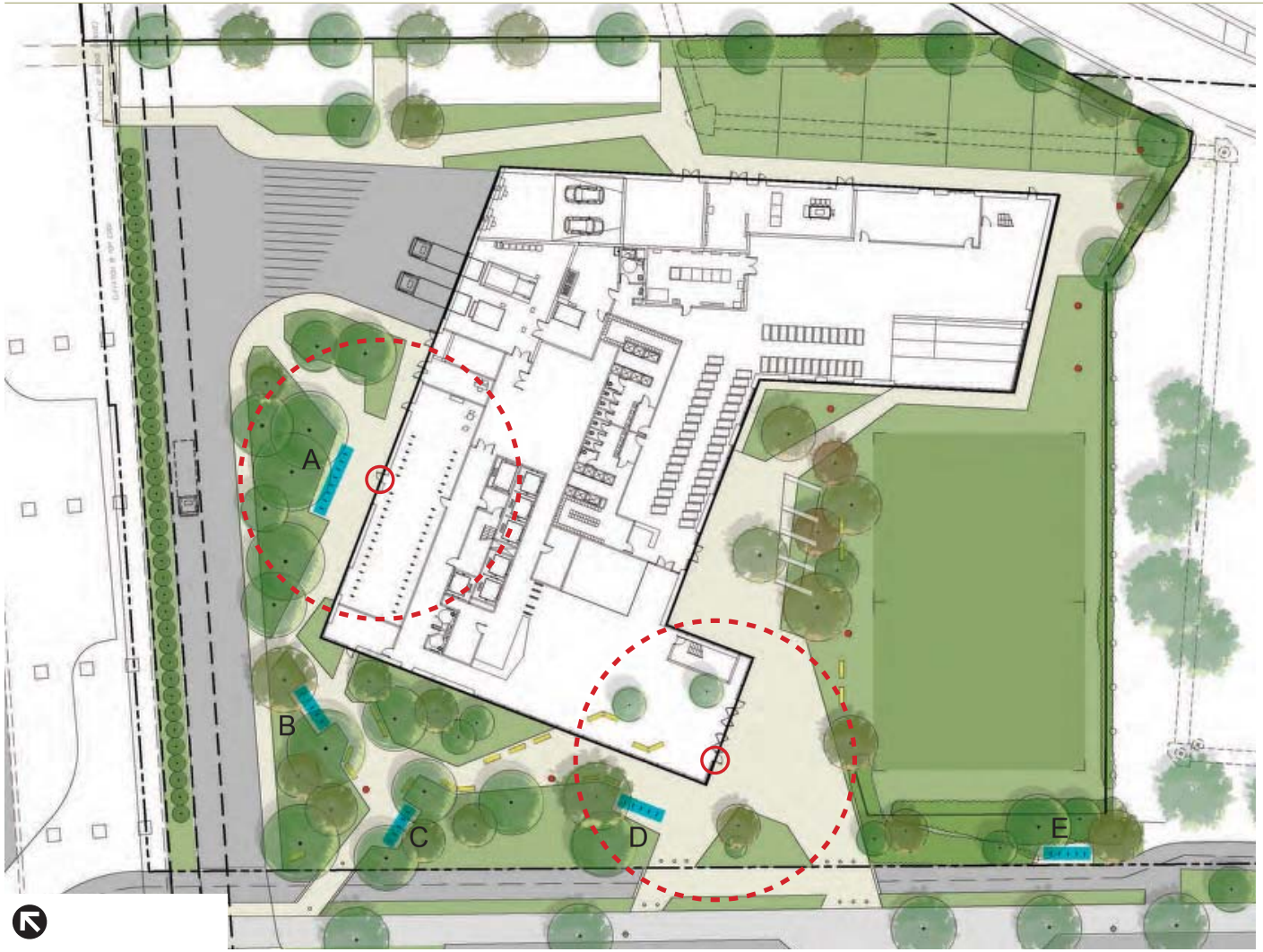
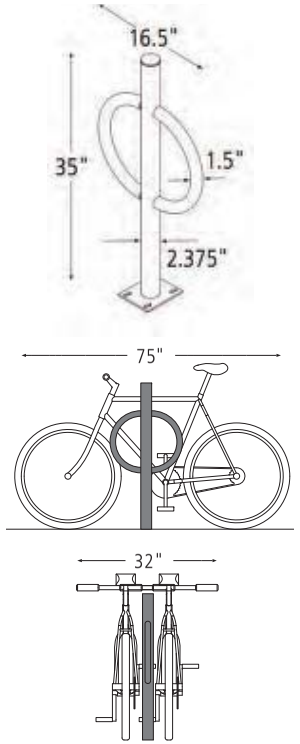




DERO Bike Hitch

LEGEND

50'

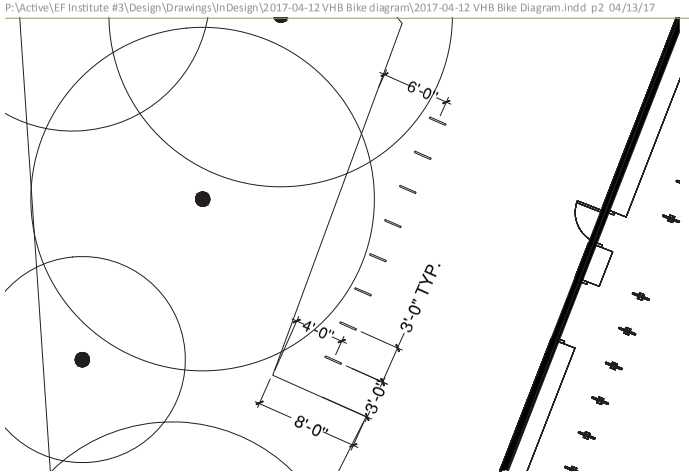
Doors within 50' of short-term bike parking

Proposed short-term bike parking (letter corresponds to Figure_)

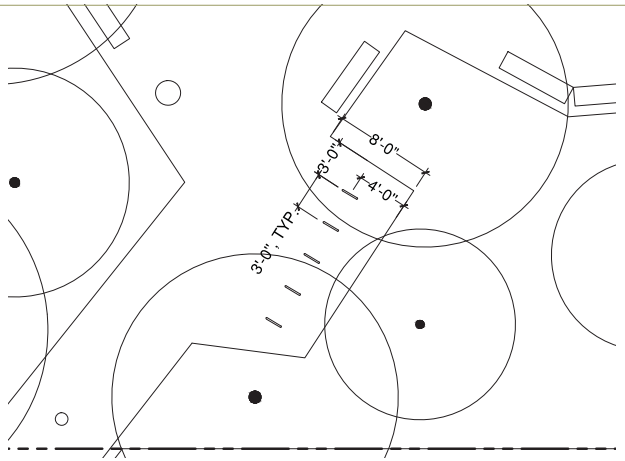
- Total: 28 bike racks/ 56 bike spaces, including 4 tandem bike spaces

Figure F1
Short-Term Bike Parking

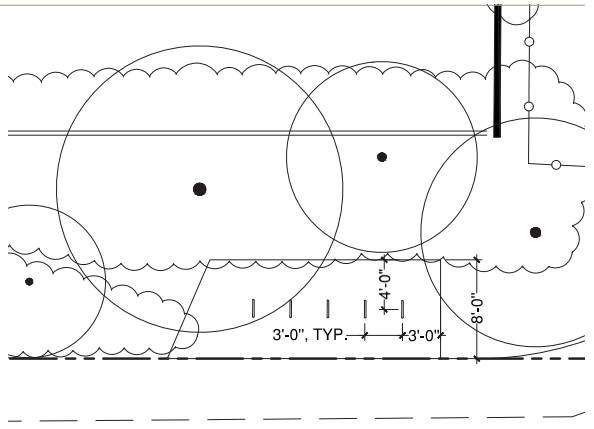
EF Education First III
Cambridge, Massachusetts



