	17	11	7	4	1	9
<b>Time of Day</b>								
Weekday, 7:00 AM - 9:00 AM	1	0	1	0	0	0	0	2
Weekday, 4:00 PM - 6:00 PM	1	0	1	1	2	2	0	0
Saturday, 11:00 AM - 2:00 PM	0	0	0	0	0	0	0	1
Weekday, other time	4	4	9	8	4	0	1	5
Weekend, other time	2	1	6	2	0	2	0	1
Total	8	5	17	11	7	4	1	9
<b>Pavement Conditions</b>								
Dry	5	4	12	6	1	3	0	8
Wet	1	0	1	2	5	0	1	1
Snow	1	0	0	0	0	1	0	0
Ice	0	0	1	1	0	0	0	0
Sand, mud, dirt, oil, gravel	0	0	0	0	0	0	0	0
Water (standing, moving)	0	0	0	0	0	0	0	0
Slush	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0
Unknown	1	1	3	2	1	0	0	0
Total	8	5	17	11	7	4	1	9
<b>Non Motorist (Bike, Pedestrian)</b>	0	0	2	0	0	0	0	2

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## Parking

The Sweeney Field site contains a 42-space lot for Wentworth student parking, which is fully utilized during peak periods. This parking lot will be eliminated from the Wentworth parking supply by the proposed development. The loss of this parking was anticipated in the Wentworth IMP and sufficient parking will be available on campus to accommodate the vehicles that currently park in this lot.

On-street parking near Sweeney Field is provided on both sides of Parker Street and on Annunciation Road south of Huntington Avenue and on both directions of Evans Way and Vancouver Street north of Huntington Avenue. Parking on Parker Street northeast of Ruggles Street is controlled by two-hour parking meters and on Evans Way by four-hour meters. There are no restrictions on parking on Parker Street southwest of Ruggles Street, Annunciation Way or Vancouver Street. Weekday, mid-day occupancy counts showed all the streets were fully utilized. No on-street parking is permitted on two sides of the Sweeney Field site along Huntington Avenue and Ruggles Street. Table 5 shows the number of spaces and parking controls on the streets near Wentworth. There are 328 spaces available on these streets.

The unrestricted section of Parker Street southwest of Ruggles Street and Annunciation Way contain 178 spaces. Because there are no restrictions, turnover (the average number of vehicles using each space during the day) is low. Turnover counts conducted in December 2009 showed an average of 1.8 vehicles per space on Annunciation Way during the day and an average turnover of about 1.4 vehicles per space on Parker Street. Average lengths of stay were between 6 and 7 hours on Parker Street and about 5 hours on Annunciation Way. Much of the parking is overnight parking, indicating use by local residents. At 6:00 a.m., the east side of Parker Street was 98 percent occupied and the west side was 89 percent occupied. Annunciation Way had an occupancy rate of between 93 and 95 percent.

Table 5 On-Street Parking Inventory

<b>Street</b>	<b>Segment</b>	<b>Side of Street</b>	<b>Number of Spaces</b>	<b>Parking Control</b>	<b>Average Duration</b>
Parker Street	Huntington -- Ruggles	East	24	Two-hour Meters	n/a
		West	28	Two-hour Meters	n/a
Parker Street <sup>1</sup>	Ruggles -- Horaden	East	48	Unrestricted	7.2 Hours
		West	47	Unrestricted	6.2 Hours
Annunciation Way <sup>1</sup>	Parker -- Ruggles	East	44	Unrestricted	5.0 Hours
		West	39	Unrestricted	5.3 Hours
Vancouver Street <sup>1</sup>	Louis Prang - - Huntington	East	8	Unrestricted	n/a
		West	12	Unrestricted	n/a
Evans Way NB	Tetlow – Louis Prang	East	18	Four-hour Meters	n/a
Evans Way SB	Louis Prang – Tetlow	West	23	Four-hour Meters	n/a
		East	22	Four-hour Meters	n/a
		West	<u>15</u>	Four- hour Meters	n/a
<b>Total</b>			<b>328</b>		

n/a Not available or not applicable  
 1. Spaces not marked; capacity may vary



### Transit Service

The Sweeney Field site is readily accessible by public transportation, including rapid transit, bus, and commuter rail (see Figure 5-4). The E Branch Green Line Museum of Fine Arts stop is located in the median of Huntington Avenue in front of the Sweeney field site. The Orange Line is available at Ruggles station within a half mile of site. Ruggles station also provides access to three commuter rail lines serving the south side (Needham, Providence, and Stoughton) and about a dozen bus routes. Five of these bus routes travel along Ruggles Street adjacent to Sweeney Field. A bus stop and shelter is located on the northbound side of Ruggles Street just before the intersection with Huntington Avenue and a bus stop is located on the southbound side of Ruggles Street in front of Wentworth Hall.





The rapid transit service in the study area is summarized in Table 6. The E Branch of the Green Line operates with six-minute headways during peak periods, providing capacity for 3,434 passengers per hour. Daily boardings at the Museum of Fine Arts station total 1,676. The Orange Line operates with five-minute headways during peak periods providing capacity for 13,362 passengers per hour. Daily Orange Line boardings at the Ruggles station total 7,449.

Table 6 Rapid Transit Serving Wentworth

Line/Station	Weekday Peak <sup>1</sup>		Weekday Daily Boardings <sup>3</sup>
	Headway	Capacity <sup>2</sup>	
E Branch Green Line/ Museum of Fine Arts	6 Minutes	3,434	1,676 <sup>4</sup>
Orange Line / Ruggles Station	5 Minutes	13,362	7,449 <sup>5</sup>

1 Based on MBTA Rapid Transit service during rush hours  
2 Calculated from policy standard vehicle capacity and average number of trips peak period (MBTA furnished data)  
3 Typical weekday daily boarding counts in both directions  
4 Counts from 2007  
5 Data collected in 2008

There are two MBTA cross town bus routes and three local bus routes that directly serve the site:

- CT2, Sullivan Station – Ruggles Station via Kendall/ MIT
- CT3, Beth Israel Deaconess Medical Center - Andrew Station via Boston Medical Center
- Route 8, Harbor Point/UMass - Kenmore Station via Boston Medical Center & Dudley Station
- Route 19, Fields Corner - Ruggles Station via Grove Hall and Dudley Square Station
- Route 47, Central Square, Cambridge - Broadway Station via Boston Medical Center and Dudley Street

Table 8 presents schedule and ridership information for the MBTA bus routes described above. About 45 buses pass the site in the morning peak period between 7:00 AM and 9:00 AM, resulting in an average headway of 2.5 minutes. About 36 buses pass the site in the evening peak period between 4:00 and 6:00, resulting in an average headway of 3.5 minutes.



Table 7 Weekday Peak Period Bus Service on Ruggles Street

<b>Bus Route</b>	<b>Peak Period</b>	<b>Headways<sup>1</sup> (Minutes)</b>	<b>Number of Buses</b>
CT2	Morning <sup>2</sup>	20	7
	Evening <sup>3</sup>	25	5
CT3	Morning	20	7
	Evening	25	5
8	Morning	14	8
	Evening	25	5
19	Morning	14	9
	Evening	25	6
47	Morning	22	6
	Evening	20	7
All Five Routes	Morning	3.5	37
	Evening	4.5	28

Source: Winter 2012 MBTA Bus Schedules

1. Frequency of buses in minutes
2. 7:00 AM to 9:00 AM
3. 4:00 PM to 6:00 PM

Three commuter rail lines that connect South Station with suburban areas to the west and south of Boston can be accessed at Ruggles Station:

- Providence/Stoughton
- Needham
- Franklin

Table 8 provides information on the number of peak period and daily trains on each service at Ruggles station. Although there is a high frequency of outbound commuter rail service, the current track layout at the station reduces the capacity for inbound service. For many inbound trips, commuters going to Wentworth, Northeastern or the surrounding area must get off at Back Bay station and transfer to the Orange Line outbound to back track to Ruggles station. The four commuter rail lines at North Station and the Worcester Line at Back Bay station can be accessed via the Orange Line.

Table 8 Weekday Southside Commuter Rail Service

Line	Number of Trains		Daily Total <sup>1</sup>
	Morning Peak Period (Inbound)	Evening Peak Period (Outbound)	
Providence/Attleboro	5	11	35
Needham	5	5	24
Franklin	4	6	19

Source: Commuter rail schedules effective July 1, 2012

1. Total trains per day stopping at Ruggles Station (in both directions)



### Pedestrian and Bicycle Accommodations

The Sweeney Field site has sidewalks on all three sides and there are crosswalks at the three intersections adjacent to the site. The site is directly across eastbound Huntington Avenue from the Museum of Fine Arts Green Line stop. A crosswalk across Huntington Avenue provides a direct pedestrian connection between the Project site and the Green Line stop. The site is also with a 10-minute walk to the Longwood Green Line MBTA stop and two Orange Line stations at Ruggles and Roxbury Crossing. Three commuter rail lines are also available at Ruggles station. There are currently no bicycle accommodations on the streets adjacent to the site.



### Transportation Demand Management

Transportation Demand Management (TDM) measures currently implemented by Wentworth that will apply to the Innovation Center include:

- A \$72 per month MBTA Charlie Card subsidy to employees
- Participation in the MBTA Corporate Pass Program, providing tax-free withholding from employees' pay for transit passes
- Membership in the MASCO Transportation Management Association (TMA)
- Financial support for MASCO shuttle service to campus
- Carpool/vanpool matching through MASCO TMA
- Preferential parking for carpools/vanpools
- Participation in the Bike Week Commuter Challenge
- Posting transit schedules and routes
- Provisions for motorcycle parking
- Emergency Ride Home via MASCO's Commute Works Program
- Although there are no car sharing spaces on campus, there are four Zipcars near the campus: two at the Museum of Fine Arts and two at Vancouver and Ward streets



# Future Transportation Conditions

The Future Transportation Conditions includes analyses of 2020 projected No-Build (without Wentworth IMP projects) and Build (with Wentworth IMP projects) conditions for the transportation systems described in the Existing Transportation Conditions section. This section also projects future trips for the two Potential Future Projects.

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## No-Build Conditions

Traffic operations for the No-Build condition were determined using Build volumes from the Wentworth IMP. Future No-Build traffic volumes include an expected growth of 0.5 percent per year in general background traffic, traffic from several proposed developments in the area and trips associated with growth and the Proposed Institutional Projects at Wentworth as specified in its IMP. Figures 5-6 and 5-7 show 2020 No-Build morning and evening peak hour volumes, respectively.

The No-Build traffic operations analysis results are presented in Tables 9 and 10 for signalized and unsignalized intersections, respectively. The analysis is based on the projected No-Build traffic volumes and incorporates any roadway improvements currently planned by the state, city or private development in the area.

The signalized intersections of Huntington Avenue at Longwood Avenue and Ruggles Street at Tremont Street will continue to operate at deficient levels of service under No-Build conditions. The intersection of Huntington Avenue at Louis Prang Street/ Ruggles Street will deteriorate to a deficient LOS E and LOS F during the morning and evening peak hours, respectively. All other signalized intersections will also experience a slight increase in delay, but will continue to operate at acceptable levels of service during both peak hours.

The unsignalized intersection of Ruggles Street at Albert Street will decline from LOS D to a deficient LOS F during the morning peak hour. The high traffic volumes travelling on Ruggles Street during the morning peak hour make it difficult for traffic exiting Albert Street to find gaps to make left-turns onto Ruggles Street. The evening peak hour will continue to operate at an acceptable level of service because of the lack of vehicles turning left from Albert Street.