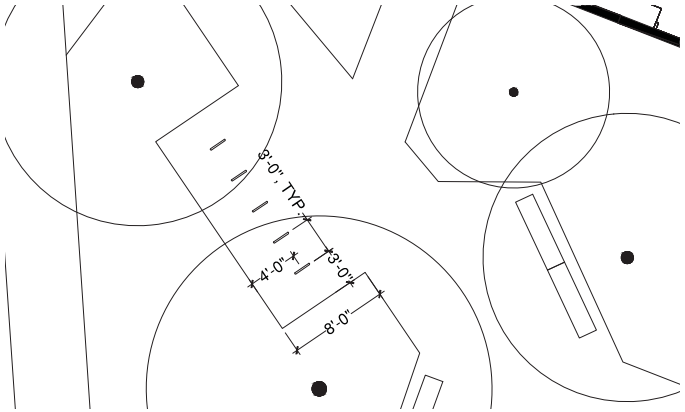
A: 8 Bike Racks/ 16 Bike Spaces



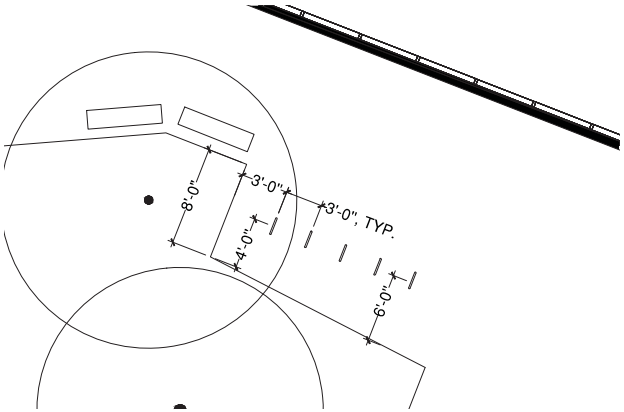
C: 5 Bike Racks/ 10 Bike Spaces



E: 5 Bike Racks/ 10 Bike Spaces



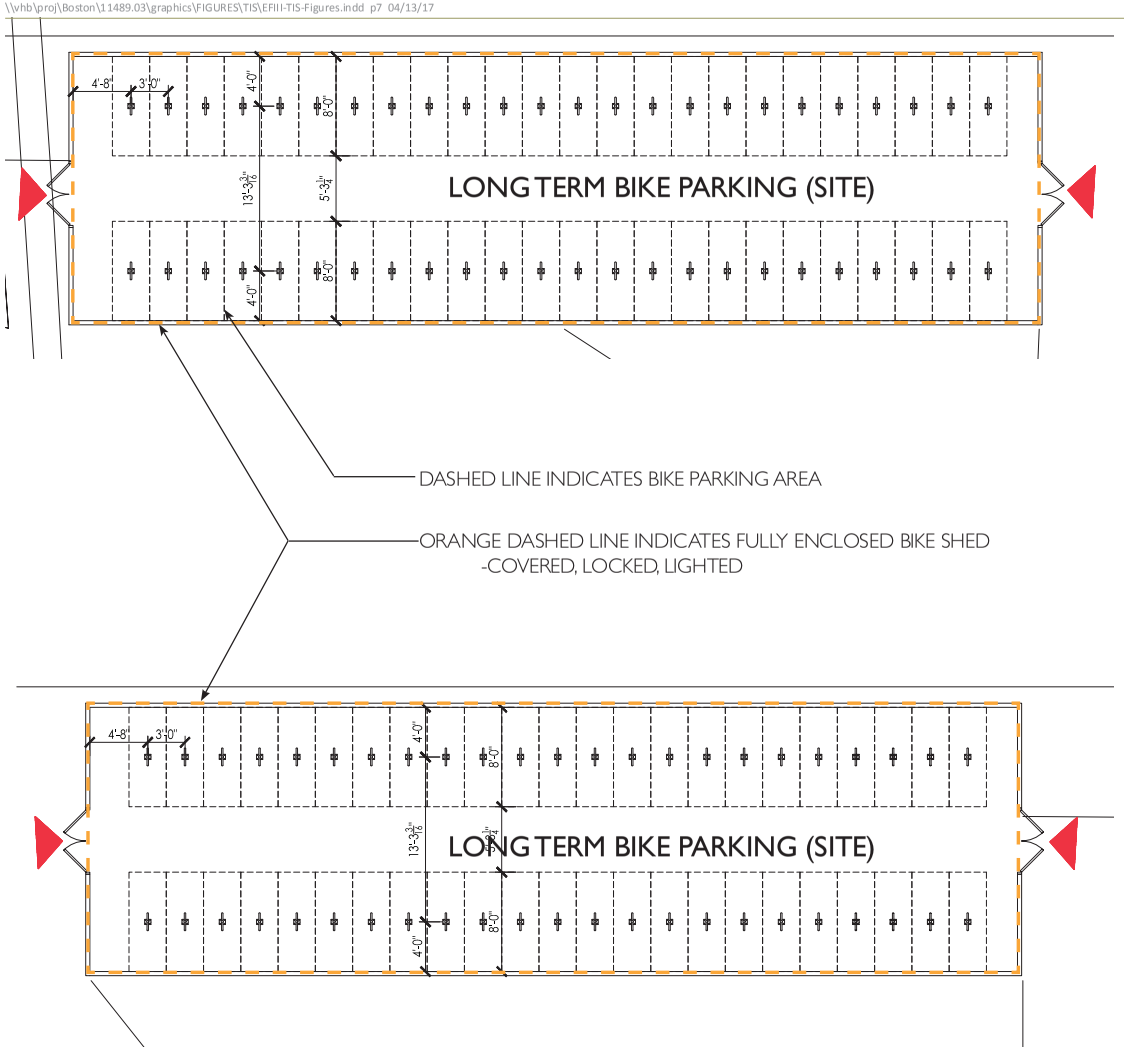
B: 5 Bike Racks/ 10 Bike Spaces



D: 5 Bike Racks/ 10 Bike Spaces

Figure F.2
Short-Term Bike Parking Layout

EF Education First III
Cambridge, Massachusetts



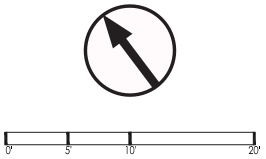
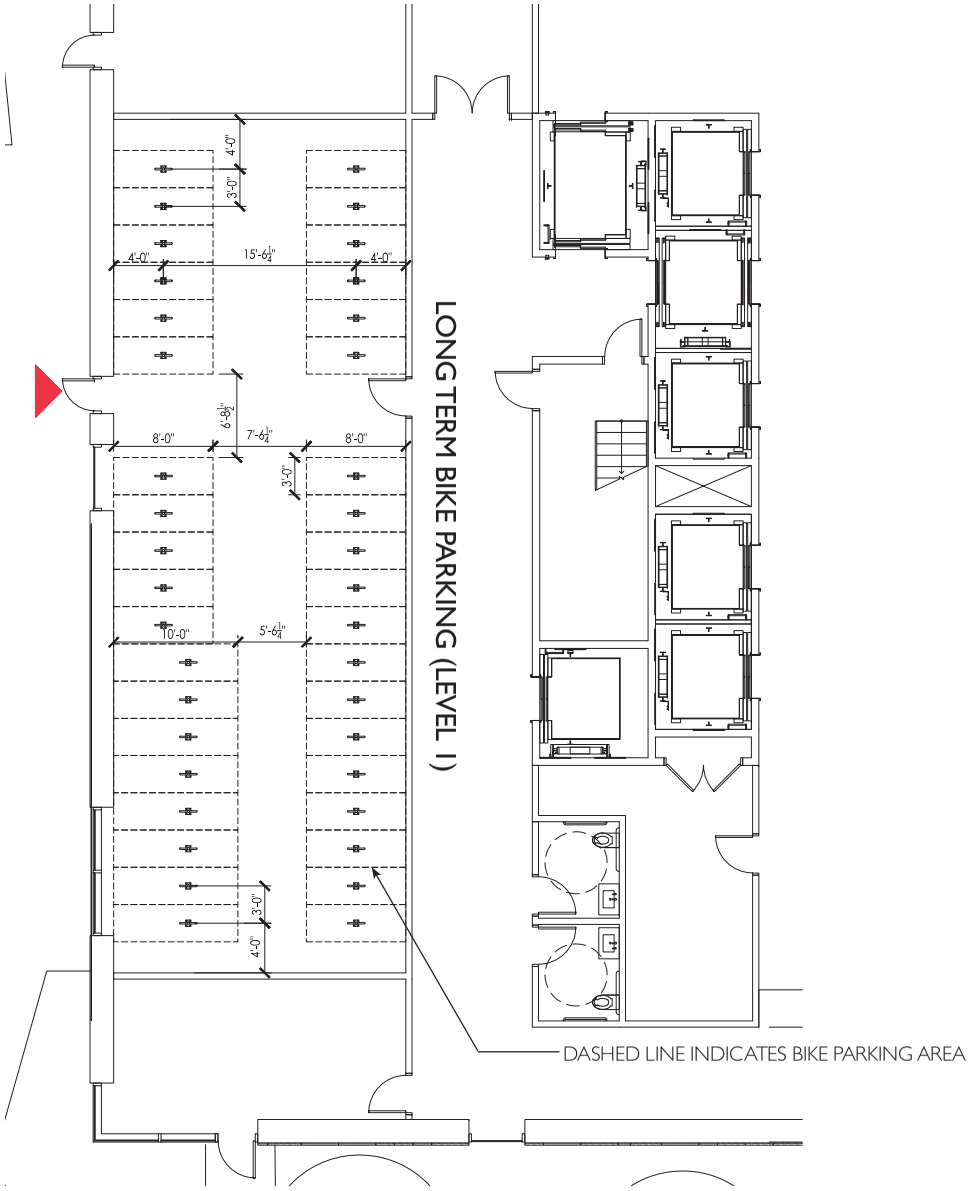


Figure F.3
Proposed Long Term Bike Storage

EF Education First III TIS
Cambridge, Massachusetts



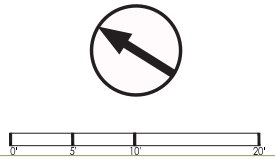


Figure F.4

Proposed Long Term Bike Parking Detailed Layouts

EF Education First III TIS
Cambridge, Massachusetts

1. Monsignor O'Brien Highway at Water Street
2. Monsignor O'Brien Highway at East Street/Cambridge Street
3. Monsignor O'Brien Highway at Charlestown Avenue/Land Boulevard
4. Charles River Dam Road/Monsignor O'Brien Highway at Museum Way
5. East Street at North Point Boulevard
6. North Point Boulevard at North Street
7. Museum Way at Education Street
8. Museum Way at North Point Boulevard
9. EF1 Driveway at North Point Boulevard
10. Education Street at North Point Boulevard
11. EFII Driveway at Education Street

0 250 500 Feet

Source: ArcGIS Online Bing Aerial

Signalized Intersection
Unsignalized Intersection

Figure G

TIS Study Area

EF Education First III TIS
Cambridge, Massachusetts

Planning Board Criteria Summary

Based on the TIS analysis, the Project has been evaluated within the context of the Planning Board Criteria to determine if the Project has any potential adverse transportation impacts. Exceeding one or more of the Criteria is indicative of a potentially adverse impact on the City's transportation network. However, the Planning Board will consider mitigation efforts, their anticipated effectiveness, and other information that identifies a reduction in adverse transportation impacts.

The Planning Board Criteria consider the Project's vehicular trip generation, impact to intersection level of service and queuing, as well as increase of volume on residential streets. In addition, pedestrian and bicycle conditions are considered. A discussion of the Criteria set forth by the Planning Board is presented in the final section of the TIS, and the Planning Board Criteria Performance Summary is presented below.

CITY OF CAMBRIDGE Planning Board Criteria Performance Summary
Special Permit Transportation Impact Study (TIS)

Planning Board Permit Number: _____

PROJECT NAME: EF Education First Expansion Project (EFIII)

Address: Two Education Circle
Cambridge MA 02141

Owner/Developer Name: EFEKTA Group, Inc.

Contact Person: Shawna Sullivan Marino

Contact Address: Two Education Circle
Cambridge, MA 02141

Contact Phone: 617-619-1488

SIZE:

ITE sq. ft.: 242,600

Land Use Type: Education (dormitory/cafeteria), Office, Fitness Center

PARKING:

Existing Parking Spaces*: 0

New Parking Spaces**: 110 Use: Education (dormitory/cafeteria), Office, Fitness Center

Net New Parking Spaces*** +110

*Not including existing DCR parking spaces since they are being relocated to the northeast of the site

Date of Parking Registration Approval: N/A

TRIP GENERATION:

	Daily	AM Peak Hour	PM Peak Hour
Total Trips	4,048	389	488
Vehicle	710	76	90
Transit	1,850	176	221
Pedestrian	1,190	105	139
Bicycle	298	32	38

MODE SPLIT (PERSON TRIPS):

	Education	Office	Fitness Center
Auto	13.1%	35.8%	31.0%
Transit	47.2%	41.9%	30.0%
Walk	32.8%	12.7%	29.0%
Bike	6.3%	7.8%	8.0%
Other	0.6%	1.8%	2.0%

TRANSPORTATION CONSULTANT:

Company Name: VHB

Contact Name: Susan Sloan-Rossiter

Phone: 617.728.7777

Date of Building Permit Approval: _____

Planning Board Permit Number: _____

CITY OF CAMBRIDGE Planning Board Criteria Performance Summary
Special Permit Transportation Impact Study (TIS)

Project Name: EF Education First Expansion Project (EFIII)

Total Data Entries = 115 Total Number of Criteria Exceedances = 12

1. Project Vehicle Trip Generation*

Time Period	Criteria (trips)	Build	Exceeds Criteria?
Weekday Daily	2,000	710	No
Weekday AM Peak Hour	240	76	No
Weekday PM Peak Hour	240	90	No

2. Level of Service (LOS)

	AM Peak Hour				PM Peak Hour			
Intersection	Existing Condition	Build Condition	Traffic Increase	Exceeds Criteria?	Existing Condition	Build Condition	Traffic Increase	Exceeds Criteria?
Monsignor O'Brien Hwy at Cambridge St/East St	C	C	1.1%	No	C	C	1.4%	No
Monsignor O'Brien Hwy at Land Blvd/ Charlestown Ave	F	F	0.7%	No	F	F	0.8%	No
Monsignor O'Brien Hwy at Museum Way	B	B	1.2%	No	B	B	1.7%	No

3. Traffic on Residential Streets

			AM Peak Hour			PM Peak Hour		
Roadway	Reviewed Segment	Amount of Residential	Existing	Project Trips	Exceeds Criteria?	Existing	Project Trips	Exceeds Criteria?
East Street	O'Brien Hwy to North Point Blvd	1/3 or less	225	32	No	270	39	No
North Point Boulevard	East St to Leighton St	1/2 or more	215	32	Yes	255	39	Yes
	North St to Museum Way	1/3 or less	295	33	No	280	46	No
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2,510	11	No	2,430	5	No
	Leighton St to East St/Cambridge St	1/2 or more	2,465	0	No	2,385	0	No
Museum Way	O'Brien Hwy to Education St	1/3 or less	450	33	No	365	46	No
	Education St to North Point Blvd	1/3 or less	315	33	No	285	46	No

*volume interpolated from nearest data available in study area

4. Lane Queue (for signalized intersections)

		AM Peak Hour			PM Peak Hour		
Intersection	Movement	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
Monsignor O'Brien Hwy at Cambridge St/East St	Cambridge St EB thru/left	1	1	No	3	3	No
	Cambridge St EB right	0	0	No	0	0	No
	East St WB left/thru/right	2	2	No	2	3	No
	MOB NB left	5	5	No	5	5	No
	MOB NB thru/right	3	3	No	10	10	No
	MOB SB left	2	3	No	1	1	No
	MOB SB thru	10	10	No	5	5	No
	MOB SB right	2	2	No	1	1	No
Monsignor O'Brien Hwy at Land Blvd/ Charlestown Ave	Land Blvd EB left	5	5	No	~13	~13	No
	Land Blvd EB thru	8	8	No	~17	~17	No
	Land Blvd EB right	0	0	No	2	2	No
	Charlestown Ave WB left	7	7	No	6	6	No
	Charlestown Ave WB thru/right	~39	~39	No	~22	~22	No
	MOB NB left	~10	~10	No	7	8	No
	MOB NB thru	9	9	No	9	9	No
	MOB NB right	5	5	No	6	7	No
	MOB SB left	~6	~6	No	~14	~14	No
	MOB SB Thru	~13	~13	No	7	7	No
	MOB SB right	~11	~11	No	2	3	No
Monsignor O'Brien Hwy at Museum Way	Museum Way WB left	3	3	No	4	4	No
	Museum Way WB right	0	0	No	1	1	No
	MOB NB thru/right	2	2	No	3	4	No
	MOB SB left/thru	8	9	No	2	2	No

5. Pedestrian and Bicycle Facilities

		AM Peak Hour			PM Peak Hour		
Intersection	Crosswalk	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
O'Brien Highway at Cambridge Street / East Street	North	D	D	No	D	D	No
	East	C	C	No	C	C	No
	South	D	D	No	D	D	No
	South (Cambridge Median to channelized island)	C	C	No	C	C	No
	West (Cambridge St RT)	B	B	No	B	B	No
O'Brien Highway at Land Boulevard / Charlestown Avenue/Gilmore Bridge	North	D	D	No	E	E	Yes
	South	E	E	Yes	E	E	Yes
	West	E	E	Yes	E	E	Yes
O'Brien Highway at Museum Way	North	E	E	Yes	E	E	Yes
	East	D	D	No	E	E	Yes
	South	E	E	Yes	E	E	Yes

Sidewalk and Bicycle Facilities

Adjacent Street	Link (between)	Sidewalks or Walkways Present?	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present?	Exceeds Criteria?
East Street	MOB Hwy to North Point Blvd (west side)	Yes	No	Yes	No
	MOB Hwy to North Point Blvd (east side)	Yes	No	Yes	No
North Point Boulevard	East St to Leighton St (north side)	Yes	No	Yes	No
	East St to Leighton St (south side)	Yes	No	Yes	No
	Leighton St to Museum Way (north side)	Yes	No	Yes	No
	Leighton St to Museum Way (south side)	Yes	No	Yes	No
	Museum Way to Education St (north side)	Yes	No	Yes	No
	Museum Way to Education St (south side)	Yes	No	Yes	No
Museum Way	MOB Hwy to Education Street (west side)	Yes	No	Yes	No
	MOB Hwy to Education Street (east side)	Yes	No	Yes	No
	Education St to North Point Blvd (west side)	Yes	No	Yes	No
	Education St to North Point Blvd (east side)	Yes	No	Yes	No

Transportation Impact Study

This Transportation Impact Study for the proposed EF Education First Expansion Project (EFIII) in Cambridge, MA (the Project) describes existing and future transportation conditions in the study area in accordance with the City of Cambridge Sixth Revision (November 28, 2011) of the Transportation Impact Study Guidelines. The study area for the TIS includes three existing signalized intersections and eight existing unsignalized intersections as previously shown in Figure G.

This section includes inventories of physical and operational conditions in the study area including roadways, intersections, crosswalks, sidewalks, on-street and off-street parking, transit facilities, and land uses in the study area. Transportation data that were collected and compiled are presented, including automatic traffic recorder counts, intersection turning movement counts, pedestrian and bicycle counts, vehicle crash data, and transit service data.

1. Inventory of Existing Conditions

a. Roadways

The Project Site will be accessed by North Point Boulevard just south of the Site. North Point Boulevard, a local roadway, extends from Education Street east of the Site to East Street west of the Site. Access from North Point Boulevard to Monsignor O'Brien Highway (also known as MOB) is provided via Museum Way and East Street which are also local roadways. Monsignor O'Brien Highway is a state-owned roadway that begins at the Cambridge/Somerville City-Limits and terminates at Land Boulevard where it becomes Charles River Dam Road until it meets Leverett Circle in Boston. It is also designated as Massachusetts Route 28. MassDOT classifies this roadway a Principal Arterial and it is part of the National Highway System (other). Monsignor O'Brien Highway intersects with Land Boulevard and Charlestown Avenue/Gilmore Bridge southwest of the Site. MassDOT classifies both Charlestown Avenue/Gilmore Bridge and Land Boulevard as Urban Principal Arterials. Figure D, previously presented, shows the existing roadway layout near the Project site. Figures referenced in the following *section b. Intersections* illustrate the cross sections of the study area roadways.

b. Intersections

The Project study area includes the following 11 existing study intersections which are presented in Figure G and illustrated in Figures 1.b.1 through 1.b.11.

1. Monsignor O'Brien Highway at Water Street
2. Monsignor O'Brien Highway at East Street/Cambridge Street
3. Monsignor O'Brien Highway at Charlestown Avenue/Gilmore Bridge/Land Boulevard
4. Monsignor O'Brien Highway at Museum Way
5. East Street at North Point Boulevard
6. North Point Boulevard at North Street
7. Museum Way at Education Street
8. Museum Way at North Point Boulevard
9. EF1 Driveway at North Point Boulevard
10. Education Street at North Point Boulevard
11. EFII Driveway at Education Street

Geometric roadway and signal timings as analyzed under the Monsignor O'Brien Highway Functional Design Report have been assumed for the baseline existing conditions analysis (2017) for the intersections along Monsignor O'Brien Highway due to the construction of the Longfellow Bridge.

c. Parking

The existing EF campus (comprising of EFI and EFII) currently uses the parking supply at a high occupancy the majority of the time. Existing peak hour parking data for both garages is presented in Table 1.c.1. Supplementary parking data showing a full weeks' worth of data by user type is provided in the Appendix. The data demonstrates that EF1 has a peak parking occupancy of 93% at 12:00 PM and EFII has a parking occupancy of 96% at 12:00 PM.

Table 1.c.1 Existing Peak Parking Occupancy March 29, 2017

	10 AM	12 PM	2 PM	4 PM
EFI				
Occupancy	124	127	114	100
% Occupancy	91%	93%	84%	74%
EFII				
Occupancy	112	117	113	110
% Occupancy	92%	96%	93%	90%

Source: EF collected parking data on March 29, 2017

d. Transit Services

The Proposed Project is well served by public and private transportation services in the area as illustrated in Figure 1.d.1. Pedestrian access to and from public transportation facilities is shown in Figure 1.d.2. It is anticipated that many of the students and staff/faculty of the Project will use public transit to commute to the Site. The MBTA Lechmere Station (Green Line) is less than a half-mile walk to the northwest on O'Brien Highway while the Science Park Station (Green Line) is a half mile walk in the opposite direction south of the Site along Charles River Dam Road. The Orange Line Community College Station is located less than one half mile from the Site on Charlestown Avenue/Gilmore Bridge. The recently constructed Brian P. Murphy Memorial Staircase provides vertical access from Charlestown Avenue/Gilmore Bridge to the North Point neighborhood. In addition to the private direct shuttle EF offers staff and students to the red and orange lines, the EZ ride shuttle connects Kendall Square on the Redline to Lechmere Station and North Station.

Public Transit Services

Orange Line

The Orange Line runs between Oak Grove in Malden and Forest Hills in Jamaica Plain. The closest stop to the Project Site is at the Community College Station. The Orange Line also stops at North Station providing access for Commuter Rail riders. The service runs on 6-minute headways during peak hours. The Orange Line runs from 5:16 AM to 12:30 AM weekdays. Saturday service is provided between 5:16 AM and 12:35 AM while Sunday service is provided between 6:00 AM and 12:35 AM.

Green Line E Branch

The Heath Street E Branch of the Green Line light rail line runs between Heath Street in Jamaica Plain and Lechmere Station in Cambridge. The service runs on 6-minute headways during peak hours with two-car train-sets during peak periods. The E Branch runs from 5:01 AM to 12:30 AM weekdays. Saturday service is provided between 5:01 AM and 12:47 AM while Sunday service is provided between 5:35 AM and 12:47 AM. Lechmere Station also provides bus service for MBTA routes 69, 80, 87, and the 88. The Green Line also stops at North Station providing access for Commuter Rail Riders. The Green Line will be extended into Medford in the future which includes the relocation of Lechmere Station to the northeast side of Monsignor O'Brien Highway in the North Point neighborhood.

MBTA Buses

The MBTA operates the following four bus routes that provide service within one-half mile of the Project site:

- **Bus Route 69** operates between Lechmere Station and Harvard Holyoke Gate via Cambridge Street in Cambridge. The closest stop is at Lechmere Station. Rush hour service is provided every 10-30 minutes. Weekday service is provided from 5:25 AM to 12:59 AM. Saturday service is provided from 5:15 AM to 1:25 AM and Sunday service is provided from 6:20 AM to 1:09 AM.
- **Bus Route 80** operates between Lechmere Station and Arlington Center via Medford Hillside. The closest stop is at Lechmere Station. Rush hour service is provided every 20 minutes. Weekday service is provided from 5:00 AM to 12:49 AM. Saturday service is provided from 5:05 AM to 1:22 AM and Sunday service is provided from 6:30 AM to 12:21 AM.
- **Bus Route 87** operates between Lechmere Station and Arlington Center or Clarendon Hill via Somerville Avenue. The closest stop is at Lechmere Station. Rush hour service is provided approximately every 20-30 minutes. Weekday service is provided between 5:10 AM and 1:00 AM. Saturday service is provided from 5:15 AM to 1:19 AM and Sunday service is provided from 6:00 AM to 1:13 AM.
- **Bus Route 88** operates between Lechmere Station and Clarendon Hill via Highland Avenue. The closest stop is at Lechmere Station. Rush hour service is provided every 16-25 minutes. Weekday service is provided between 5:16 AM and 12:50 AM. Saturday service is provided from 5:30 AM to 1:14 AM and Sunday service is provided from 6:40 AM to 1:15 AM.

Privately-Operated Services

CRTMA EZRide Shuttle

The Charles River Transportation Management Association (TMA) operates the EZRide Shuttle service between North Station, Lechmere Station, Kendall Square, University Park and Cambridgeport. This shuttle provides connections to the Green Line and the northern MBTA commuter rail services, as well as the Orange Line at North Station. The shuttle travels along North Point Boulevard and stops on Museum Way at Education Street during the peak periods. Weekday service is provided every 7-10 minutes during the morning and evening peak periods starting at 6:20 AM at North Station and ending at 10:28 PM. The EZRide shuttle does not run on Saturday or Sunday. Members of the TMA that pay for service can use the shuttle for free, however it is available to the public for $2 per ride.

EF Shuttle

EF provides its employees and students with a customized shuttle service to Kendall Square, Lechmere, and Community College MBTA stations that are in highest demand to further enhance the opportunity for its employees and students to utilize public transportation. The shuttle picks up employees and students at the cul-de-sac outside of EF Center at Two Education Circle every 30 minutes from 5:40 p.m. through 9:40 p.m. Monday – Friday. Shuttle data shows that on average approximately 300 riders utilize the shuttle service per month during the winter (November through March) and approximately 150 riders per month utilize the shuttle between April and October. The shuttle information and schedule are available on EF's and Hult's internal websites and information is distributed to new employees and students at staff/student orientation events.

e. Land Use

Figure 1.e.1 illustrates land uses in the area surrounding the Project. The neighborhood is comprised of a mixed use of land including residential, commercial, industrial, office, higher education, transportation, utility, and open space. The North Point Park is located to the east of the site along the Charles River. Land used for industrial and transportation/utility is located to the north and northeast of the site. The rest of North Point is a mixed-use commercial/residential/office/higher education neighborhood.

2. Data Collection

a. ATR Counts

Due to the construction on the Longfellow Bridge, automatic traffic recorders (ATR) collected in May, 2012 from the NorthPoint Monsignor O'Brien Highway Transportation Improvement Project and contained in the Functional Design Report (FDR) are presented as the existing traffic volumes. If ATR counts were to be conducted in 2017, they would not reflect typical traffic conditions along O'Brien Highway and Land Boulevard due to the Longfellow Bridge construction. ATR counts were conducted on Museum Way and North Point Boulevard in September, 2016 since these roadway volumes would not be impacted by the Longfellow Bridge construction.

Traffic volume summaries for these ATR locations are presented in Tables 2.a.1 through 2.a.4. These data, representing the averages of data collected, indicate the variations of traffic volume and the directional distribution of traffic over the course of an average weekday. The 2012 ATR counts have been grown by 0.5 percent per year to reflect current conditions. Raw count data sheets are included in the Appendix.

Table 2.a.1 Existing Traffic Volume Summary (September, 2016 & May, 2012)

Location	Daily [a]	Weekday AM Peak Hour			Weekday PM Peak Hour		
		Volume [b]	K [c]	Peak Direction	Volume [b]	K [c]	Peak Direction
1. North Point Blvd west of Museum Way[d]	4,063	417	10.3%	78% EB	372	9.2%	62% EB
2. Museum Way north of O'Brien Highway[d]	5,847	467	8.0%	59% SB	448	7.7%	68% SB
3. O'Brien Highway east of Museum Way[e]	29,697	1,755	5.9%	51% WB	1,597	5.4%	55% WB
4. O'Brien Highway between Museum Way & Land Blvd[e]	17,568	794	4.5%	60% EB	734	4.2%	61% EB
5. Land Blvd south of O'Brien Highway[e]	20,493	1,055	5.1%	78% SB	941	4.6%	52% NB
6. Gilmore Bridge north of O'Brien Highway[e]	25,422	874	3.4%	55% SB	1,740	6.8%	72% NB
7. O'Brien Highway west of Leighton Street[e]	22,755	1,134	5.0%	62% EB	1,261	5.5%	51% EB
8. O'Brien Highway east of Water Street[e]	21,458	1,444	6.7%	75% EB	1,547	7.2%	53% WB

a vehicles per day
b vehicles per peak hour
c percentage of daily traffic that occurs during the peak hour
d traffic volumes collected in September, 2016
e traffic volumes collected in May, 2012 grown to Existing Conditions

Table 2.a.2 Existing Average Daily Traffic Summary September, 2016

	1. North Point Blvd west of Museum Way			2. Museum Way north of O'Brien Highway		
Start Time	EB	WB	Total	SB	NB	Total
12:00	34	14	48	48	25	73
1:00	16	14	30	26	20	46
2:00	14	3	17	22	9	31
3:00	7	4	11	10	9	19
4:00	8	13	21	14	20	34
5:00	14	55	69	26	80	106
6:00	61	66	127	70	117	187
7:00	160	56	216	184	104	288
8:00	304	88	392	262	166	428
9:00	197	68	265	200	150	350
10:00	132	58	190	188	110	298
11:00	104	64	168	149	98	247
12:00	100	52	152	168	104	272
13:00	112	56	168	170	110	280
14:00	160	64	224	224	112	336
15:00	136	67	203	200	106	306
16:00	168	74	242	232	118	350
17:00	237	118	355	302	138	440
18:00	184	137	321	266	158	424
19:00	151	98	249	214	140	354
20:00	108	84	192	182	128	310
21:00	100	64	164	165	122	287
22:00	78	49	127	118	87	205
23:00	70	42	112	105	71	176
Total*	2,655	1,408	4,063	3,545	2,302	5,847

*Note: values represented in table are rounded numbers; therefore, the "Total" row takes into consideration these decimals

Table 2.a.3 Existing Average Daily Traffic Summary May 2012

	3. O'Brien Hwy east of Museum Way			4. O'Brien Hwy btwn Museum Way & Land Blvd			5. Land Blvd south of O'Brien Hwy			6. Gilmore Bridge north of O'Brien Hwy		
Start Time	EB	WB	Total	EB	WB	Total	SB	NB	Total	NB	SB	Total
12:00	249	361	610	200	319	518	115	178	293	237	88	324
1:00	168	185	352	157	164	321	63	94	157	121	62	183
2:00	113	142	255	106	132	238	44	75	119	94	54	148
3:00	93	86	179	82	89	171	61	43	104	58	69	126
4:00	210	153	363	202	139	341	152	56	208	77	206	283
5:00	387	311	698	340	246	586	459	112	571	148	587	735
6:00	731	625	1,355	531	374	905	739	163	902	388	1,069	1,456
7:00	830	741	1,571	496	336	832	801	233	1,034	368	626	994
8:00	866	889	1,755	477	317	794	827	228	1,055	396	478	874
9:00	834	814	1,648	489	349	838	798	266	1,063	423	523	946
10:00	843	772	1,615	519	397	915	694	306	999	548	610	1,157
11:00	825	797	1,622	473	436	909	651	390	1,041	615	645	1,259
12:00	815	782	1,597	515	408	923	653	450	1,103	795	714	1,508
13:00	849	759	1,608	522	415	937	639	560	1,199	831	693	1,524
14:00	1,005	779	1,784	551	375	925	615	752	1,367	1,065	734	1,799
15:00	818	847	1,664	497	344	841	508	618	1,126	1,277	655	1,932
16:00	727	847	1,573	451	324	775	431	551	982	1,102	436	1,538
17:00	717	881	1,597	446	289	734	448	494	941	1,248	492	1,740
18:00	729	914	1,643	449	356	805	668	693	1,360	1,077	512	1,589
19:00	736	805	1,541	462	400	862	575	703	1,278	895	507	1,402
20:00	672	655	1,326	476	440	916	411	659	1,069	777	410	1,187
21:00	745	542	1,287	543	362	905	356	673	1,029	678	346	1,024
22:00	620	485	1,105	508	345	852	310	554	864	618	352	969
23:00	449	505	954	324	408	732	208	426	634	526	205	731
Total*	15,026	14,671	29,697	9,810	7,759	17,568	11,220	9,273	20,493	14,357	11,066	25,422