**Table 9 Signalized Intersection Capacity Analysis Summary – 2020 No-Build**

Signalized Intersection	Morning Peak Hour					
	2012 Existing			2020 No-Build		
	V/C <sup>1</sup>	Delay <sup>2</sup>	LOS <sup>3</sup>	V/C	Delay	LOS
Huntington Ave. at Longwood Ave.	>1.20	>120	F	>1.20	>120	F
Huntington Ave. at Tetlow St./ Evans Way	0.67	27	C	0.77	29	C
Huntington Ave. at Louis Prang St./ Ruggles St.	0.94	41	D	>1.20	75	E
Huntington Ave. at Parker St/ Forsyth Way	0.69	25	C	0.74	30	C
Huntington Ave. at Forsyth St.	0.49	21	C	0.51	21	C
Ruggles St. at Parker St.	0.95	43	D	1.03	51	D
Ruggles St. at Leon St.	0.61	4	A	0.70	5	A
Ruggles St. at -Ruggles Station bus way	0.81	15	B	0.92	18	B
Ruggles St. at Tremont S.t	>1.20	>120	F	>1.20	>120	F

Signalized Intersection	Evening Peak Hour					
	2012 Existing			2020 No-Build		
	V/C	Delay	LOS	V/C	Delay	LOS
Huntington Ave. at Longwood Ave.	1.12	103	F	>1.20	>120	F
Huntington Ave. at Tetlow St./ Evans Way	0.53	13	B	0.60	14	B
Huntington Ave. at Louis Prang St./ Ruggles St.	0.97	51	D	1.15	80	F
Huntington Ave. at Parker St/ Forsyth Way	0.68	27	C	0.75	37	D
Huntington Ave. at Forsyth St.	0.69	18	B	0.72	19	B
Ruggles St. at Parker St.	0.83	26	C	0.93	30	C
Ruggles St. at Leon St.	0.59	9	A	0.66	10	A
Ruggles St. at -Ruggles Station bus way	0.64	8	A	0.71	9	A
Ruggles St. at Tremont S.t	>1.20	>120	F	>1.20	>120	F

Source: VHB, Inc. using Synchro 7 (Build 773) software.

1. Volume-to-capacity ratio. V/C ratios range from 1.0 when demand equals capacity to 0 when demand is zero. Values over 1.0 indicate demand in excess of capacity.
2. Average control delay per vehicle for all entering vehicles, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
3. Level of Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.

**Table 10 Unsignalized Intersection Capacity Analysis Summary – 2020 No-Build**

Unsignalized Intersection	Critical Movement	Morning Peak Hour				Evening Peak Hour			
		2012 Existing		2020 No-Build		2012 Existing		2020 No-Build	
		Delay <sup>1</sup>	LOS <sup>2</sup>	Delay	LOS	Delay	LOS	Delay	LOS
Ruggles Street at Albert Street	EBL	32	D	104	F	14	B	14	B

Source: VHB, Inc. using Synchro 7 (Build 773) software.

1. Average control delay per vehicle for all entering vehicles, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
2. Level of Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.
3. EBL = Eastbound Left

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## Build Conditions

This section presents project vehicle trip generation, distribution of project trips to the roadway system and the Build traffic operation analysis.



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### Project Vehicle Trip Generation

The projection of traffic for the proposed non-institutional development at 500 Huntington Avenue was based on Institute of Transportation Engineers (ITE) vehicle trip generation rates<sup>1</sup>. The ITE vehicle trips were converted to person trips by dividing by a assumed vehicle occupancy rate (VOR) of 1.05 persons per vehicle. The ITE person trip generation was converted back to vehicle trips using the vehicle mode share and higher (VOR) for the Fenway area. Because of the extensive transit access available to the project site, the Fenway area a much lower vehicle mode share and higher VOR compared to the suburban locations from which ITE rates are developed. Based on Access Boston 2000 – 2010 from the BTB, the vehicle mode share in the Fenway is 37 percent. Based on 2000 Census journey-to-work data, the Fenway area, which includes Wentworth and Northeastern University, has an average VOR of 1.22 persons per vehicle.

The application of the Fenway vehicle mode share and VOR to the ITE person trips results in a projection of about 310 vehicle trips in both the morning and evening peak hours. These projected volumes are lower than the IMP projections, which were based on a higher square footage for the project and which did not account for Wentworth use of 97,200 sf of the Project for the Center for Innovation. Traffic projected to be generated by Wentworth’s Center for Innovation was previously accounted for in the Wentworth IMP. As a result, no trip generation for the Center is included in this Build analysis.

Table 11 shows ITE vehicle trip generation for the project, conversion of ITE vehicle trips to person trips, and calculation of Project vehicle trips. The Project is expected to generate about 230 vehicle trips in each peak hour. About 190 of the peak hour trips will be in the peak direction (inbound in the morning and outbound in the evening) and about 40 trips will be in the off-peak direction. The largest generator of trips is the office component. Retail generates no trips in the morning because most retail establishments do not open until after the morning peak hour.



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<sup>1</sup> *Trip Generation*, Eighth Edition, Institute of Transportation Engineers, Washington, D.C., 2008



Table 11 Project Vehicle Trip Generation

Land Use	AM			PM		
	In	Out	Total	In	Out	Total
<b>ITE Vehicle Trips</b>						
Retail <sup>1</sup>	0	0	0	25	32	57
Office <sup>2</sup>	338	46	384	60	293	353
R&D <sup>3</sup>	<u>285</u>	<u>58</u>	<u>343</u>	<u>48</u>	<u>273</u>	<u>321</u>
<b>Total</b>	<b>623</b>	<b>104</b>	<b>727</b>	<b>133</b>	<b>598</b>	<b>731</b>
<b>ITE Person Trips (vehicle trips times 1.05)</b>						
Retail	0	0	0	26	34	60
Office	355	48	403	63	308	371
R&D	<u>299</u>	<u>61</u>	<u>360</u>	<u>50</u>	<u>287</u>	<u>337</u>
<b>Total</b>	<b>654</b>	<b>109</b>	<b>763</b>	<b>139</b>	<b>629</b>	<b>768</b>
<b>Project Vehicle Trips with Local mode Share and VOR</b> (ITE person trips times mode share <sup>4</sup> (37%); divided by VOR <sup>4</sup> (1.22))						
Retail	0	0	0	9	12	21
Office	108	15	123	19	93	112
R&D	<u>91</u>	<u>18</u>	<u>109</u>	<u>15</u>	<u>87</u>	<u>102</u>
<b>Total</b>	<b>198</b>	<b>33</b>	<b>232</b>	<b>43</b>	<b>192</b>	<b>235</b>

1. ITE land use code 814
2. ITE land use code 760
3. ITE land use code 710
4. Fenway area (Northeastern and Wentworth block groups)



## Trip distribution

The geographic distribution of trips to the Project was also based on the 2000 Census journey-to-work data. The numbers of workers commuting to the Northeastern and Wentworth census block groups were summarized by the municipality they reside in. The principal route likely to be used for reaching the Project from each municipality was identified and the total number of vehicles on each route was determined. Table 12 shows the distribution of project trips by approach routes to the Project site.





Table 12 Trip Distribution

Approach Route	Percent of Trips
Forsyth Way	32%
Huntington Avenue East	19%
Huntington Avenue West	13%
Longwood Avenue	2%
Louis Prang Street	2%
Tremont Street East	14%
Tremont Street West	18%
Total	100%



## Transit

Project transit trips were generated in the same fashion as vehicle trips. The transit mode share for the Fenway area from the 2000 Census journey to work data (27.8 percent) was applied to the ITE person trips. The results are presented in Table 13. About 210 transit trips are projected to be generated by the planned non-institutional uses in each peak hour. As with vehicle trips, transit trips from the Center for Innovation were accounted for in the Wentworth IMP.

Between 175 and 180 transit riders will be moving in the peak direction toward the site in the morning and away from the site in the evening. Given the variety of transit modes available to the site (local bus, Green Line, Orange Line and commuter rail) and the geographic distribution of trips, the impact on any one transit mode will be small.

Table 13 Project Transit Trips

Land Use	AM			PM		
	In	Out	Total	In	Out	Total
Retail	0	0	0	7	9	16
Office	98	13	112	17	85	103
R&D	83	17	100	14	80	94
Total	182	30	212	39	174	213



## Parking

The existing site contains Wentworth’s 42-space North Lot which is used for student parking. The proposed project will eliminate this parking. The Wentworth IMP demonstrates that there is sufficient capacity elsewhere on campus to accommodate the parkers displaced from the North Lot.



The Project will provide a 410-space underground garage with the entrance on Parker Street. The garage will contain three card controlled gates on the first level. Two gates can be operated in the peak direction to assure that entering vehicles do not queue onto Parking Street.

The proposed 410-space parking supply represents a ratio of 0.75 spaces per 1,000 square feet for the tenant office and R&D space. This is consistent with the parking guidelines provided for the Fenway area for office uses. Parking demand for Wentworth's Innovation Center will be accommodated in Wentworth parking facilities on its campus as described in its IMP. The staff of the Innovation Center will be relocated from the main campus and their parking demand has already been accounted for in Wentworth's IMP.



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## Pedestrians and Bicycles

The Sweeney Field development will include pedestrian access across the site between Huntington Avenue and Parker Street and the provision of on-site bicycle accommodations. The development will include a pedestrian path across the site between the Huntington Avenue crossing and Parker Street opposite the arch in Northeastern's West Village on Parker Street. The proposed development also will include bicycle storage facilities, and on-site showers and lockers for commuters.



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## Transportation Demand Management

The 78,000 Center for Innovation will be part of Wentworth, which has an extensive program of transportation demand management (TDM) measures, including the following which will be available to employees in the Center:

- A \$72 per month MBTA Charlie Card subsidy to employees
- Participation in the MBTA Corporate Pass Program, providing tax-free withholding from employees' pay for transit passes
- Membership in the MASCO Transportation Management Association (TMA)
- Financial support for MASCO shuttle service to campus
- Carpool/vanpool matching through MASCO TMA
- Preferential parking for carpools/vanpools
- Participation in the Bike Week Commuter Challenge
- Posting transit schedules and routes
- Provisions for motorcycle parking
- Emergency Ride Home via MASCO's Commute Works Program
- Although there are no car sharing spaces on campus, there are four Zipcars near the campus: two at the Museum of Fine Arts and two at Vancouver and Ward streets

The proponent will encourage tenants to adopt an extensive TDM program for their employees.



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## Loading

The loading area for 500 Huntington Avenue will be located off Parker Street and will provide four loading bays. All vehicles using the loading area will be able to maneuver inside the loading bay, allowing them to drive directly in and out. The loading area will accommodate service vehicles and deliveries for the office, R&D, and retail space and the Center for Innovation.



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## Traffic Operations

The Build traffic operations analysis results are presented in Tables 14 and 15 for signalized and unsignalized intersections, respectively. The analysis is based on the projected Build traffic volumes and incorporates traffic generated by the proposed development added to the No-Build traffic volumes.

The signalized intersection of Huntington Avenue at Louis Prang Street/Ruggles Street will deteriorate from LOS E to LOS F during the morning peak hour. Huntington Avenue at Parker Street/Forsyth Way will experience a decline in level of service from LOS D to LOS E during the evening peak hour. At the intersection of Ruggles Street at Parker Street, the level of service will decline from LOS C to LOS E during the evening peak hours. All other signalized intersections will experience a slight increase in delay, but will continue to operate at acceptable levels of service during both peak hours.

The eastbound left-turn movement from the site driveway will operate at LOS E during the evening peak hour under the Build Condition. The cause for the deficiency is the heavy volume of traffic on Parker Street, which provides a limited number of gaps for exiting traffic, especially for left-turning vehicles.