*Note: values represented in table are rounded numbers; therefore, the "Total" row takes into consideration these decimals

Table 2.a.4 Existing Average Daily Traffic Summary May, 2012

	7. O'Brien Hwy west of Leighton St			8. O'Brien Hwy east of Water St		
Start Time	EB	WB	Total	EB	WB	Total
12:00	191	222	412	125	189	314
1:00	128	118	246	80	96	175
2:00	73	82	154	40	66	106
3:00	70	57	127	42	39	81
4:00	123	96	219	89	54	142
5:00	238	171	409	226	87	313
6:00	644	371	1,014	705	239	943
7:00	756	443	1,199	1,011	341	1,352
8:00	708	426	1,134	1,090	355	1,444
9:00	721	451	1,172	1,010	379	1,389
10:00	722	444	1,166	756	395	1,151
11:00	680	538	1,217	574	434	1,008
12:00	744	553	1,297	635	497	1,132
13:00	778	559	1,337	624	480	1,103
14:00	781	529	1,309	632	528	1,160
15:00	771	564	1,335	658	658	1,316
16:00	692	676	1,367	638	809	1,447
17:00	640	621	1,261	721	826	1,547
18:00	670	584	1,254	683	682	1,364
19:00	723	586	1,309	578	520	1,098
20:00	636	490	1,126	435	459	894
21:00	624	428	1,052	410	379	789
22:00	511	386	897	337	313	650
23:00	379	371	749	224	321	545
Total*	12,997	9,759	22,755	12,317	9,141	21,458

*Note: values represented in table are rounded numbers; therefore, the "Total" row takes into consideration these decimals

b. Pedestrian and Bicycle Counts

Peak hour pedestrian and bicycle movements at study-area intersections, collected during the vehicle turning movement counts are discussed below.

c. Intersection Turning Movement Counts

Turning movement counts (TMCs), including pedestrians and bicyclists, were conducted at study area intersection locations within the North Point neighborhood on September 21, 2016. Due to ongoing construction of the Longfellow Bridge, TMCs along Monsignor O'Brien Highway would not reflect typical traffic conditions. Therefore, TMCs conducted as part of the NorthPoint Monsignor O'Brien Highway Transportation Improvement Project and contained in the Functional Design Report (FDR) have been used for the study area intersections along Monsignor O'Brien Highway. Since these intersections were counted in 2012, the volumes have been increased by 0.5 percent per year to account for growth.

The Monsignor O'Brien Highway corridor traffic peak hours were determined to be 8:00 AM – 9:00 AM for the morning peak hour and 5:00 AM – 6:00 PM for the evening peak hour. The North Point neighborhood intersections traffic peak hours were determined to be 8:15 AM – 9:15 AM for the morning peak hour and 5:30 PM – 6:30 PM for the evening peak hour. Existing 2017 peak hour traffic volumes are shown in Figures 2.c.1 and 2c.2 for the morning and evening commuter peaks, respectively.

Pedestrian volumes at study intersections are shown in Figures 2.c.3 and 2.c.4 for the AM and PM peak hours, respectively. Bicycle volumes are presented in Figures 2.c.5 and 2.c.6 for the AM and PM peak hours, respectively.

d. Traffic Crash Analysis

Study-area crash data were obtained from Mass Highway records for the three-year period from January 2012 through December 2014 (the most recent data available). An analysis of the crash data is summarized in Table 2.d.1. A detailed summary by crash type is provided in Table 2.d.2.

Table 2.d.1 MassDOT Crash Analysis (2012 – 2014) Summary

Location		Total Crashes (3-year period)	Signalized or Unsignalized/ Average Crash Rate	Calculated Crash Rate
1)	Monsignor O'Brien Highway at Water Street	1	0.53	0.04
2)	Monsignor O'Brien Highway at East Street/Cambridge Street	18	0.70	0.53
3)	Monsignor O'Brien Highway at Charlestown Avenue/Gilmore Bridge/Land Boulevard	42	0.70	0.68
4)	Monsignor O'Brien Highway at Museum Way	9	0.70	0.27
5)	East Street at North Point Boulevard	0	0.53	0
6)	North Point Boulevard at North Street	1	0.53	0.28
7)	Museum Way at Education Street	1	0.53	0.20
8)	Museum Way at North Point Boulevard	5	0.53	1.13
9)	EF1 Driveway at North Point Boulevard	0	0.53	0
10)	Education Street at North Point Boulevard	0	0.53	0
11)	EFII Driveway at Education Street	0	0.53	0

The Statewide Average Intersection crash rates for signalized intersections in District 6 (which includes the Project Site) is 0.70 for signalized intersections and 0.53 for unsignalized intersections. None of the study area intersections are above the 0.70 crash rate for signalized intersections. The intersection of Museum Way at North Point Boulevard is above the 0.53 crash rate for unsignalized intersections with a 1.13 crash rate.

Table 2.d.2 MassDOT Crash Analysis (2012 – 2014) Details

Year		Monsignor O'Brien Highway			North Point Blvd	Museum Way	
	Water St	East Street/ Cambridge St	Charlestown Ave/ Land Blvd	Museum Way	North St	Education St	North Point Blvd
2012	0	7	14	2	0	0	3
2013	1	5	14	4	1	0	0
2014	0	6	14	3	0	1	2
Total	1	18	42	9	1	1	5
Average	0.33	6.00	14.00	3.00	0.33	0.33	1.67
Collision Type							
Angle	0	3	14	2	0	0	1
Head-on	0	0	1	1	0	0	0
Rear-end	0	2	13	3	0	0	1
Rear-to-Rear	0	1	0	0	0	0	0
Sideswipe, opp direction	0	3	2	0	0	1	0
Sideswipe, same direction	0	6	8	1	1	0	0
Single vehicle crash	0	2	4	2	0	0	2
Unknown	1	1	0	0	0	0	1
Not reported	0	0	0	0	0	0	0
Total	1	18	42	9	1	1	5
Crash Severity							
Fatal injury	0	0	0	0	0	0	0
Non-fatal injury	0	5	14	4	0	0	1
Property damage only	0	11	26	5	1	0	1
Not Reported	1	2	2	0	0	1	3
Unknown	0	0	0	0	0	0	0
Total	1	18	42	9	1	1	5
Time of Day							
Weekday, 7 AM - 9 AM	0	1	5	2	0	0	2
Weekday, 4 PM - 6 PM	0	5	3	1	0	0	0
Saturday, 11 AM - 2 PM	0	0	1	0	0	0	0
Weekday, other time	1	8	18	0	1	1	3
Weekend, other time	0	4	15	6	0	0	0
Total	1	18	42	9	1	1	5
Pavement Conditions							
Dry	1	11	38	6	1	1	1
Wet	0	7	2	3	0	0	3
Snow	0	0	2	0	0	0	0
Ice	0	0	0	0	0	0	1
Not reported	0	0	0	0	0	0	0
Total	1	18	42	9	1	1	5
Non Motorist (Bike, Ped)	0	2	4	3	0	0	1
MassDOT Crash Rates	0.04	0.53	0.68	0.27	0.28	0.20	1.13

e. Summary of Existing Transit Ridership & Operations

Transit stops and stations closest to the site are shown previously in Figure 1.d.1 and Figure 1.d.2. Operating hours, weekday daily ridership, and peak-hour headways for each service line are presented in Table 2.e1.

Table 2.e.1 Transit Services

Route	Destination	(a) Weekday Hours of Operation	(b) Weekday Daily Ridership (Passengers)	(a) Peak-Hour Headways (Minutes)
Bus (c)				
69	Harvard Square / Lechmere	5:25 AM – 12:59 AM	3,185	10-30
80	Arlington Center / Lechmere	5:00 AM – 12:49 AM	2,058	20
87	Arlington Center / Lechmere	5:10 AM – 1:00 AM	3,796	20-30
88	Clarendon Hill / Lechmere	5:16 AM – 12:50 AM	4,075	16-25
Rail				
Green Line E Branch	E-Line Heath Street Station/Lechmere Station	5:01 AM – 12:30 AM	81,574 (d)	6
Orange Line	Oak Grove/Forest Hills	5:16 AM – 12:30 AM	159,220	6
Private				
EZRide	North Station, Lechmere Station, Kendall Square and Cambridgeport	6:20 AM – 10:28 PM	n/a	7-10
CambridgeSide Galleria Shuttle	CambridgeSide Galleria Mall, Binney Street and Kendall Square	9:00 AM – 8:00 PM	n/a	20
EF Shuttle	EF Center at Two Education Circle, Kendall Square, Lechmere, Community College	5:40 PM -9:40 PM	n/a	30

Notes:
(a) Hours of operation and frequency compiled from MBTA Schedules, published March 2017
(b) Daily ridership compiled from MBTA Ridership and Service Statistics (BlueBook) Fourteenth Edition 2014; CRTMA EZRide Feasibility Study March 2014
(c) Bus Weekday Daily Ridership = Weekday Boardings
(d) Green Line E Branch and Orange Line Weekday Daily Ridership = Station Entries for Entire Line

f. Hubway

The EF - North Point Park Hubway Station is sponsored by EF and contains 22 bicycle docks located on North Point Boulevard near Education Street adjacent to the EFI building. The Brian P. Murphy Staircase at Child Street Hubway Station contains 23 additional Hubway bicycle docks. The Hubway website was used to monitor the utilization of the Hubway bicycles at these two locations over the course of a typical day on November 2, 2016. This data is presented in Table 2.f.1. The data shows that throughout the day there were always bikes and docks available. The EF docks were

fuller between 10:00 AM and 5:00 PM. The docks at Child Street were consistent throughout the day with more docks available than bikes.

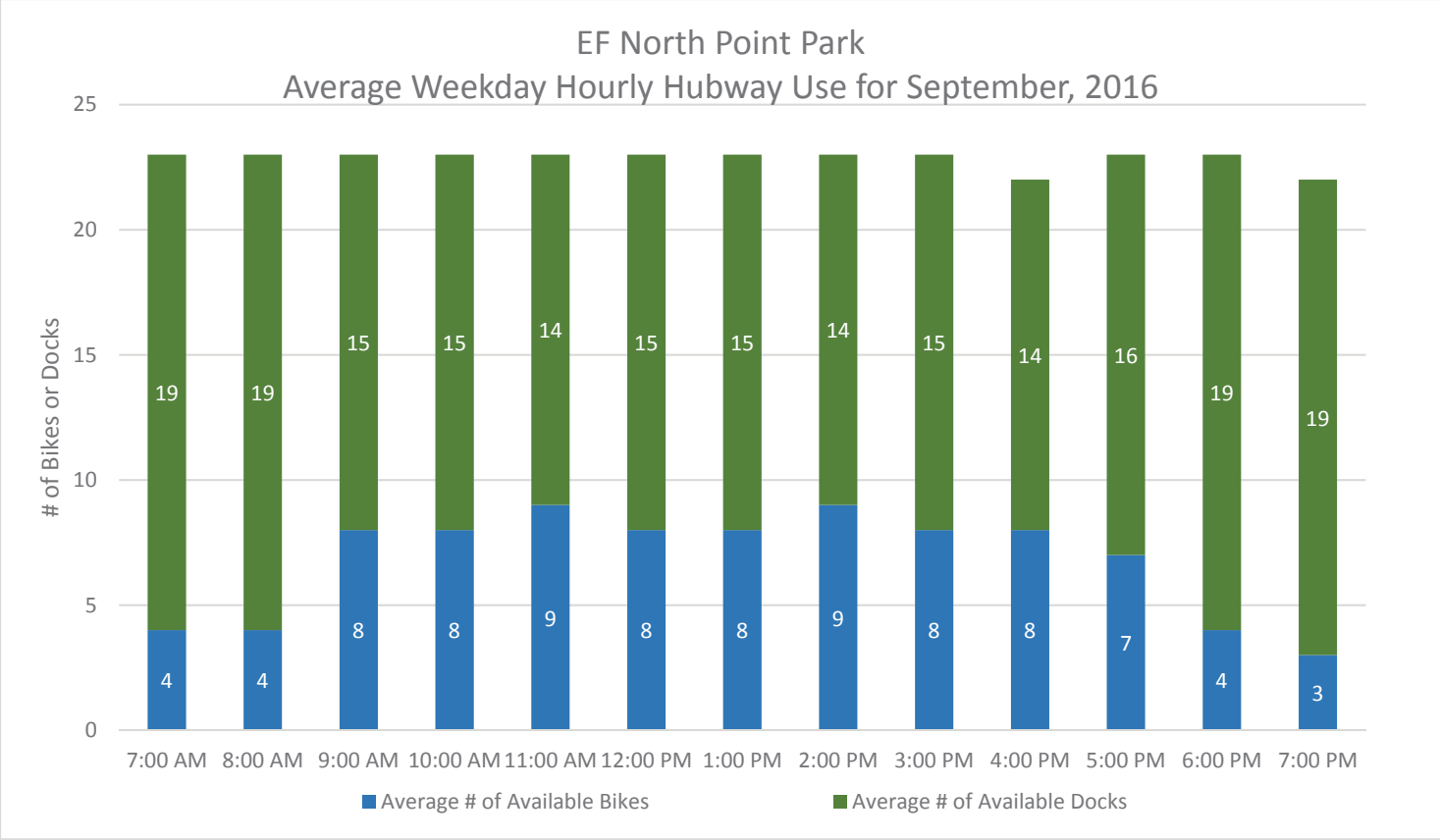
Table 2.f.1 Hubway Bicycle Utilization Data November 2, 2016

	EF		Child Street	
	Bikes Available	Docks Available	Bikes Available	Docks Available
6:00 AM	2	20	7	16
7:00 AM	2	20	7	16
8:00 AM	2	20	6	17
9:00 AM	8	14	5	18
10:00 AM	13	9	4	19
11:00 AM	13	9	4	19
12:00 PM	13	9	5	18
1:00 PM	13	9	5	18
2:00 PM	14	8	4	19
3:00 PM	13	9	4	19
4:00 PM	13	9	4	19
5:00 PM	14	8	5	18
6:00 PM	9	13	7	16
7:00 PM	5	17	7	16

Source: https://secure.thehubway.com/map/

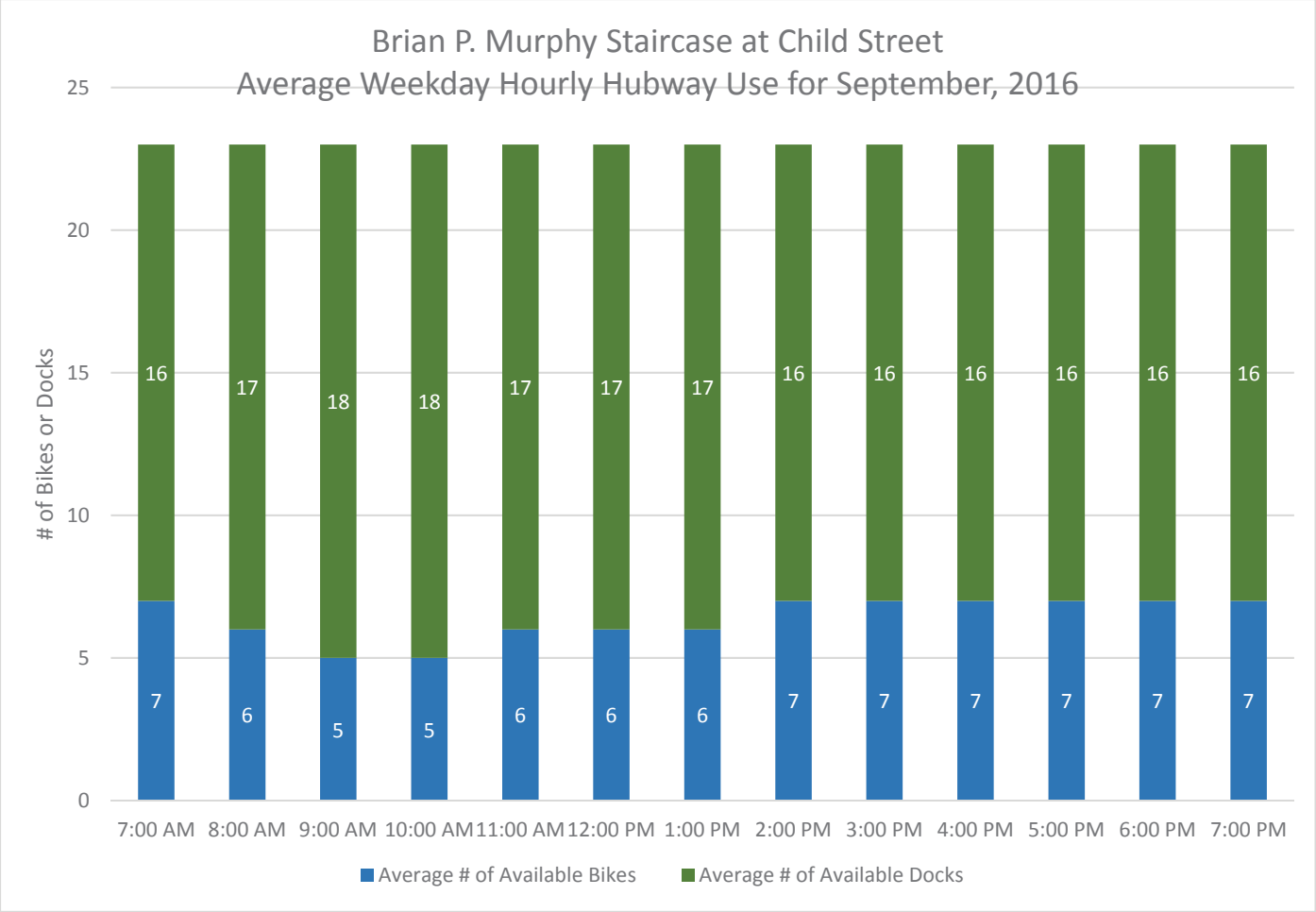
In addition to the Hubway utilization data pulled from the Hubway website in Table 2.f.1 a privately developed website called Hubway Tracker was consulted, which is used by Hubway's Field Operations Managers for dispatch and station rebalancing efforts. Data for the month of September of 2016 was downloaded to obtain a utilization rate throughout the month. This average weekday data is presented in Chart 2.f.1 and 2.f.2 for both Hubway locations respectively.

Chart 2.f.1: EF Hubway Station September, 2016



Data Source: http://www.hubwaytracker.com/

Chart 2.f.2: Child Street Hubway Station September, 2016



Data Source: http://www.hubwaytracker.com/

The data provided by *Hubway Tracker* demonstrates that on average, there are usually Hubway bikes or docks available throughout the day. However, when looking at each day's worth of data, there were nine (9) days at the EF Hubway Station when bikes were not available either at the beginning or end of the day. The data indicated that there were seven (7) days when bikes were not available at the Brian P. Murphy Staircase at Child Street Station either at the beginning or middle of the day.

3. Project Traffic

a. Trip Generation

Hult Campus

Due to the nature of the proposed College/University land use, changes to trip generation at the EF/Hult Campus will be driven largely by changes in student enrollment and the number of additional faculty/staff. Providing students with on-campus housing will serve to reduce the overall number of commuter trips to campus. Existing and projected student/employee populations are presented in Table 3.a.1. These student and employee population projections were provided directly by Hult International Business School. Hult prides itself on being a new kind of business school for the global generation. It currently offers several graduate degree programs at its Cambridge campus where international students attend classes for a semester or one year. Hult takes a global approach to learning and encourages students to rotate for a semester to one of its other campuses around the world (Dubai, London, New York, San Francisco or Shanghai). Hult's faculty members rotate and visit different campuses to teach certain classes as well. In fall 2018, Hult will launch its undergraduate degree program in Massachusetts. Hult already offers undergraduate degree programs in London and San Francisco. Hult's projected faculty and staff numbers are based on comparisons at its two other campuses. Hult's approach is a unique type of higher education and therefore may have a different professor to student ratio than other nearby colleges/universities.

Table 3.a.1 Hult/EF Student/Employee Projections

	Existing (2016)	Proposed Total (2023)	Net New (change)
Hult Students	750	1,750	+1,000
Hult Staff/Faculty (FTE)	100	200	+100

Source: Hult International Business School

The Project is expected to allow Hult to increase its student enrollment by approximately 1,000 students and 100 staff/faculty. Daily and peak hour trip generation estimates were developed based upon standard Institute of Transportation Engineers (ITE) Trip Generation manual (9th Edition) using the regression formula for University/College (LUC 550). Since this Project will be an expansion of the existing Hult Campus, the ITE trips have been calculated by determining the delta between the trips generated by the entire proposed Hult Campus and subtracting out the trips generated by the existing Hult Campus. ITE has two sets of formulas for the University/College land use category, faculty/staff and students. Number of students has been assumed due to the ITE manual describing it as a more reliable independent

variable. Unadjusted ITE vehicle trips representing the delta between the trips generated by the entire Future proposed Hult Campus and subtracting out the trips generated by the existing Hult Campus are presented in Table 3.a.2. An alternative calculation for determining the Hult Campus trip generation has been conducted based on projected population, mode share data, and time of day arrival and departure as a comparison tool for the ITE Trip Generation methodology. This separate analysis is provided as a reference in the Technical Appendix and confirms that the ITE methodology is an appropriate trip generation methodology for the project.

Table 3.a.2 Unadjusted ITE Vehicle Trip Generation for the Proposed Project – Calculated Delta between Existing and Future Campus

	Existing Hult Campus			Future Hult Campus			Net New		
	Daily	AM Peak Hour	PM Peak Hour	Daily	AM Peak Hour	PM Peak	Daily	AM Peak Hour	PM Peak Hour
In	1,023	134	93	2,119	282	173	1,096	148	80
Out	1,023	38	198	2,119	80	367	1,096	42	169
Total	2,046	172	291	4,238	362	540	2,192	190	249

Notes: Assumes 750 existing and 1,750 proposed students, trip generation represents the delta between Existing and Future Campus
no adjustments made for mode share in this table
Source: Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition, University/College LUC 550

Outbound trips during the morning and inbound trips during the evening represent students that live on campus that are going off-campus for other purposes such as errands, etc. or staff/faculty or students that may have night classes or are returning to campus to study. The majority of students will be international and enrolled in Hult's undergraduate degree program and would likely not have part-time jobs off-campus during their stay. EFIII will have a cafeteria and fitness center to serve students on-campus. Students are not permitted to park on campus in EF parking garages and therefore these types of vehicle trips are limited to the few that would park off campus or students that utilize taxis or uber/lyft type car sharing services.

Office

The EFIII building will contain 22,754 SF of general office space which will be used by EF. Since EF maintains a more dense office space at approximately 11.0 employees/1,000 sf then other office uses in Cambridge, the office trip generation analysis has been based on the ITE LUC 710 General Office Building using number of employees as the independent variable. EF laid out the office space for the EFIII building based on how they use space in the existing EF buildings and are assuming they will have 250 employees sitting in the 22,754 SF. The 250 employees has been used as the independent variable for the office trip generation calculation. A summary of the revised resulting unadjusted ITE trip generation is provided in Table 3.a.3.

Table 3.a.3 Unadjusted Office ITE Vehicle Trip Generation

	Daily	AM Peak Hour	PM Peak Hour
In	415	106	20
Out	415	14	95
Total	830	120	115

Notes: Assumes 250 EF employees
no adjustments made for mode share in this table
Source: Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition, LUC 710 General Office

Fitness Center

Daily and peak hour trip generation estimates for the Fitness Center were developed based upon standard Institute of Transportation Engineers (ITE) Trip Generation manual (9th Edition) using the average rate for Health/Fitness Club (LUC 492). Average rates for ITE LUC 492 have been applied to the square footage to develop the unadjusted ITE vehicle trips that are summarized in Table 3.a.4.

Table 3.a.4 Unadjusted Fitness Center ITE Vehicle Trip Generation

	Daily	AM Peak Hour	PM Peak Hour
In	198	8	24
Out	198	8	18
Total	396	16	42

Notes: Assumes 12,042 SF Fitness Center
no adjustments made for mode share in this table
Source: Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition, LUC 492 Health/Fitness Club

Mode Split

Since the Project Site is located in close proximity to transit, pedestrian, and bicycle accommodations, it is important to adjust the ITE trip generation results to reflect an accurate quantification of the Project's transportation impacts.

Based on mode share data collected as part of the fall 2016 City of Cambridge PTDM survey, the Hult student and staff/faculty mode share data has been combined to develop a weighted average since the ITE land use category for University/College does not differentiate the students and staff/faculty. The survey results indicated that a high percentage of students walk/bike and take transit and a high percentage of staff/faculty take transit to Hult as shown in Table 3.a.5.

Table 3.a.5 Hult Staff/Faculty & Student Mode Share Weighted Average

Mode Share	Staff/Faculty	Students	Calculation	Weighted Average[1]
SOV	27.1%	3.2%	((27.1%X100)+(3.2%X750))/(100+750)	6.0%
HOV[2]	5.1%	7.3%	((5.1%X100)+(7.3%X750))/(100+750)	7.1%
Walk	4.2%	36.7%	((4.2%X100)+(36.7%X750))/(100+750)	32.8%
Bike	0.0%	7.2%	((0%X100)+(7.2%X750))/(100+750)	6.3%
Transit	61.0%	45.3%	((61.0%X100)+(45.3%X750))/(100+750)	47.2%
Telecommute/Other	2.5%	0.3%	((2.5%X100)+(0.3%X750))/(100+750)	0.6%
Total[3]	100%	100%		100%

[1] Weighted Average developed by multiplying the existing populations by the corresponding 2016 PTDM mode share and divided by the total population for staff/faculty and students.
[2] HOV includes Uber/Lyft/Taxi/Car Share Service and drop-off
[3] Out of Office/Scheduled day-off responses have been removed from the mode share calculations per PTDM Measures
Note: assumes 750 existing students and 100 existing staff/faculty

This weighted average mode share data was used to adjust the Hult ITE trip generation analysis presented above.

Additional mode share data for the office land use was also assumed using the 2016 PTDM mode share results. This is presented for employees in Table 3.a.6.

Table 3.a.6 Employee Mode Share

Mode Share	Employees
SOV	24.5%
HOV2	11.3%
Walk	12.7%
Bike	7.8%
Transit	41.9%
Telecommute/Other	1.8%
Total	100.0%

Source: 2016 PTDM Mode Share Data for employees

The fitness center portion of the Project was assumed based on the City of Cambridge Kendall Square K2 Planning Study mode share for retail. Mode shares for the fitness center are presented in Table 3.a.7.