**Table 14 Signalized Intersection Capacity Analysis Summary – 2020 Build**

Signalized Intersection	Morning Peak Hour								
	2012 Existing			2020 No-Build			2020 Build		
	V/C <sup>1</sup>	Delay <sup>2</sup>	LOS <sup>3</sup>	V/C	Delay	LOS	V/C	Delay	LOS
Huntington Ave. at Longwood Ave.	>1.20	>120	F	>1.20	>120	F	>1.20	>120	F
Huntington Ave. at Tetlow St./ Evans Way	0.67	27	C	0.77	29	C	0.77	29	C
Huntington Ave. at Louis Prang St./ Ruggles St.	0.94	41	D	>1.20	75	E	>1.20	78	F
Huntington Ave. at Parker St/ Forsyth Way	0.69	25	C	0.74	30	C	0.91	69	E
Huntington Ave. at Forsyth St.	0.49	21	C	0.51	21	C	0.52	21	C
Ruggles St. at Parker St.	0.95	43	D	1.03	51	D	>1.03	50	D
Ruggles St. at Leon St.	0.61	4	A	0.70	5	A	0.75	5	A
Ruggles St. at -Ruggles Station bus way	0.81	15	B	0.92	18	B	0.98	26	C
Ruggles St. at Tremont S.t	>1.20	>120	F	>1.20	>120	F	>1.20	>120	F

Signalized Intersection	Evening Peak Hour								
	2012 Existing			2020 No-Build			2020 Build		
	V/C <sup>1</sup>	Delay <sup>2</sup>	LOS <sup>3</sup>	V/C	Delay	LOS	V/C	Delay	LOS
Huntington Ave. at Longwood Ave.	1.12	103	F	>1.20	>120	F	>1.20	>120	F
Huntington Ave. at Tetlow St./ Evans Way	0.53	13	B	0.60	14	B	0.62	14	B
Huntington Ave. at Louis Prang St./ Ruggles St.	0.97	51	D	1.15	80	F	>1.17	86	F
Huntington Ave. at Parker St/ Forsyth Way	0.68	27	C	0.75	37	D	0.93	77	E
Huntington Ave. at Forsyth St.	0.69	18	B	0.72	19	B	0.73	19	B
Ruggles St. at Parker St.	0.83	26	C	0.93	30	C	1.07	57	E
Ruggles St. at Leon St.	0.59	9	A	0.66	10	A	0.67	10	A
Ruggles St. at -Ruggles Station bus way	0.64	8	A	0.71	9	A	0.72	9	A
Ruggles St. at Tremont S.t	>1.20	>120	F	>1.20	>120	F	>1.20	>120	F

Source: VHB, Inc. using Synchro 7 (Build 773) software.

1. Volume-to-capacity ratio. V/C ratios range from 1.0 when demand equals capacity to 0 when demand is zero. Values over 1.0 indicate demand in excess of capacity.
2. Average control delay per vehicle for all entering vehicles, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
3. Level of Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.

**Table 15 Unsignalized Intersection Capacity Analysis Summary – 2020 Build**

		Morning Peak Hour					
Unsignalized Intersection	Critical Movement	2012 Existing		2020 No-Build		2020 Build	
		Delay <sup>1</sup>	LOS <sup>2</sup>	Delay <sup>1</sup>	LOS <sup>2</sup>	Delay <sup>1</sup>	LOS <sup>2</sup>
Ruggles Street at Albert Street	EBL	32	D	104	F	>120	F
Parker Street-Driveway	EBL	<i>Driveway does not exist</i>				19	C

		Evening Peak Hour					
Unsignalized Intersection	Critical Movement	2012 Existing		2020 No-Build		2020 Build	
		Delay <sup>1</sup>	LOS <sup>2</sup>	Delay <sup>1</sup>	LOS <sup>2</sup>	Delay <sup>1</sup>	LOS <sup>2</sup>
Ruggles Street at Albert Street	EBL	14	B	14	B	14	B
Parker Street-Driveway	EBL	<i>Driveway does not exist</i>				31	D

Source: VHB, Inc. using Synchro 7 (Build 773) software.

1. Average control delay per vehicle for all entering vehicles, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
2. Level of Service. LOS A indicates free flow conditions with minimal delays. LOS E and F indicate congested conditions.
3. EBL = Eastbound Left

## Mitigation

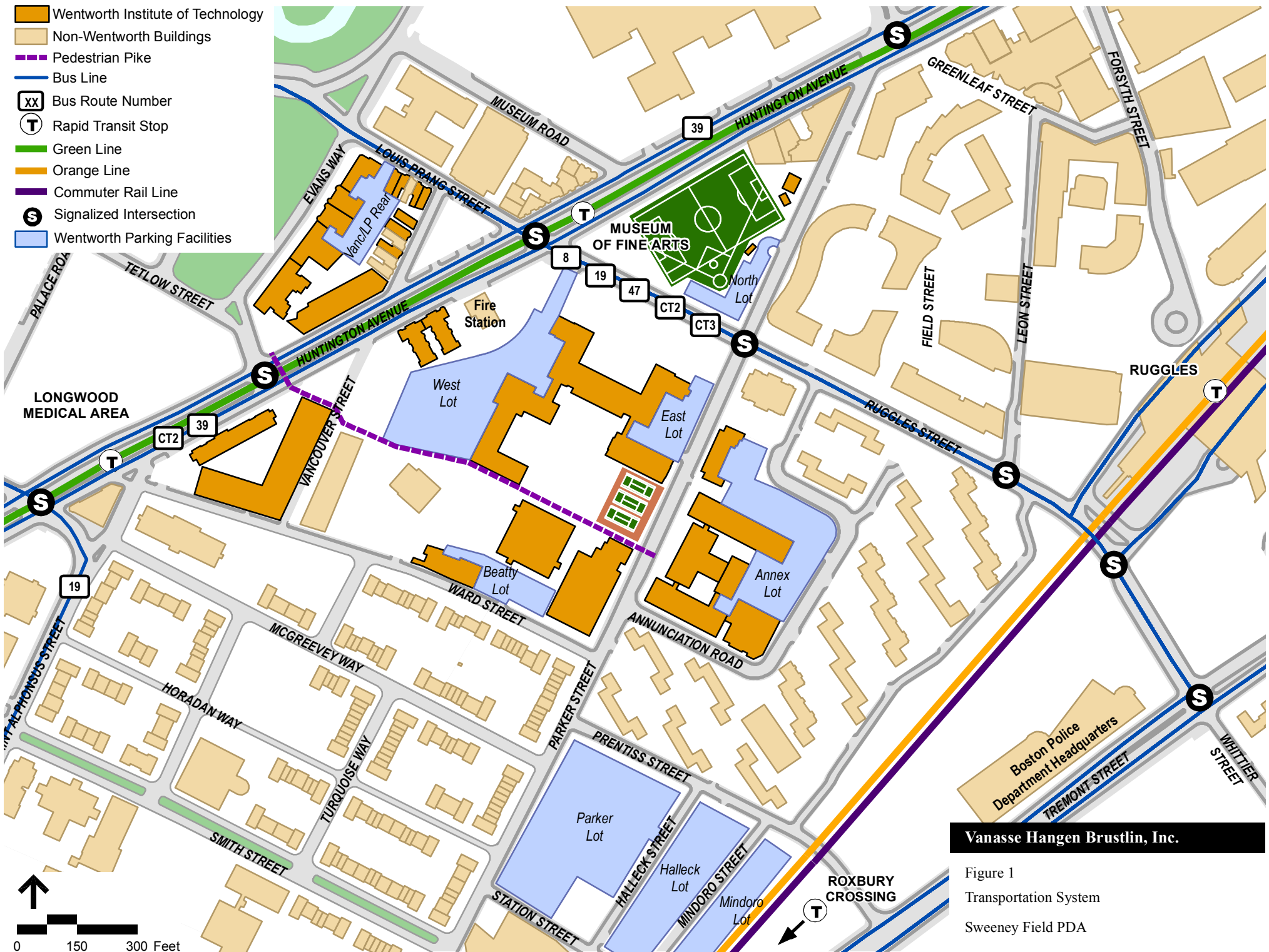
The project includes mitigation measures for the intersection of Ruggles and Parker Street. The proposed mitigation involves the widening of the northwest (Wentworth) side of Parker Street on the approaches to Ruggles Street (see Figure 9). The roadway will be widened by 10 feet to provide an exclusive left-turn lane and a through/right-turn lane on each Parker Street approach to Ruggles Street. As shown in Table 16, the proposed improvement will result in LOS C operations at the intersection in both the morning and evening peak hours. This improvement will be consistent with future bicycle accommodations on Parker Street proposed as part of the City’s Emerald Necklace/Southwest Corridor Connector (bicycle).

**Table 16 Intersection Capacity Analysis Summary – 2020 Build with Mitigation**

		Morning Peak Hour					
Signalized Intersection		2020 Build			2020 Build with Mitigation		
		V/C <sup>1</sup>	Delay <sup>2</sup>	LOS <sup>3</sup>	V/C	Delay	LOS
Ruggles St. at Parker St.		>1.03	50	D	1.01	34	C

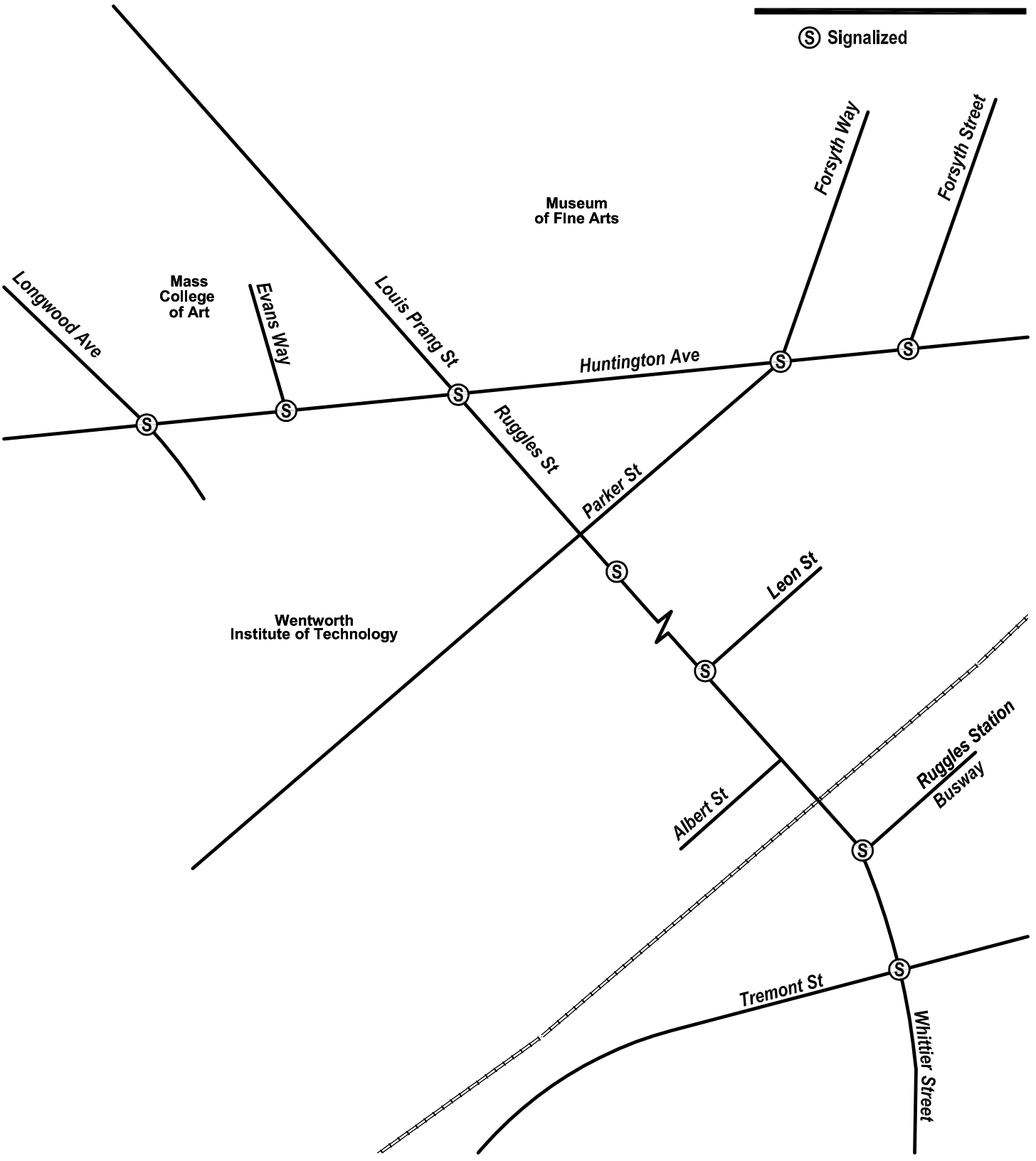
  

		Evening Peak Hour					
Signalized Intersection		2020 Build			2020 Build with Mitigation		
		V/C <sup>1</sup>	Delay <sup>2</sup>	LOS <sup>3</sup>	V/C	Delay	LOS
Ruggles St. at Parker St.		1.07	57	F	0.91	27	C



Vanasse Hangen Brustlin, Inc.