Table 3.a.7 K2 Retail Mode Share

Mode Share	Retail
Auto	31%
Walk	29%
Bike	8%
Transit	30%
Telecommute/Other	2%
Total	100%

Source: Kendall Square Planning Study Mode Share Data for Retail

In order to determine the trip generation by mode, the first step was to convert ITE vehicle trips to person-trips by application of a national Average Vehicle Occupancy (AVO) of 1.2 for Hult, 1.13 for Office employees and 1.78 for the Fitness Center. The next step was to apply the mode shares presented in Tables 3.a.5-7. The person trips that were associated with drive alone and carpooling were then converted back to vehicle trips assuming the AVO. The resulting trip generation by mode for the Project by land use is summarized in Table 3.a.8.

Table 3.a.8 Total Project Generated Trips by Mode

	Auto			Transit			Walk			Bicycle		
	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily	AM Peak	PM Peak
Fitness Center												
In	62	3	8	106	5	13	103	5	13	29	2	4
Out	62	3	6	106	5	10	103	5	10	29	2	3
Total	124	6	14	212	10	23	206	10	23	58	4	7
Office												
In	149	38	7	197	50	10	60	16	3	37	10	2
Out	149	6	35	197	7	46	60	3	14	37	2	9
Total	298	44	42	394	57	56	120	19	17	74	12	11
University/College												
In	144	20	11	622	85	46	432	59	32	83	12	7
Out	144	6	23	622	24	96	432	17	67	83	4	13
Total	288	26	34	1,244	109	142	864	76	99	166	16	20
Grand Total												
In	355	61	26	925	140	69	595	80	48	149	24	13
Out	355	15	64	925	36	152	595	25	91	149	8	25
Total	710	76	90	1,850	176	221	1,190	105	139	298	32	38

b. Vehicular Site Access/Egress

As shown in Figure E.1 Proposed Site Plan, vehicular access and egress to this garage will be provided via North Point Boulevard.

Per the Scoping Letter request, the following describes the alternative site plan layouts that were considered:

The design of the Project reinforces the urban design and planning goals of the Eastern Cambridge Design Guidelines. The design team has been working closely with the City of Cambridge as the design has evolved. Although the proposed design is quite similar to the original design concept, the design has evolved to improve a number of features related to bicycle and pedestrian access, bicycle parking, vehicular traffic, and access for loading and service deliveries.

These features include:

- The building is set back from North Point Boulevard to make the street level feel habitable and prevent a "canyon" effect; the southern wing of the building and the building entrance have been aligned to create a stronger presence along North Point Boulevard, strengthening the pedestrian realm and increasing the quality and visibility of the site's open space.
- The building siting optimizes the location of the public open space by putting planned recreational areas adjacent to the proposed multi-use path and network of public streets and pedestrian connections. This new public open space connects and unifies the existing North Point Park and North Point Commons.
- The proposed building will continue to serve as a back-drop for the Public Open Space, screening it from the Project Site driveway, DCR maintenance facility, highway ramps, railroad uses and Boston Sand & Gravel.

Two driveway location options were studied to determine which would have the least impact on the features described above – west and east. The west driveway location, partially within the DOT easement for the Gilmore Bridge, was selected. In order to not prohibit DOT from widening the Gilmore Bridge in the future, they require an additional 10 ft. easement, which means that main stretch of the proposed driveway would then be within the easement. The benefit is that there would be no future reduction in open space on the site.

The concept of using the adjacent Twenty|20 driveway was investigated; however, the geometry of the existing driveway would present a challenge for truck access and would adversely impact traffic on North Street.

Sight distance triangles for vehicles exiting the site driveway are provided in the Technical Appendix.

c. Trip Distribution and Assignment

Project trips for the 2017 Build Conditions were distributed through the study area intersections based on zip code data from the 2016 PTDM survey. Trip assignments for the Hult trips are based on the zip code data for respondents that drove to or were dropped off at Hult. The Project trips were assigned to the study area network based on the data presented in Table 3.c.1 and shown in Figures 3.c.1 through 3.c.4. Figures 3.c.5 and 3.c.6 show the total morning and evening peak hour trips distributed through the existing study area.

Table 3.c.1 Hult Vehicle Trip Distribution

Roadway	Direction (To/From)	Percent (To/From)
Charles River Dam Road	North/South	8%
Monsignor O'Brien Highway/Route 28	South/North	46%
Cambridge Street	East/West	7%
Gilmore Bridge	West/East	17%
Charlestown Avenue/Gilmore Bridge/Land Boulevard	East/West	22%
Total	-	100%

Source: PTDM Survey data collected in October 2016

Vehicle trip distribution patterns were also developed for the Office and Fitness Center land uses using 2016 Employee PTDM data as presented in Table 3.c.2.

Table 3.c.2 Office Vehicle Trip Distribution

Roadway	Direction (To/From)	Percent (To/From)
Charles River Dam Road	North/South	15%
Monsignor O'Brien Highway/Route 28	South/North	31%
Cambridge Street	East/West	6%
Gilmore Bridge	West/East	20%
Charlestown Avenue/Gilmore Bridge/Land Boulevard	East/West	28%
Total	-	100%

Source: PTDM Survey data collected in October 2016

d. Servicing and Deliveries

Truck Routes

Service and Delivery trucks will access the site using only designated truck routes as outlined by the City of Cambridge. Regionally, trucks will use O'Brien Highway (Route 28) and Land Boulevard, while avoiding Memorial Drive (Route 3).

Truck Access and Egress

As shown in Figure E.2, loading and service for the proposed EFIII building will be accessed via the proposed Site driveway on NorthPoint Boulevard. Loading and service activity will take place on the northwest side of the building at the two loading bays. The loading area will be sized to accommodate 13 feet of clear head height. It will be sized to accommodate a semi-trailer, city or a straight truck in each dock and a flatbed truck will be able to fit in the southern bay and not obstruct the parking entry. All loading and service and move-in/move-out activity will take place inside the loading dock area on the site.

Since the majority of Hult students are international, they will arrive in the US with limited belongings and the housing will be fully furnished. There will be no moving trucks and Hult does not anticipate a lengthy move-in/move-out process for its international students.

Daily Deliveries

The facilities team will likely manage the oversight of the loading dock activity. Scheduled delivery truck trips will likely occur during the early morning time period. Fedex, UPS and USPS type deliveries are expected to occur throughout the day. Limited delivery truck trips will be generated by the Fitness Center. The majority of delivery truck trips will be attributed to the student café land use in the building. There will be a centralized trash room with once daily trash pickup and storage in the loading dock. Trash will be picked up daily from the loading dock area similar to how trash is handled at EFI and EFII. There will be a dumpster located next to the loading dock outside the building in the area adjacent to the Gilmore Bridge.

4. Background Traffic

2022 Future Condition

Background Growth

In accordance with the TP&T Scoping Letter, background traffic growth was assumed to occur at one-half a percent per year for a 5-year time horizon. Additionally, traffic associated with specific projects planned or under construction in the area were added to develop the 2022 Future Condition traffic volumes. The following 12 developments were included in the background traffic growth:

1. Courthouse Redevelopment project
2. Binney Street/Alexandria at Kendall Square
3. Kendall Square Urban Renewal Project Infill Development Concept Plan
4. MIT Kendall Square Redevelopment project
5. 300 Massachusetts Avenue
6. Novartis (181 Massachusetts Avenue)
7. 610-650 Main Street
8. North Point project (DivcoWest)
9. First Street Planned Unit Development (PUD) project
10. 88 Ames Street project
11. 399 Binney Street project
12. 249 Third Street

Infrastructure Changes

The 2022 Future Conditions for the Monsignor O'Brien Highway intersections have been developed using the 25% Design plans and traffic volumes presented in the Monsignor O'Brien Highway Transportation Improvement Project Functional Design Report (the "FDR"). EF met with MassDOT to discuss the status of the redesign of the study intersections on Monsignor O'Brien Highway and it was agreed that utilizing the latest submitted design plans and FDR would provide the best available traffic network to demonstrate the impacts of the Project.

DivcoWest, the owner of NorthPoint Development, is currently redesigning Monsignor O'Brien Highway from Third Street to Museum Way as part of the NorthPoint development's mitigation requirements. The 25% design plans and FDR for the reconstruction of Monsignor O'Brien Highway were submitted to MassDOT, DCR and the City of Cambridge by the NorthPoint Development project in February 2015. The 25% design plan and FDR has been reviewed by the reviewing agencies and

the NorthPoint project team is addressing comments. The timing of Monsignor O'Brien Highway reconstruction in the Lechmere Square area is dependent on the relocation of the Green Line Lechmere Station to the north side of O'Brien Highway and the removal of the Green Line Tracks spanning O'Brien Highway at East Street. The 2022 Future Conditions assumptions for the geometry/signal timings and peak hour traffic volumes are summarized as follows:

Geometry/Signal Timing Assumptions

The focus of the Monsignor O'Brien Highway Transportation Improvement Project is to improve traffic signal and roadway operations and improve pedestrian and bicycle accommodations along the O'Brien Highway Corridor from Winter Street to south of Museum Way. The following information from the FDR summarizes some of the proposed corridor improvements:

- Pavement rehabilitation (mill and overlay) and full depth reconstruction for minor roadway widening;
- Remove a portion of the median at the intersection of O'Brien Highway at Water Street to allow for left-turning vehicles to enter the NorthPoint site via Water Street. (This will also include buses as this is part of the MBTA proposed bus route);
- Close the existing driveway to old Lechmere Bus Terminal and remove the existing traffic signal;
- Construct North First Street as a continuation of First Street through the old Lechmere Station and into the NorthPoint site;
- Reconstruct/Reconfigure the intersection of O'Brien Highway at East Street/Cambridge Street;
- Sidewalk reconstruction;
- Separated bicycle lane provisions along O'Brien Highway;
- Drainage improvements;
- Improved wheelchair ramps, sidewalks and crosswalks for pedestrian accessibility;
- Addition of landscape and streetscape improvements;
- Reconstruction of several existing traffic signals; and
- Improve traffic signal coordinated systems.

These roadway improvements are reflected in the EF 2022 Future Conditions per the approved 25% design. In addition to the existing study area intersections, new intersections being developed as part of the NorthPoint Project are included in the operations analysis include:

- Intersection #12: North Point Boulevard/Water Street
- Intersection #13: Monsignor O'Brien Highway/North First Street (signalized)
- Intersection #14: North First Street/North Point Boulevard

5. Traffic Analysis Scenarios

Traffic networks were developed, in accordance with the TIS Guidelines, for the following scenarios:

a. 2017 Existing Condition

The 2017 Existing Condition analysis is based on existing vehicle, bicycle and pedestrian counts at the study area intersections as previously presented in Section 2.

b. 2017 Build Condition

The 2017 Build Condition assumes full occupancy of the EFIII Project. Project-generated traffic is added to the study area to create the 2017 Build networks, presented in Figures 5.b.1 and 5.b.2 for the AM and PM peak hours, respectively.

c. 2022 Future Condition

The 2022 Future Condition includes future background growth and other developments (as described above), as well as Project trips, and the traffic networks are presented in Figures 5.c.1 and 5.c.2.

6. Vehicle Capacity Analysis

Capacity Analysis

Synchro 9 software was used to determine the vehicle level of service (VLOS) for signalized and unsignalized study intersections. Synchro software is based on the 2000 Highway Capacity Manual.

Results for the 2017 Existing, 2017 Build, and 2022 Future conditions are presented in Table 6.a.1 and Table 6.a.2 for signalized intersections and Table 6.a.3 and Table 6.a.4 for unsignalized intersections. A summary of the analysis results follows.

Table 6.a.1 Signalized Intersection Level of Service Results – AM Peak Hour

	2017 Existing			2017 Build			2022 Future		
Intersection	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**
1) MOB/Water St							**0.63**	**10.2**	**B**
MOB WB right							0.33	22.7	C
Water St NB thru/right	Unsignalized Intersection see unsignalized LOS Table						0.32	14.9	B
Water St SB left							0.58	28.6	C
Water St SB thru							0.57	3.4	A
2) MOB/Cambridge St/East St	**0.63**	**28.2**	**C**	**0.63**	**28.2**	**C**	**0.70**	**14.1**	**B**
Cambridge St EB thru/left	0.15	7.7	A	0.16	7.7	A	0.48	37.7	D
Cambridge St EB right	0.18	1.3	A	0.18	1.3	A	0.59	37.9	D
East St WB left/thru/right	0.17	24.7	C	0.19	24.9	C	0.08	0.1	A
MOB NB left	0.55	30.2	C	0.55	30.2	C	-	-	-
MOB NB thru/right	0.30	22.9	C	0.30	22.9	C	0.69	19.9	B
MOB SB left	0.39	27.2	C	0.47	29.4	C	-	-	-
MOB SB thru	0.89	35.7	D	0.89	35.7	D	0.71	1.7	A
MOB SB right	0.20	22.3	C	0.20	22.3	C	-	-	-
3) MOB/ Land Blvd/ Charlestown Ave	**1.30**	**128.1**	**F**	**1.31**	**130.6**	**F**	**1.41**	**136.0**	**F**
Land Blvd EB left	0.57	46.2	D	0.57	46.2	D	0.95	81.1	F
Land Blvd EB thru	0.84	56.1	E	0.84	56.1	E	1.12	117.6	F
Land Blvd EB right	0.21	40.9	D	0.23	41.0	D	0.82	37.7	D
Charlestown Ave WB left	0.47	30.6	C	0.47	30.6	C	0.52	32.6	C
Charlestown Ave WB thru/right	1.62	324.9	F	1.64	335.0	F	1.45	247.5	F
MOB NB left	1.51	319.2	F	1.53	329.6	F	1.72	381.8	F
MOB NB thru	0.72	54.1	D	0.72	54.0	D	0.83	39.1	D
MOB NB right	0.31	17.8	B	0.32	17.7	B	0.39	29.1	C
MOB SB left	1.14	173.1	F	1.14	173.1	F	1.03	120.9	F
MOB SB Thru	1.06	91.1	F	1.06	91.1	F	0.97	64.8	E
MOB SB right	1.03	101.1	F	1.03	101.1	F	1.24	158.2	F
4) MOB/Museum Way	**0.53**	**11.1**	**B**	**0.56**	**11.6**	**B**	**0.85**	**18.5**	**B**
Museum Way WB left	0.58	53.7	D	0.59	53.8	D	0.87	64.2	E
Museum Way WB right	0.04	40.1	D	0.04	40.1	D	0.24	34.0	C
MOB NB thru/right	0.36	8.4	A	0.36	8.4	A	0.55	15.2	B
MOB SB left/thru	0.50	9.4	A	0.53	10.1	B	0.80	12.0	B
13) MOB/North First St							**0.97**	**62.1**	**E**
North First St EB left							0.34	28.4	C
North First St EB thru	Intersection does not exist under Existing Conditions						0.47	32.1	C
North First St WB left/thru							0.66	51.1	D
MOB NB Left							1.13	100.0	F
MOB NB thru/right							0.27	4.8	A
MOB SB thru/right							1.03	65.8	E

v/c volume-to-capacity ratio
Delay average delay expressed in seconds per vehicle VLOS vehicular level of service

Table 6.a.2 Signalized Intersection Level of Service Results – PM Peak Hour

	2017 Existing			2017 Build			2022 Future		
Intersection	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**
1) MOB/Water St							**0.80**	**34.7**	**C**
MOB WB right							0.43	19.8	B
Water St NB thru/right	Unsignalized Intersection see unsignalized LOS Table						1.05	57.5	E
Water St SB left							0.34	21.3	C
Water St SB thru							0.28	2.0	A
2) MOB/Cambridge St/East St	**0.77**	**25.8**	**C**	**0.79**	**26.4**	**C**	**1.05**	**31.7**	**C**
Cambridge St EB thru/left	0.58	31.3	C	0.63	33.2	C	0.38	7.7	A
Cambridge St EB right	0.34	1.2	A	0.34	1.2	A	0.93	24.9	C
East St WB left/thru/right	0.29	26.3	C	0.34	27.1	C	0.11	0.2	A
MOB NB left	0.59	33.7	C	0.59	33.7	C	-	-	-
MOB NB thru/right	0.84	35.3	D	0.84	35.3	D	0.99	48.9	D
MOB SB left	0.60	54.1	D	0.74	72.1	E	-	-	-
MOB SB thru	0.45	24.4	C	0.45	24.4	C	0.53	22.8	C
MOB SB right	0.12	21.3	C	0.12	21.3	C	-	-	-
3) MOB/ Land Blvd/ Charlestown Ave	**1.23**	**106.0**	**F**	**1.24**	**107.5**	**F**	**1.94**	**231.7**	**F**
Land Blvd EB left	1.05	102.2	F	1.05	102.2	F	1.46	262.4	F
Land Blvd EB thru	1.14	120.6	F	1.14	120.6	F	1.80	413.7	F
Land Blvd EB right	0.45	38.8	D	0.45	38.9	D	0.92	41.0	D
Charlestown Ave WB left	0.59	45.4	D	0.59	45.4	D	0.54	41.9	D
Charlestown Ave WB thru/right	1.64	348.0	F	1.66	359.2	F	1.01	83.9	F
MOB NB left	0.72	48.0	D	0.77	52.9	D	3.39	1129.9	F
MOB NB thru	0.88	57.7	E	0.88	59.8	E	0.94	49.4	D
MOB NB right	0.53	21.0	C	0.55	21.4	C	0.64	51.1	D
MOB SB left	1.24	182.2	F	1.24	182.2	F	1.84	437.8	F
MOB SB Thru	0.79	53.9	D	0.79	53.9	D	0.81	51.5	D
MOB SB right	0.39	47.8	D	0.44	48.3	D	0.56	26.6	C
4) MOB/Museum Way	**0.49**	**10.7**	**B**	**0.50**	**11.8**	**B**	**0.87**	**23.0**	**C**
Museum Way WB left	0.62	54.6	D	0.64	55.0	E	0.94	67.7	E
Museum Way WB right	0.16	39.6	D	0.26	39.3	D	0.26	29.6	C
MOB NB thru/right	0.45	10.1	B	0.46	10.9	B	0.64	20.3	C
MOB SB left/thru	0.43	5.7	A	0.44	6.0	A	0.79	13.2	B
13) MOB/North First St							**0.87**	**45.8**	**D**
North First St EB left							0.60	19.1	B
North First St EB thru	Intersection does not exist under Existing Conditions						0.18	9.6	A
North First St WB left/thru							0.80	49.1	D
MOB NB Left							0.82	60.7	E
MOB NB thru/right							0.93	44.6	D
MOB SB thru/right							0.72	49.2	D

v/c volume-to-capacity ratio
Delay average delay expressed in seconds per vehicle VLOS vehicular level of service

Table 6.a.3 and Table 6.a.4 show the results for the Existing (2017), Build (2017), and Future (2022) conditions for unsignalized intersections.

Table 6.a.3 Unsignalized Intersection Level of Service Results – AM Peak Hour

	2017 Existing			2017 Build			2022 Future		
Intersection	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**
1) MOB/Water St									
Water St WB right	0.08	10.6	B	0.08	10.6	B	see signalized LOS Table		
5) East St/North Point Blvd									
North Point Blvd EB thru/right	0.03	7.1	A	0.03	7.2	A	0.17	0.0	A
North Point Blvd WB left/thru	0.11	8.2	A	0.12	8.4	A	0.04	1.9	A
East St NB left/right	0.20	7.7	A	0.23	7.9	A	0.38	15.6	C
6) North Point Blvd/North St									
North Point Blvd EB left/thru	0.01	0.4	A	0.01	0.4	A	0.10	2.8	A
North St SB left/right	0.08	12.0	B	0.08	12.4	B	0.69	46.0	E
7) Museum Way/Education St									
Driveway EB left/thru/right	0.34	22.9	C	0.34	23.6	C	0.59	53.8	F
Education St WB left/thru/right	0.37	38.8	E	0.39	41.7	E	0.88	174.1	F
Museum Way SB left/thru/right	0.01	0.06	A	0.01	0.06	A	0.02	0.5	A
8) Museum Way/North Point Blvd									
North Point Blvd WB left/thru	0.04	3.9	A	0.04	3.9	A	0.04	4.2	A
Museum Way NB left/right	0.25	15.9	C	0.32	17.5	C	1.24	165.5	F
9) North Point Blvd/EFI Driveway									
North Point WB left/thru	0.01	0.7	A	0.01	0.7	A	0.01	0.7	A
EFI Driveway NB left/right	0.03	10.2	B	0.03	10.2	B	0.03	10.2	B
10) North Point Blvd/Education St									
North Point Blvd EB left/thru/right	0.15	8.2	A	0.15	8.2	A	0.15	8.2	A
North Point WB left/thru/right	0.06	7.6	A	0.06	7.6	A	0.06	7.6	A
Education St NB left/thru/right	0.13	8.0	A	0.13	8.0	A	0.13	8.0	A
Education St SB left/thru/right	0.07	7.7	A	0.07	7.7	A	0.07	7.7	A
11) Education St/EFII Driveway									
EFII Driveway WB left/right	0.0	0.0	A	0.0	0.0	A	0.00	0.0	A
12) North Point Blvd/Water St									
North Point Blvd EB left/thru/right							0.15	13.3	B
North Point Blvd WB left/thru/right	Intersection does not exist under Existing						0.17	14.7	B
Water St NB left/thru/right	Conditions						0.01	0.3	A
Water St SB left/thru/right							0.03	3.1	A
14) North First St/North Point Blvd									
North Point Blvd EB left/thru/right							0.30	10.1	B
North Point Blvd WB left/thru/right	Intersection does not exist under Existing						0.35	10.4	B
North First St NB left/thru/right	Conditions						0.28	10.3	B
North First St SB left/thru/right							0.17	9.6	A
15) North Point Blvd/EFIII									

North Point Blvd EB left/thru	Proposed under Build	0.03	1.3	A	0.03	1.1	A
EF III SB left/right	Conditions	0.03	11.2	B	0.05	16.2	C

Table 6.a.4 Unsignalized Intersection Level of Service Results – PM Peak Hour

	2017 Existing			2017 Build			2022 Future		
Intersection	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**	**v/c**	**Delay**	**VLOS**
1) MOB/Water St									
Water St WB right	0.07	12.4	B	0.07	12.5	B	see signalized LOS Table		
5) East St/North Point Blvd									
North Point Blvd EB thru/right	0.05	7.2	A	0.05	7.3	A	0.15	0.0	A
North Point Blvd WB left/thru	0.16	8.5	A	0.20	8.8	A	0.07	3.2	A
East St NB left/right	0.17	7.7	A	0.19	7.9	A	0.35	15.8	C
6) North Point Blvd/North St									
North Point Blvd EB left/thru	0.01	0.9	A	0.01	0.9	A	0.06	2.1	A
North St SB left/right	0.08	11.7	B	0.09	12.1	B	1.84	416.8	F
7) Museum Way/Education St									
Driveway EB left/thru/right	0.23	16.4	C	0.24	17.5	C	0.50	42.7	E
Education St WB left/thru/right	0.32	27.0	D	0.35	29.7	D	0.85	138.2	F
Museum Way SB left/thru/right	0.01	1.0	A	0.01	0.8	A	0.02	0.5	A
8) Museum Way/North Point Blvd									
North Point Blvd WB left/thru	0.08	4.8	A	0.08	4.9	A	0.12	6.3	A
Museum Way NB left/right	0.30	18.7	C	0.34	20.2	C	1.15	148.9	F
9) North Point Blvd/EFI Driveway									
North Point WB left/thru	0.0	0.0	A	0.0	0.0	A	0.00	0.0	A
EFI Driveway NB left/right	0.05	10.9	B	0.05	10.9	B	0.05	10.9	B
10) North Point Blvd/Education St									
North Point Blvd EB left/thru/right	0.10	7.7	A	0.10	7.7	A	0.10	7.7	A
North Point WB left/thru/right	0.06	7.6	A	0.06	7.6	A	0.06	7.6	A
Education St NB left/thru/right	0.10	8.0	A	0.10	8.0	A	0.10	8.0	A
Education St SB left/thru/right	0.14	7.8	A	0.14	7.8	A	0.14	7.8	A
11) Education St/EFII Driveway									
EFII Driveway WB left/right	0.05	9.9	A	0.05	9.9	A	0.05	9.9	A
12) North Point Blvd/Water St									
North Point Blvd EB left/thru/right							0.09	14.0	B
North Point Blvd WB left/thru/right	Intersection does not exist under Existing						0.21	14.8	B
Water St NB left/thru/right	Conditions						0.04	1.5	A
Water St SB left/thru/right							0.02	1.0	A
14) North First St/North Point Blvd									
North Point Blvd EB left/thru/right							0.33	10.9	B
North Point Blvd WB left/thru/right	Intersection does not exist under Existing						0.30	10.8	B
North First St NB left/thru/right	Conditions						0.15	9.6	A
North First St SB left/thru/right							0.52	13.8	B

15) North Point Blvd/EFIII							
North Point Blvd EB left/thru	Proposed under Build	0.01	0.9	A	0.01	0.4	A
EF III SB left/right	Conditions	0.11	11.2	B	0.19	17.2	C

All of the signalized study area intersections will operate at the same overall LOS during the morning and evening peak hours respectively from Existing Conditions to Build Conditions. With the Project in place, the unsignalized intersections will continue to operate at the same LOS for the movements as analyzed under Existing Conditions.

7. Queue Analysis

Queue analysis was performed in conjunction with the LOS analysis. Tables 7.a.1 and 7.a.2 present results for observed and modeled average queues for each scenario for the AM Peak and PM Peak hours, respectively.

Table 7.a.1 Signalized Intersection Queue Analysis - AM Peak Hour

		Average Queue in Number of Vehicles		
Intersection	Lane	2017 Modeled	2017 Build	2022 Future
MOB/Water St	MOB WB right	Unsignalized Intersection under Existing Conditions		5
	Water St NB thru/right			3
	Water St SB left			12
	Water St SB thru			3
MOB/Cambridge St/East St	Cambridge St EB thru/left	1	1	7
	Cambridge St EB right	0	0	8
	East St WB left/thru/right	2	2	0
	MOB NB left	5	5	-
	MOB NB thru/right	3	3	15
	MOB SB left	2	3	-
	MOB SB thru	10	10	1
	MOB SB right	2	2	-
MOB/ Land Blvd/ Charlestown Ave	Land Blvd EB left	5	5	8
	Land Blvd EB thru	8	8	~11
	Land Blvd EB right	0	0	5
	Charlestown Ave WB left	7	7	8
	Charlestown Ave WB thru/right	~39	~39	~35
	MOB NB left	~10	~10	~18
	MOB NB thru	9	9	11
	MOB NB right	5	5	7
	MOB SB left	~6	~6	~8

Intersection	Lane	Average Queue in Number of Vehicles 2017 Modeled	2017 Build	2022 Future
	MOB SB Thru	~13	~13	13
	MOB SB right	~11	~11	~20
MOB/Museum Way	Museum Way WB left	3	3	10
	Museum Way WB right	0	0	3
	MOB NB thru/right	2	2	10
	MOB SB left/thru	8	9	6
MOB/North First St	North First St EB left	Intersection does not exist under Existing Conditions		2
	North First St EB thru			3
	North First St WB left/thru			5
	MOB NB Left			~14
	MOB NB thru/right			1
	MOB SB thru/right			~20

~Volume exceeds capacity, queue is theoretically infinite.