Figure 1  
Transportation System  
Sweeney Field PDA



Ⓢ Signalized



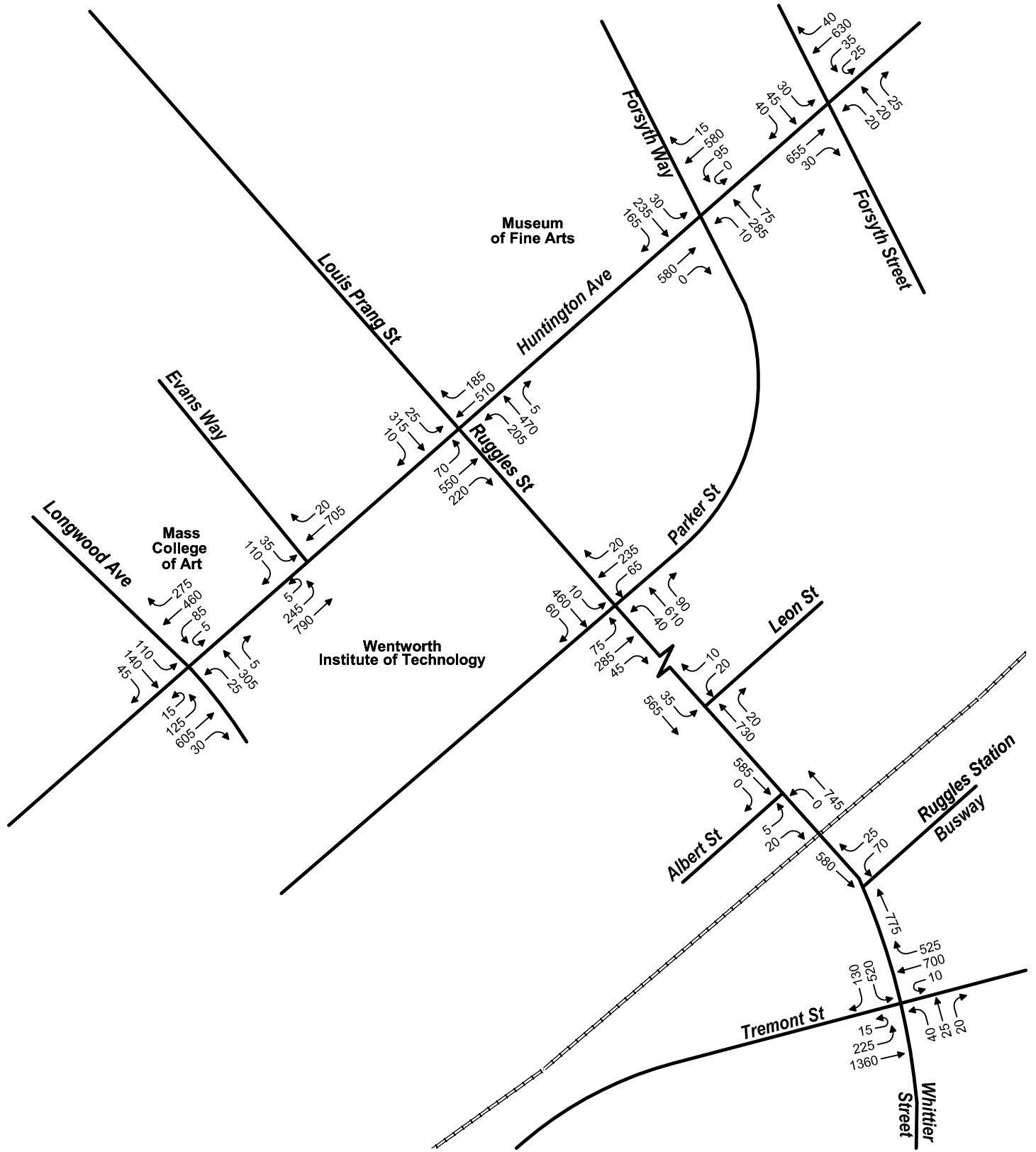
Not to Scale

Vanasse Hangen Brustlin, Inc.

Traffic Analysis Locations

Figure 2

Sweeney Field PDA



Not to Scale

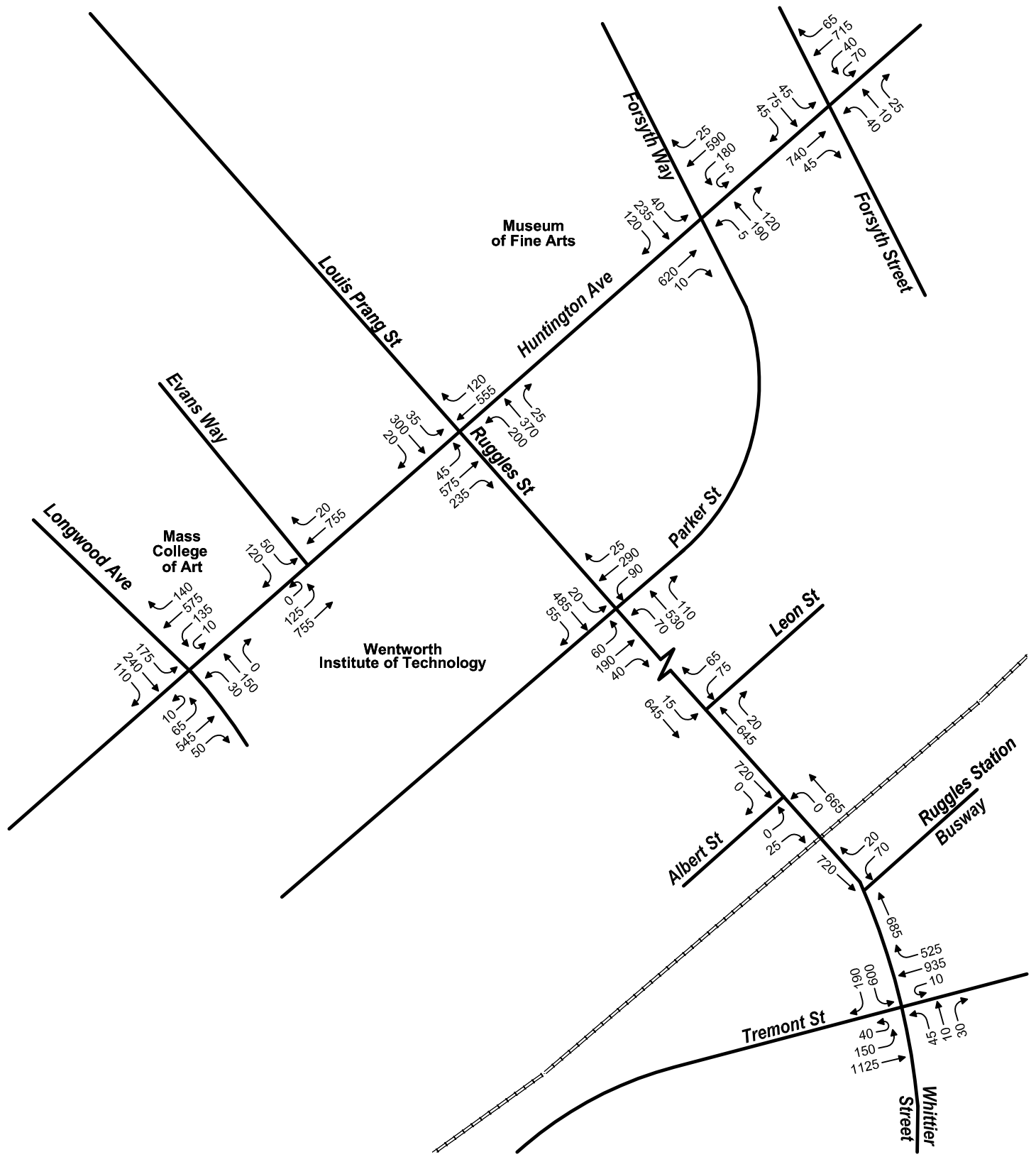
**Vanasse Hangen Brustlin, Inc.**

2012 Existing Condition  
Morning Peak Hour

Figure 3

Sweeney Field PDA



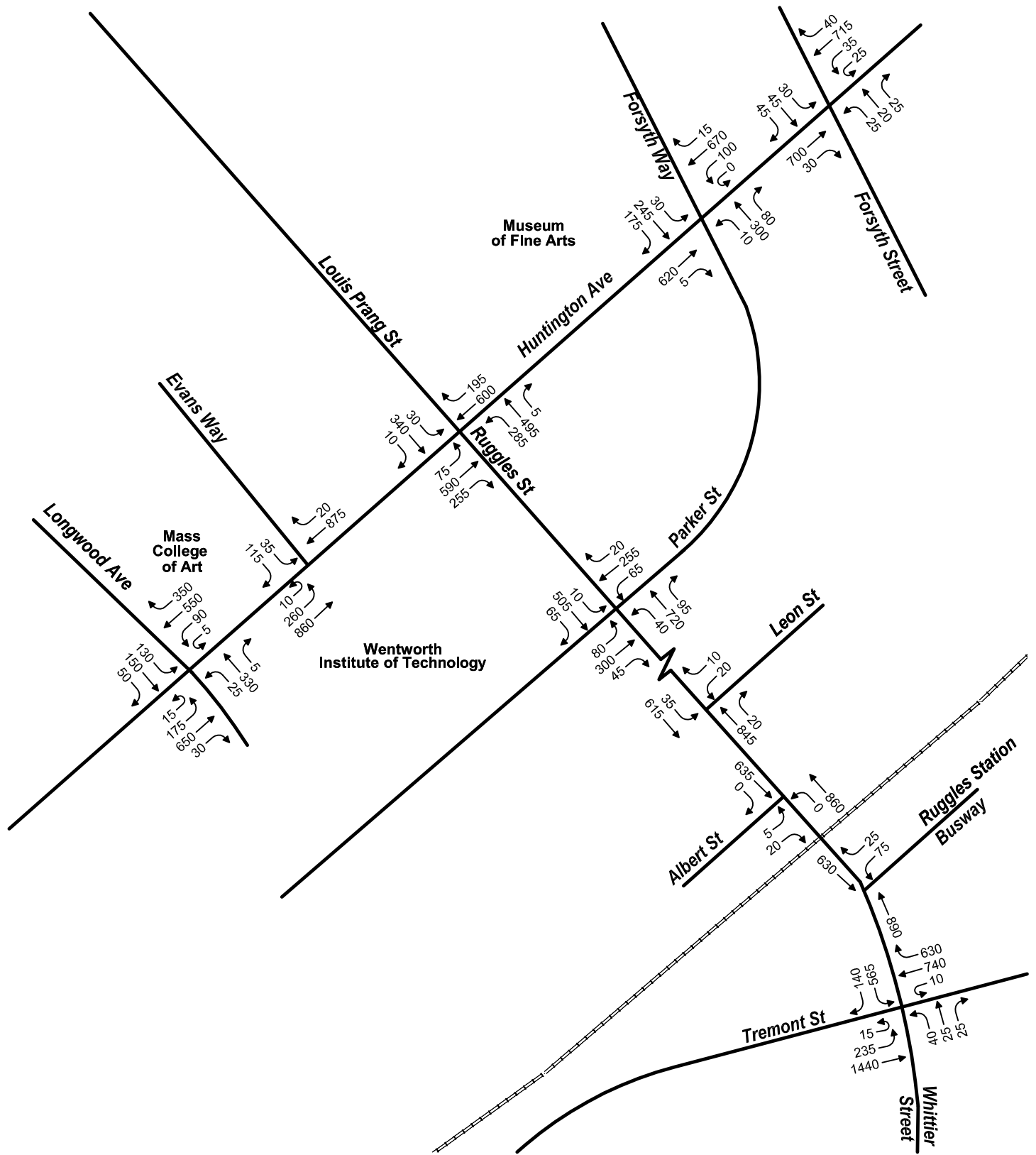


Vanasse Hangen Brustlin, Inc.

↑  
Not to Scale

2012 Existing Condition  
Evening Peak Hour  
Sweeney Field PDA

Figure 4



Vanasse Hangen Brustlin, Inc.

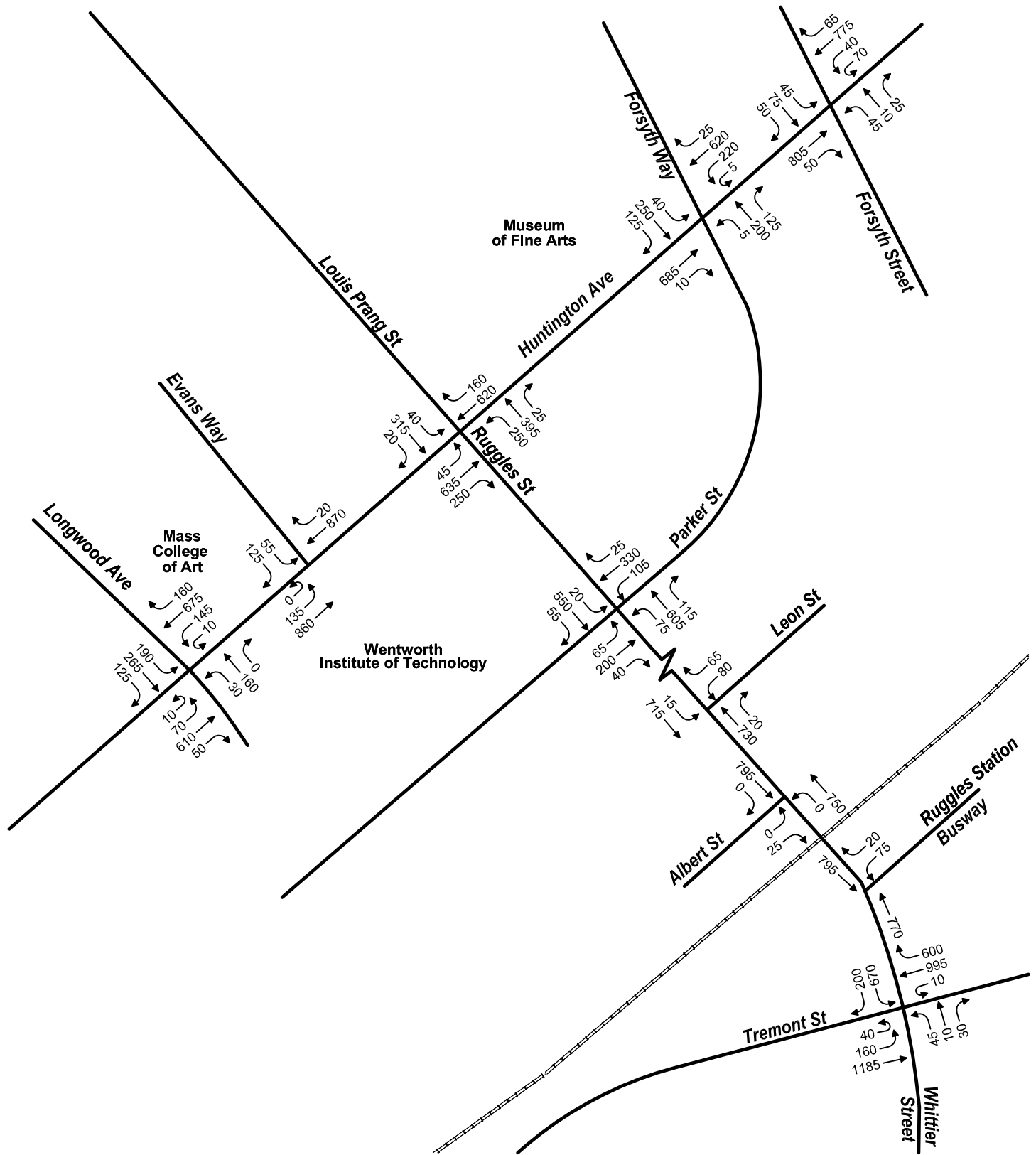


Not to Scale

2020 No-Build Condition  
Morning Peak Hour

Figure 5

Sweeney Field PDA



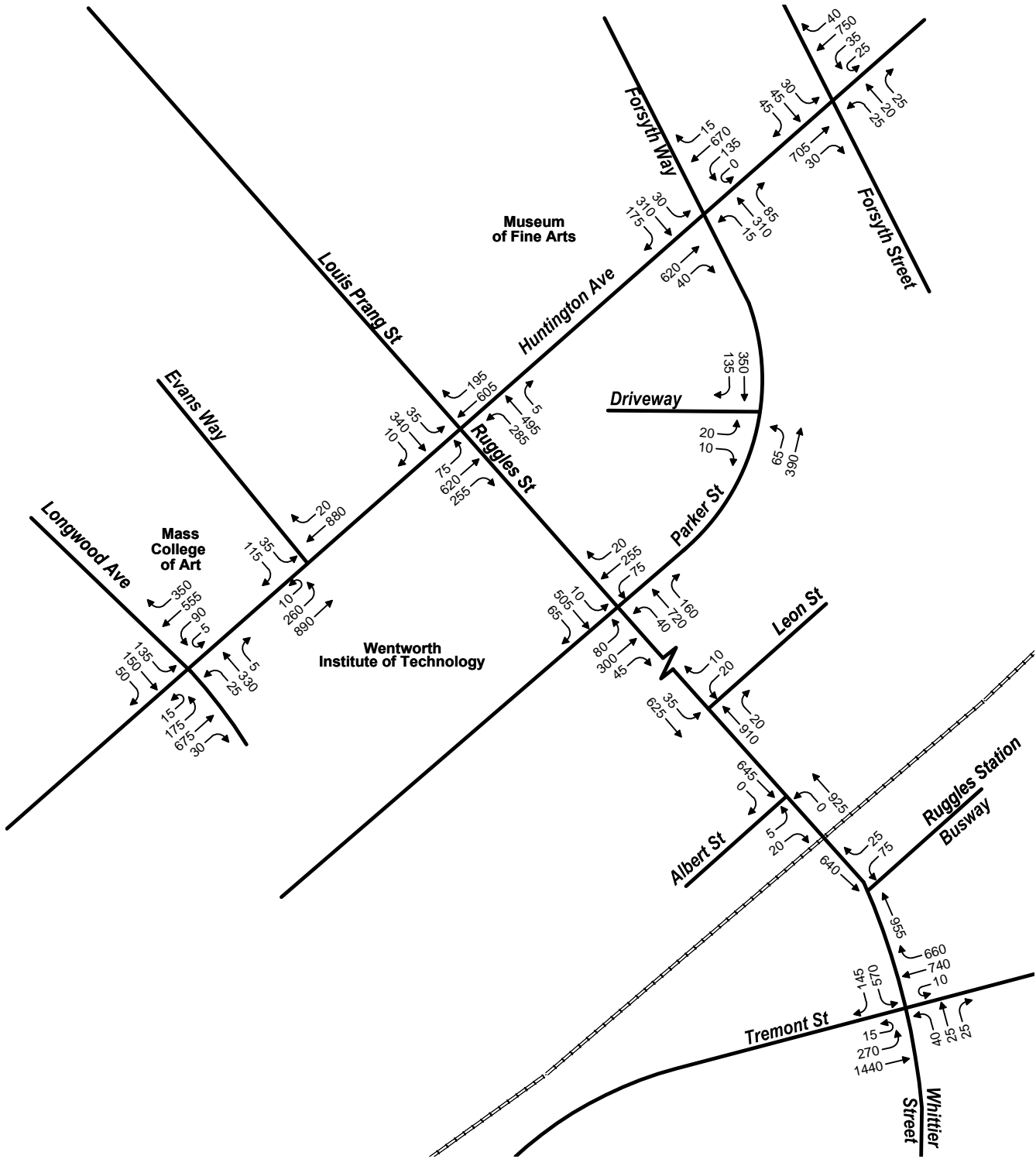
↑  
Not to Scale

**Vanasse Hangen Brustlin, Inc.**

2020 No-Build Condition  
Evening Peak Hour

Figure 6

Sweeney Field PDA

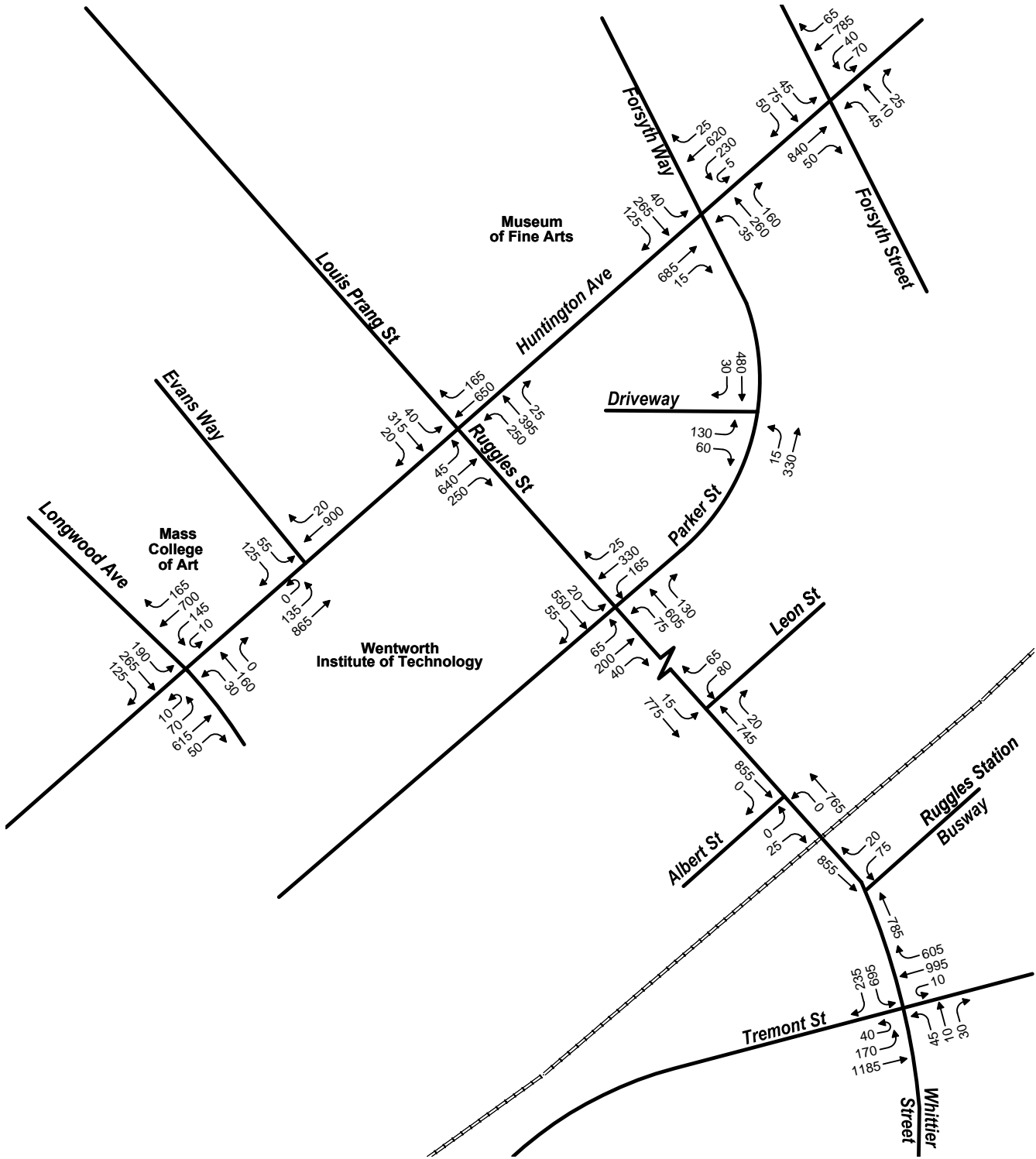


**Vanasse Hangen Brustlin, Inc.**

2020 Build Condition  
Morning Peak Hour

Figure 7

Sweeney Field PDA



**Vanasse Hangen Brustlin, Inc.**

2020 Build Condition  
Evening Peak Hour

Figure 8

Sweeney Field PDA

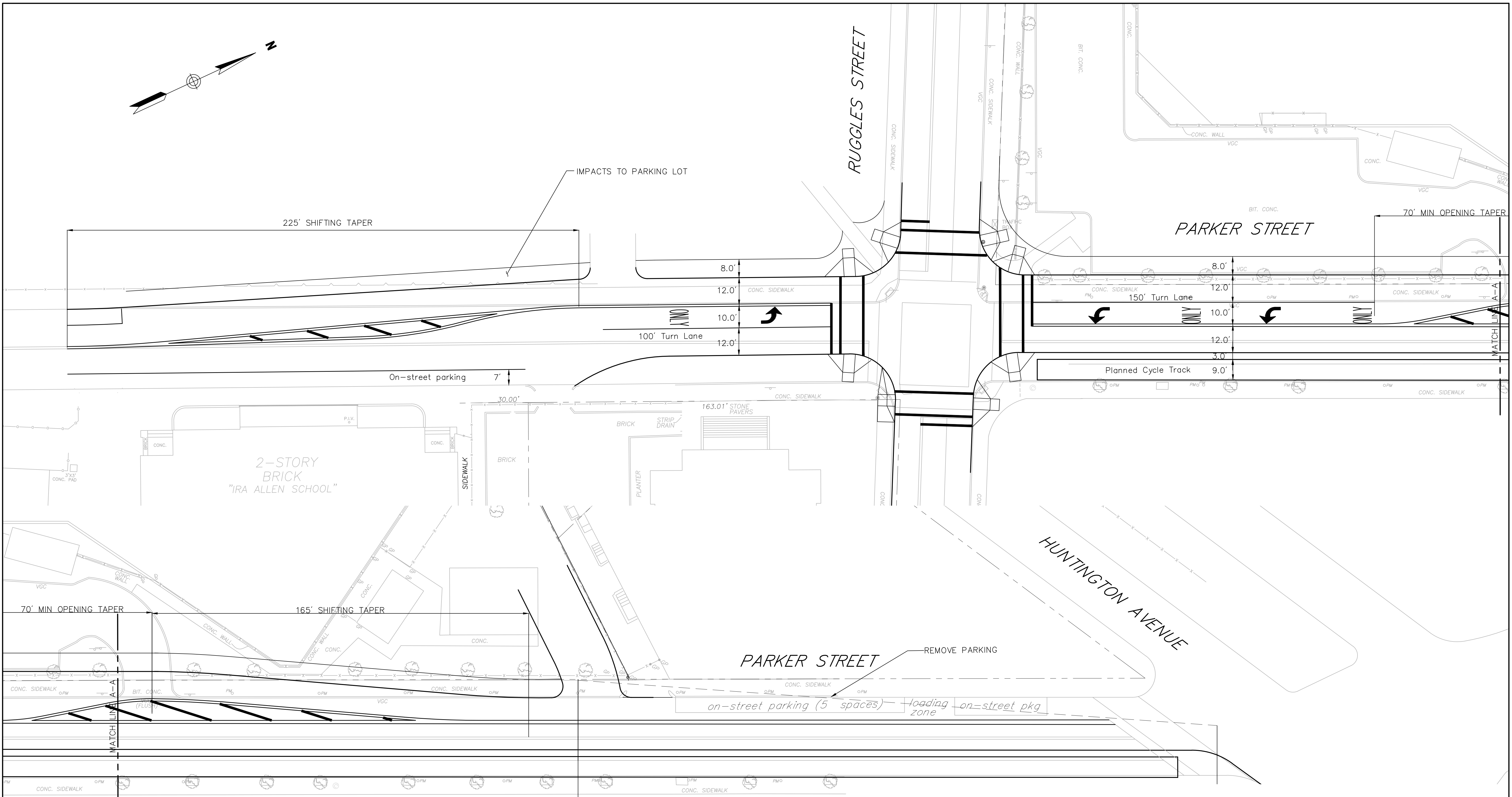


FIGURE 9 CONCEPTUAL IMPROVEMENTS

PARKER STREET  
 BOSTON, MA  
 WENTWORTH  
 BOSTON, MA

**VHB** Vanasse Hangen Brustlin, Inc.  
 Transportation Land Development Environmental Services  
 101 Walnut Street P.O. Box 9151  
 Watertown, MA 02471 617 924 1770 FAX 617 924 2286

DESIGNED BY ELT	DATE 3 JUNE 2013	JOB NO. 10837.01
DRAWN BY ELT	SCALE 1"=20'	
CHECKED BY HWM	SHEET 1 OF	



SHADOW STUDY

## SHADOW STUDY

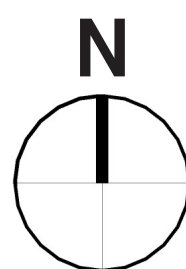
Shadow studies in the following pages illustrate and describe the shadow impacts of the proposed building at the following times of year:

Summer Solstice, June 21: 9am, Noon, 3pm, 6pm

Spring and Fall Equinox, March 21 and September 21: 9am, Noon, 3pm, 6pm

Winter Solstice, December 21: 9am, Noon, 3pm





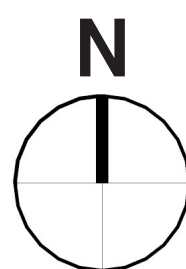
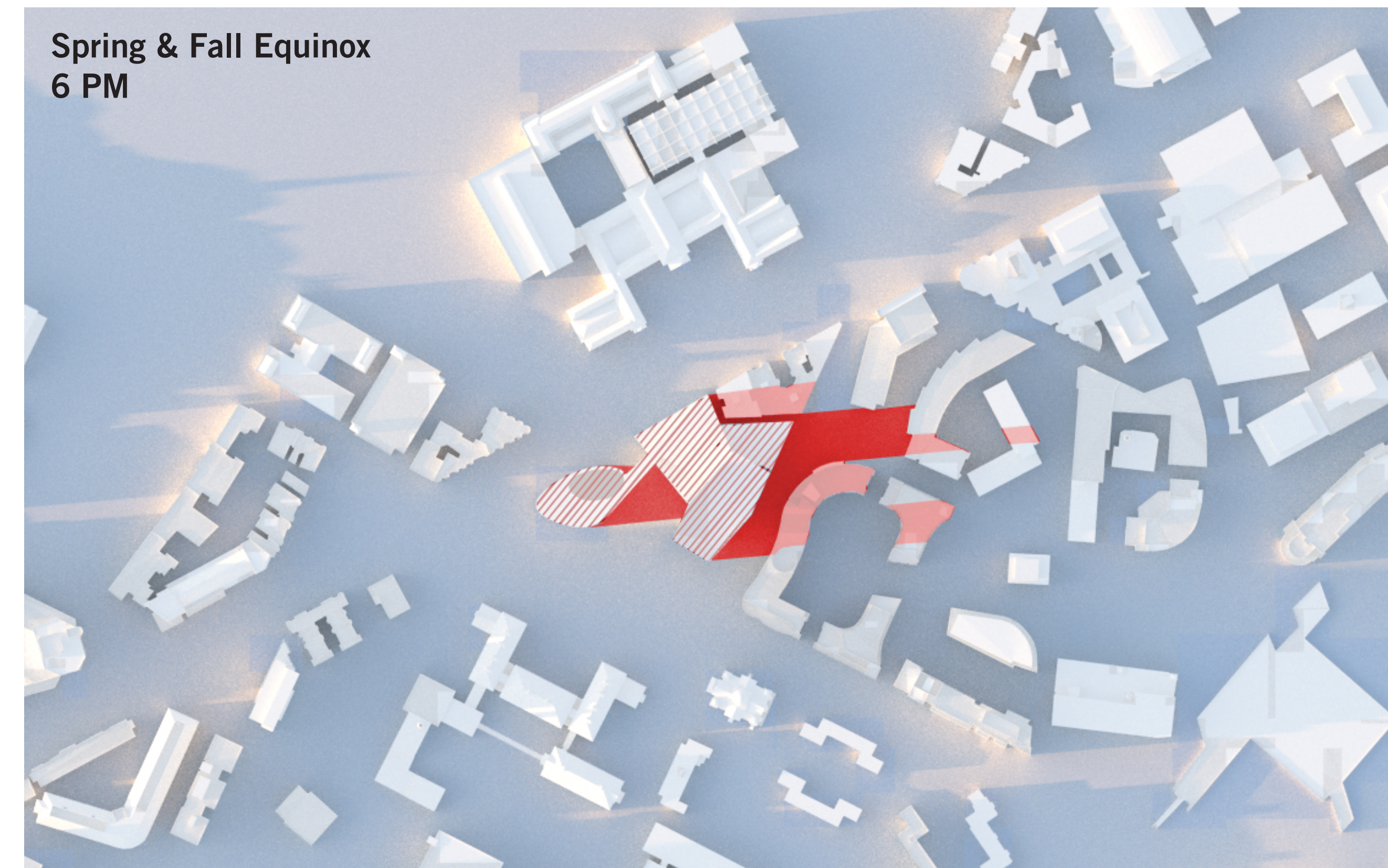
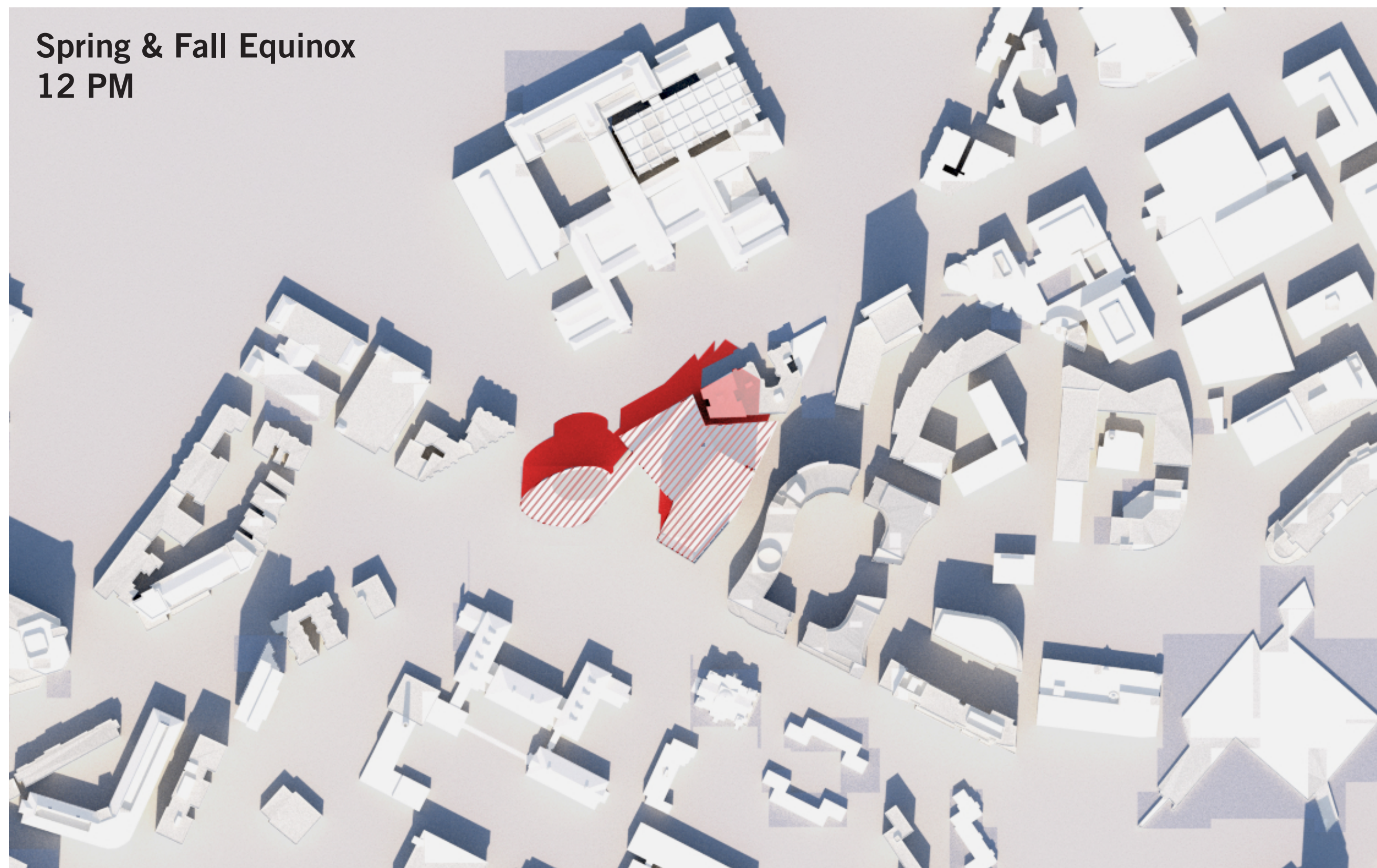
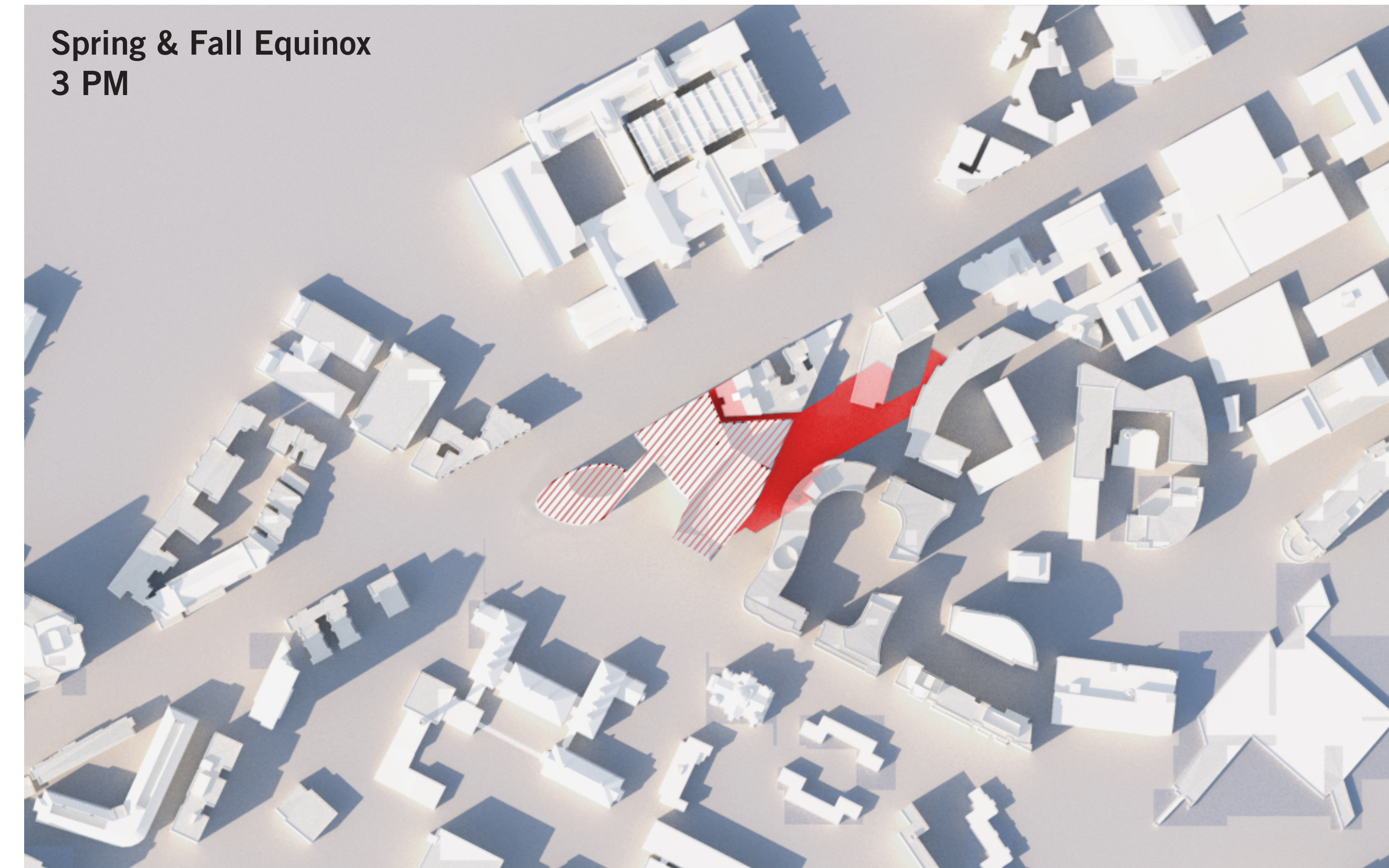
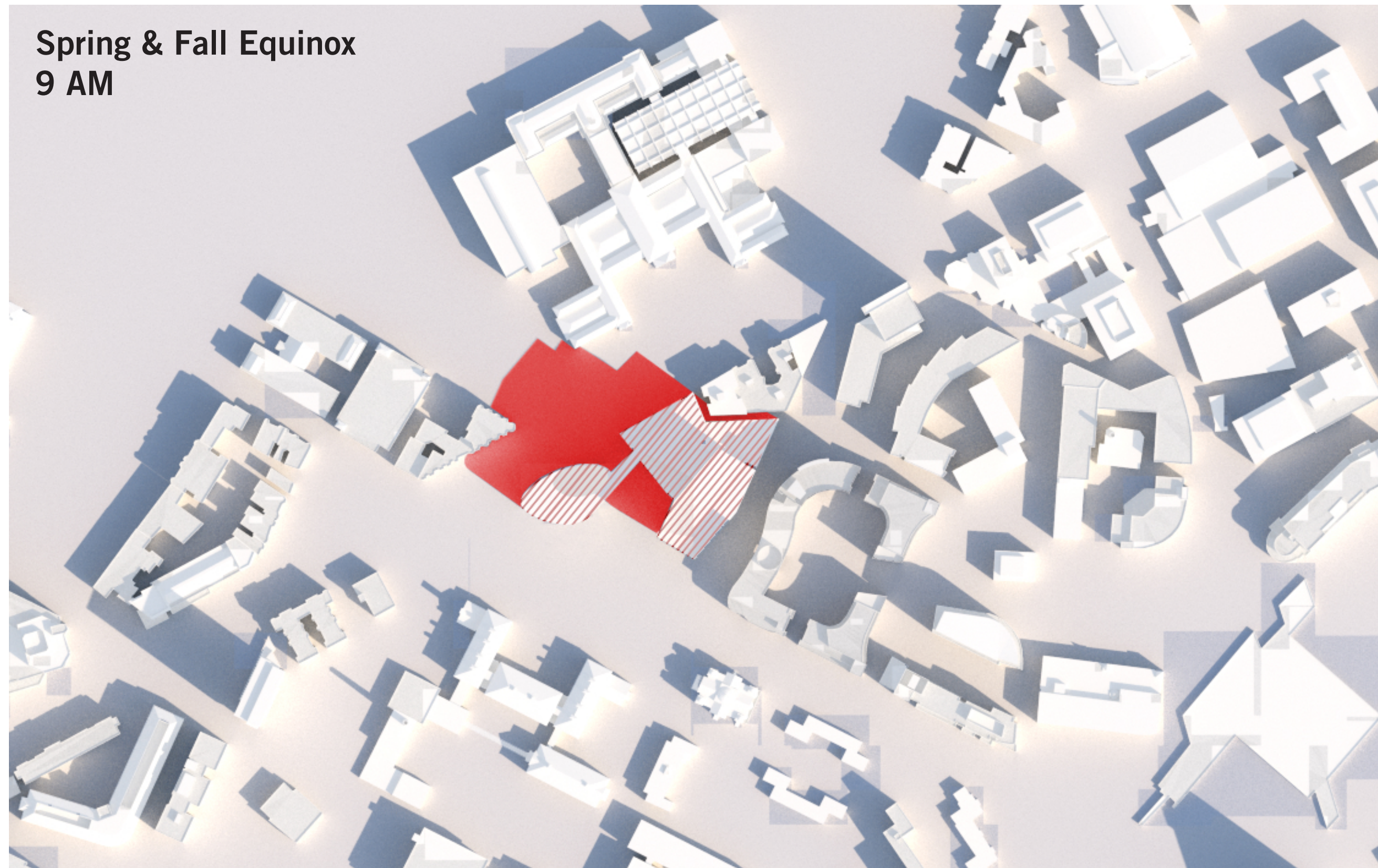
June 04, 2013



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Shadow Studies

PERKINS  
+ WILL



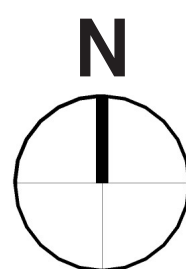
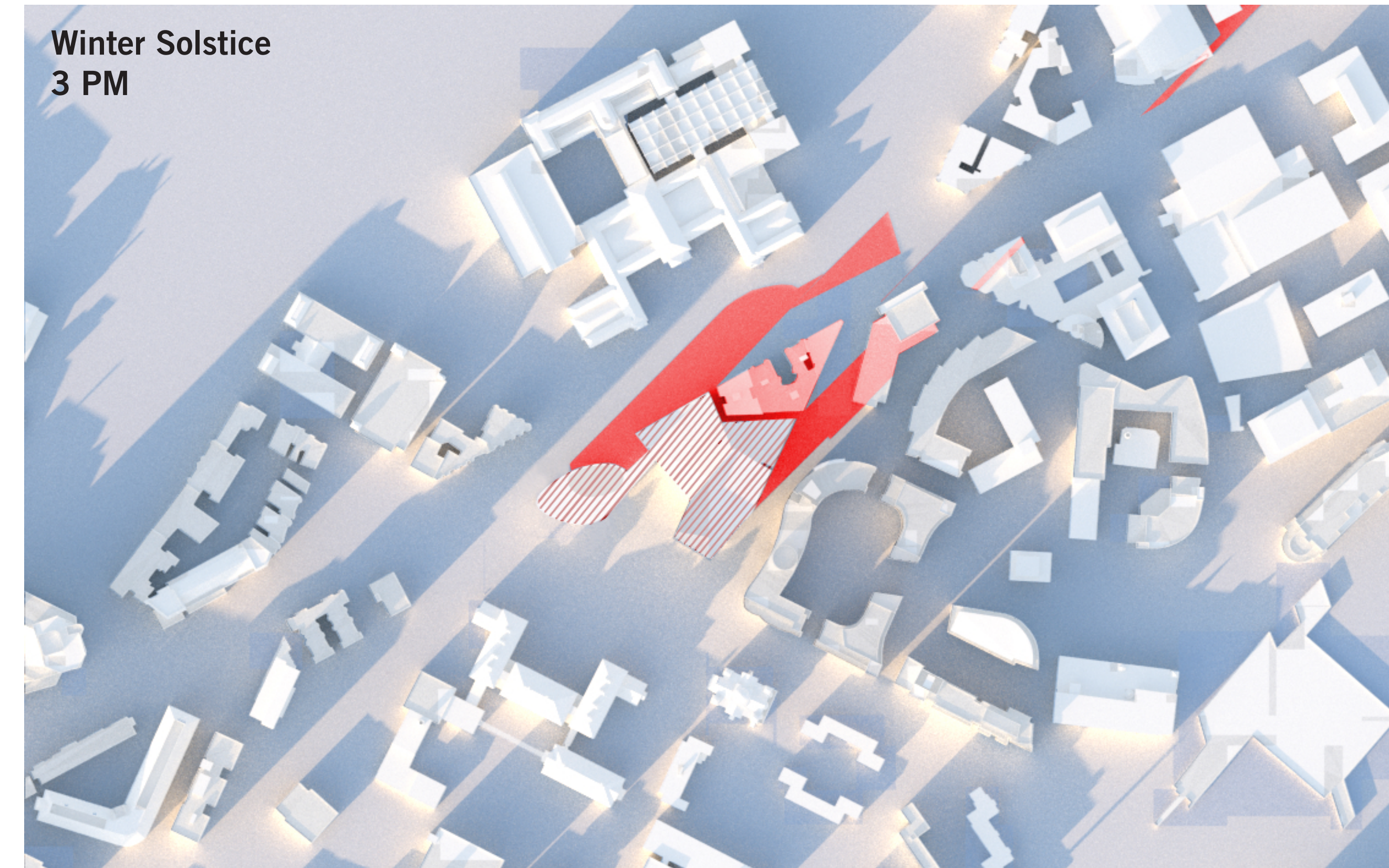
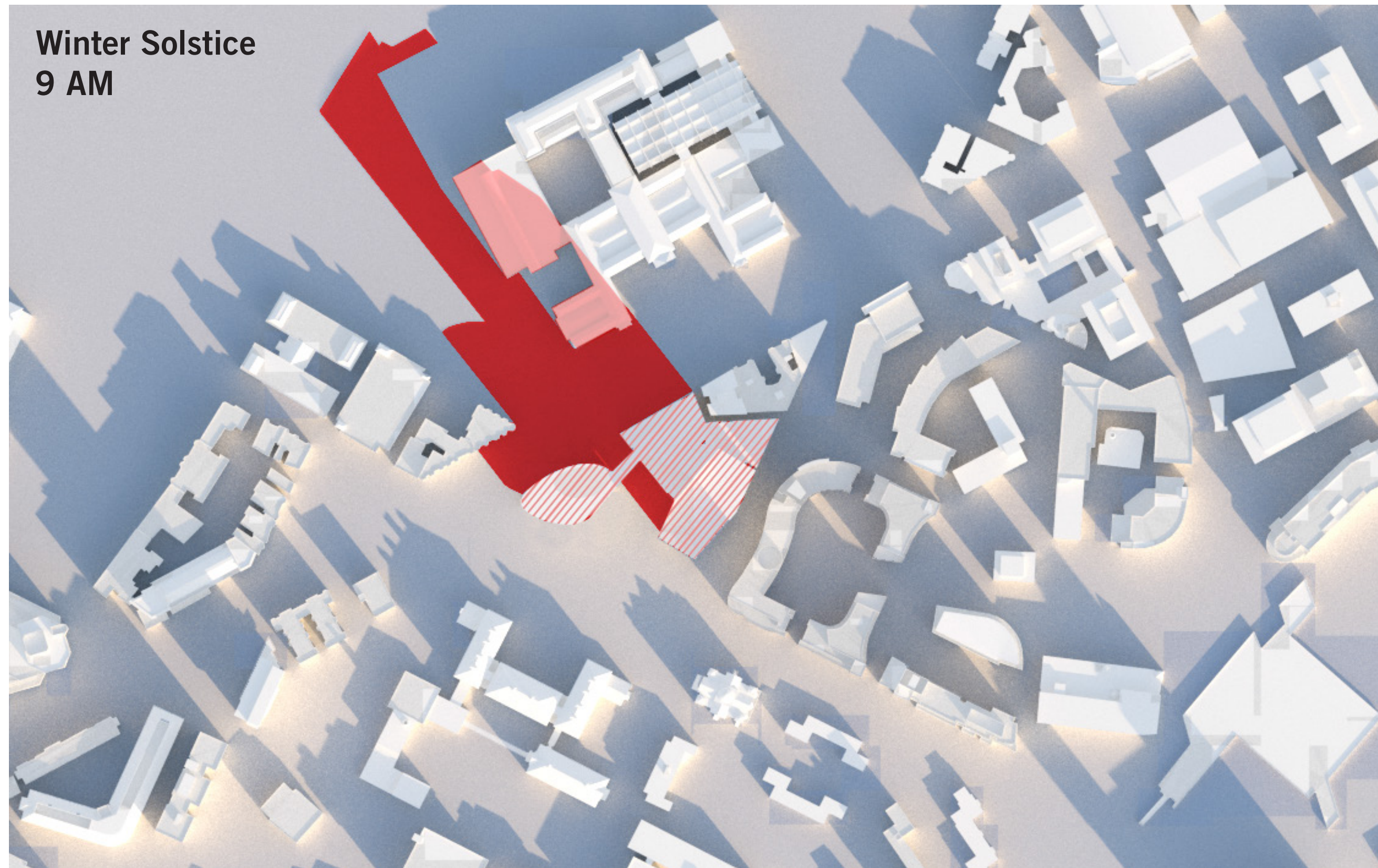
June 04, 2013



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Shadow Studies

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+ WILL



June 04, 2013



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Shadow Studies

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+ WILL

## HISTORIC RESOURCES

## HISTORIC RESOURCES

Tables 5-1 through 5-3 show properties and districts in the immediate vicinity of the Project (approximately one quarter mile). Four sites of interest have been identified in the National and State Registers of Historic Places, as shown in Tables 5-1 and 5-2. The Back Bay Fens is an individual Local Landmark (LL), and the Olmsted Park System of which it forms a part is a National Register District (NRDIS). The Isabella Stewart Gardener Museum, located at 280 The Fenway, is individually listed on the National Register (NRIND) and a Pending Local Landmark (LL). The Greek Orthodox Cathedral of New England is also individually listed on the National Register. The Museum of Fine Arts (MFA), located at 465 Huntington Avenue, is a pending Local Landmark. The sites of these resources are mapped in Figure 5-5, Historic Resources. Numerous other buildings have been identified in the Massachusetts Cultural Resource Information System, but have not received designations of any kind. Table 5-3 presents other properties identified in the Inventory of Historic and Archaeological Assets of the Commonwealth, within the same vicinity.

Due to its location and similar scale to existing buildings in the immediate area, as well as the lack of proximity to identified historic resources in the vicinity, the Proposed Project will have no visual or other impact on any of these properties. Building One will continue the existing street wall along Huntington Avenue. Locating the tower at the back of the site on Parker Street and maintaining a building setback of over 100 feet from Ruggles Street will provide appropriate visual and spatial buffers to the Greek Orthodox Cathedral of New England. Maintaining a lower height along Huntington Avenue will ensure that the new buildings One and Two will relate in massing to the Museum of Fine Arts and other historic buildings that define this urban corridor.

Shadow studies shown included in this supporting material demonstrate a minimal net new shadow impact on historic properties in the vicinity. Throughout spring/fall and summer, shadows from the tower mostly fall within the Site or on the recently constructed Northeastern residence hall on Parker Street. The Huntington Street lawn of the MFA and a portion of the building are only shaded by the tower during the late morning through noon of the shortest days of the year during the winter solstice.

**Table 5-1, Districts Listed in the State and National Registers**

<b>Name</b>	<b>Other Designations</b>
Olmsted Park System Back Bay Fens, Muddy River Boston, Brookline	Back Bay Fens, Local Landmark

**Table 5-2, Individual Properties Listed in the State and National Registers**

<b>Name</b>	<b>Other Designations</b>
Gardner, Isabella Stewart Museum 280 The Fenway	Pending Local Landmark
Greek Orthodox Cathedral of New England 520 Parker St.	

**Table 5-3, Other Properties Identified in the Inventory of Historic and Archaeological Assets of the Commonwealth**

<b>Name</b>	<b>Other Designations</b>
Boston Public Latin High School 78 Louis Pasteur Ave.	
Endicott, John Monument Forsyth Way	

<b>Name</b>	<b>Other Designations</b>
Museum Villa Apartments 465-460 Huntington Ave.	
Beaufort, the Apartments 464 Huntington Ave.	
Boston Museum of Fine Arts 465 Huntington Ave.	Pending Local Landmark
Stanley, Martha Apartment Building 641 Huntington Ave.	
Holmes, William Apartment Building 643-645 Huntington Ave.	
Carlton Apartment Building 160 Longwood Ave.	
Westcourt Apartment Building 164 Longwood Ave.	
Massachusetts College of Pharmacy 179 Longwood Ave.	

Angell Memorial Animal Hospital  
180 Longwood Ave.

Girls Latin School  
Palace Rd.

Collins, Patrick A. Model School  
Palace Rd.

Boston Normal School  
Palace Rd.

Clemente, Roberto Field  
Park Drive

School of the Museum of Fine Arts  
230 The Fenway

Simmons Female College  
300 The Fenway

Green, Joseph Three-Family House  
7 Vancouver St.

Gilligan, William Apartment Building  
456 Parker St.

Allen, Ira Public School  
540 Parker St.

Boston Trade School  
550 Parker St.

Massachusetts Cultural Resources Information System, July 2012

Boston Landmarks Commission lists of designated Boston Landmarks and petitions pending before the Commission, July 2012