Table 7.a.2 Signalized Intersection Queue Analysis - PM Peak Hour

Intersection	Lane	Average Queue in Number of Vehicles 2017 Modeled	2017 Build	2023 Future
MOB/Water St	MOB WB right	Unsignalized Intersection under Existing Conditions		6
	Water St NB thru/right			~23
	Water St SB left			7
	Water St SB thru			1
MOB/Cambridge St/East St	Cambridge St EB thru/left	3	3	3
	Cambridge St EB right	0	0	9
	East St WB left/thru/right	2	3	0
	MOB NB left	5	5	-
	MOB NB thru/right	10	10	20
	MOB SB left	1	1	-
	MOB SB thru	5	5	10
	MOB SB right	1	1	-
MOB/ Land Blvd/ Charlestown Ave	Land Blvd EB left	~13	~13	~22
	Land Blvd EB thru	~17	~17	~33
	Land Blvd EB right	2	2	14
	Charlestown Ave WB left	6	6	6
	Charlestown Ave WB thru/right	~22	~22	~13
	MOB NB left	7	8	~21
	MOB NB thru	9	9	13
	MOB NB right	6	7	12
	MOB SB left	~14	~14	27
	MOB SB Thru	7	7	10
	MOB SB right	2	3	4

Intersection	Lane	Average Queue in Number of Vehicles 2017 Modeled	2017 Build	2023 Future
MOB/Museum Way	Museum Way WB left	4	4	14
	Museum Way WB right	1	1	4
	MOB NB thru/right	3	4	13
	MOB SB left/thru	2	2	7
MOB/North First St	North First St EB left	Intersection does not exist under Existing Conditions		6
	North First St EB thru			2
	North First St WB left/thru			7
	MOB NB Left			5
	MOB NB Thru			16
	MOB SB thru/right			7

~Volume exceeds capacity, queue is theoretically infinite.

The queue analysis results presented in the tables above correspond to the level of service analyses conducted for the study area intersections.

8. Residential Street Volume Analysis

Roadway segments within the study area with residential street frontage were evaluated to understand Project impacts. The peak hour volumes (both directions) traveling the analyzed roadway segments are presented in Tables 8.a.1 and 8.a.2. The analysis shows the percent increase in traffic along the residential roadway segments between Existing and Build volumes and Build and Future volumes.

Of all the roadway segments in the study area, 3 of the 7 segments identified are streets which have more than 1/2 of residential frontage, as determined by the existing first floor use. These segments are evaluated in the Planning Board Criteria for increased volume on residential streets.

Table 8.a.1 Traffic on Study Area Roadways - AM Peak Hour

Roadway	Segment	Amount of Residential	Existing	Build	Increase	Percent Increase	Future	Increase	Percent Increase
East Street	O'Brien Hwy to North Point Blvd	1/3 or less	225	257	32	14%	229	(28)	-11%
North Point Boulevard	East St to Leighton St	1/2 or more	215	247	32	15%	416	169	68%
	North St to Museum Way	1/3 or less	295	328	33	11%	757	429	131%
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2,510	2,521	11	0%	3,077	556	22%
	Leighton St to East St/Cambridge St	1/2 or more	2,465	2,465	0	0%	3,087	622	25%
Museum Way	O'Brien Hwy to Education St	1/3 or less	450	483	33	7%	912	429	89%
	Education St to North Point Blvd	1/3 or less	315	348	33	10%	777	429	123%

Table 8.a.2 Traffic on Study Area Roadways - PM Peak Hour

Roadway	Segment	Amount of Residential	Existing[1]	Build[1]	Increase	Percent Increase	Future	Increase	Percent Increase
East Street	O'Brien Hwy to North Point Blvd	1/3 or less	270	309	39	14%	254	(55)	-18%
North Point Boulevard	East St to Leighton St	1/2 or more	255	294	39	15%	469	175	60%
	North St to Museum Way	1/3 or less	280	326	46	16%	820	494	152%
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2,430	2,435	5	0%	3,012	577	24%
	Leighton St to East St/Cambridge St	1/2 or more	2,385	2,385	0	0%	2,968	583	24%
Museum Way	O'Brien Hwy to Education St	1/3 or less	365	411	46	13%	905	494	120%
	Education St to North Point Blvd	1/3 or less	285	331	46	16%	825	494	149%

9. Parking Analysis

The proposed Project will provide 110 new parking spaces in the garage, 55 short-term bike parking spaces and 264 long-term bike parking spaces.

The following parking analysis presents the parking supply based on the zoning parking ratios and then demonstrates the vehicle parking needs of the EF/Hult Campus including the new EFIII project based on existing mode share data and projected population for the entire campus.

a. Zoning Parking Ratios

Table 9.a.1 presents the vehicle parking requirements set forth in the current zoning.

Table 9.a.1 Vehicle Parking Zoning Ratios

Land Use	Square Footage/ Beds/Units	Minimum Parking Ratio	Maximum Parking Ratio	Minimum Parking	Maximum Parking
Residential	161,343 SF/ 278 units /500 beds	1 space/ 8 Beds+1	1 space/ 8 Beds+1	64	64
Office	22,754 SF	1 space/ 1250 SF	1 space/ 625 SF	18	36
General Academic	13,873 SF	1 space/ 1800 SF	1 space/ 1200 SF	8	12
FPA (Fitness)	12,042 SF	1 space/ 900 SF	1 space/ 600 SF	13	20
Cafeteria	14,556 SF/ 400 seats	1 space / 60 seats	1 space / 60 seats	7	7
Parking/Loading/ MEP	75,432	na	na	0	0
Total	300,000			110	139

Table 9.a.2 presents the required bicycle parking based on the City's bicycle parking zoning.

Table 9.a.2 Bicycle Parking Zoning Requirements

Land Use	Square Footage/ Beds/Units	Long-term Parking Ratio	Short-term Parking Ratio	Long-term Bike Parking	Short-term Bike Parking
Residential	161,343 SF/ 278 units /500 beds	0.5 space/bed	0.05 space/bed	250	25
Office	22,754 SF	0.3 space/ 1000SF	0.08 space/ 1000SF	7	2
General Academic	13,873 SF	0.2 space/ 1000SF	0.4 space/ 1000SF	3	6
FPA (Fitness)	12,042 SF	0.1 space/ 1000SF	0.6 space/ 1000SF	1	7
Cafeteria	14,556 SF / 400 seats	0.2 space/ 1000SF	1 space/ 1000SF	3	15
Parking/Loading/ MEP	75,432	Na	Na	0	0
Total	300,000			264	55

b. Parking Demand

EF considers the existing and proposed campus parking a shared supply. Parking in EFIII will be used by both staff/faculty of Hult as well as office employees of EF and the Fitness Center. The design of the proposed parking garage in EFIII has progressed and the capacity of the garage is anticipated to accommodate 110 spaces. This is a 20-space reduction from what was presented in the MEPA DEIR Filing.

As demonstrated by the existing parking occupancy data in Section 1.c, the existing EF garages are parked at capacity. EF currently maintains a waiting list for its two existing parking garages. Some of the employees on the waiting list park off-campus in nearby public garages as indicated in the 2016 PTDM survey. A parking demand analysis is provided in Table 9.a.3 which demonstrates the anticipated parking demand based on existing and projected employee estimates, as well as existing mode shares.

Table 9.a.3 Parking Demand Analysis

	EFI	EFII	EFIII	EFIV	Total
# of Employees	1,200		300	100	1,600
Auto Mode Share (SOV+1/2 HOV)	24.8%				
Parking Demand	298		74	25	397
Physical Parking Supply	136	122	110	22	390

The results of the parking demand analysis establish that the overall parking demand for the existing and proposed EF buildings is 397 spaces. The shared parking supply is anticipated at 390 spaces, which is adequate to meet the projected parking demand based on the existing auto mode share. The proposed shared parking supply for the entire campus results in a low parking ratio of 0.59 spaces/1,000 SF. Based on this analysis, 110 additional net new parking spaces is adequate and appropriate to meet the needs of the Future EF/Hult campus.

c. Parking Management

As is the policy today, Hult will not be providing students with on-campus parking in any of the EF parking garages including the proposed EFIII garage. The 2016 PTDM data demonstrates that very few (3%) students drive alone to and from campus. It is likely that they park off-campus in nearby public garages or on-street near Hult.

In addition to providing a minimal amount of parking for the Fitness Center employees, 5 parking spaces will be allocated to visitors of the public facilities (fitness center) on the ground floor based on availability. Visitors will not be charged for parking.

The EFIII garage will be managed using the same gate system and management staff as is done in EFI and EFII. Per the PTDM Measure, employees using the EFIII garage will be charged $155 per month consistent with parking rates in EFI and EFII.

10. Transit Analysis

In accordance with TIS Guidelines, a transit analysis has been conducted to support this Project. The transit analysis assesses the impacts of Project-generated transit trips to the MBTA Orange Line, Green Line and local Bus Routes.

The following sections summarize existing transit service availability in the study area and provide an assessment of transit utilization and capacity for transit lines that are expected to be used by the proposed Project, specifically the MBTA Orange Line

accessed at Community College Station, MBTA Green Line accessed at Lechmere Station and MBTA Bus Routes 69, 80, 87, and 88.

The analysis follows five steps in evaluating the utilization and availability of capacity on the transit system:

- Step 1: Quantify the system capacity
- Step 2: Quantify the existing ridership
- Step 3: Report on existing utilization
- Step 4: Develop and assign Project-generated transit trips to the existing system
- Step 5: Report on Project impacts to system utilization

The V/C ratio (Volume to Capacity ratio) is the resulting metric that is used to reflect the level of utilization for each transit service line. The V/C ratios (or utilization rates) are presented for both the Existing Condition (year 2017) under Step 3, and Build Condition (Existing + Project trips) under Step 5.

a. Step 1: Existing Transit System Capacity

The capacity of a transit line depends on the number of trains or buses operating during a specified time period (frequency), the number of people that can be accommodated on a vehicle (a train car or bus), and the number of individual cars in each train.

The study period for this analysis includes the morning and evening transit peak hours, defined as 8:00 AM to 9:00 AM and 5:00 PM to 6:00 PM respectively.

Train and bus frequencies were compiled from the latest published MBTA schedules[1], and reported in Table 10.a.1.

For the purposes of this study the vehicle load standards (i.e. number of people safely and comfortably riding on a train car or bus) are based on MBTA's Service Delivery Policy[2] and MBTA Ridership and Service Statistics (Blue Book), Fourteenth Edition 2014 .

The Vehicle Load Standards as published in MBTA Blue Book 14th edition are:

- Orange Line policy capacity of 131 passengers per car, with a standard operation of 6-car trains.

▼

[1] MBTA schedules, March 2017
[2] MBTA Service Delivery Policy, approved by the Board of Directors in June 2010

- Green Line policy capacity of 101 passengers per car, with a standard operation of 2 -car trains.
- MBTA Bus policy capacity of 54 passengers per vehicle.

Table 10.a.1 below shows the resulting system capacities for the Orange Line, Green Line, and Bus Routes per MBTA data.

Table 10.a.1 System Capacity (Peak Hour)

Mode	(a) Frequency (# of vehicles / Peak Hour)	(b) # Passengers / vehicle	# Cars / Train	(c) Peak Hour Capacity (# Passengers / Peak Hour
Orange Line				
Inbound	10	131	6	7,860
Outbound	10	131	6	7,860
Green Line				
Inbound	10	101	2	2,020
Outbound	10	101	2	2,020
MBTA Bus				
69 Inbound	5	54	n/a	270
69 Outbound	5	54	n/a	270
80 Inbound	3	54	n/a	162
80 Outbound	3	54	n/a	162
87 Inbound	4	54	n/a	216
87 Outbound	3	54	n/a	162
88 Inbound	3	54	n/a	162
88 Outbound	4	54	n/a	216

Notes:
(a) MBTA published schedules
(b) MBTA Blue Book 14th Edition
(c) Calculated Capacity = #of Trains x # pax per vehicles x # cars

b. Step 2: Existing Transit System Ridership

The MBTA Blue Book does not provide hourly or stop-based ridership information. Therefore, the most recent data provided in the MBTA Route schedules and Flow data from Spring 2016 (Orange and Green Lines) and Composite day Load profiles from Fall 2016 (Bus) were used to obtain peak hour passenger loads as shown in Table 10.b.1.

Table 10.b.1 MBTA Ridership at Community College Station/Lechmere (Year 2016)

Mode	AM Peak Hour Pax Load Entering Station	AM Peak Hour # Pax Boarding	AM Peak Hour # Pax Alighting	AM Peak Hour Pax Load Exiting Station	PM Peak Hour Pax Load Entering Station	PM Peak Hour # Pax Boarding	PM Peak Hour # Pax Alighting	PM Peak Hour Pax Load Exiting Station
Orange Line (a)								
Inbound	7330	367	343	7354	1845	459	66	2238
Outbound	1573	35	596	1012	7035	196	512	6719
Green Line (b)								
Inbound	0	634	0	634	0	728	0	728
Outbound	400	0	400	0	459	0	459	0
MBTA Bus (c)								
69 Inbound	107	0	106	1	54	0	54	0
69 Outbound	0	24	0	24	0	67	0	67
80 Inbound	91	0	91	0	19	0	19	0
80 Outbound	0	14	0	91	0	84	0	84
87 Inbound	37	0	37	0	43	0	43	0
87 Outbound	0	19	0	19	0	38	0	38
88 Inbound	117	0	117	0	31	0	31	0
88 Outbound	0	20	0	20	0	111	0	111

Notes:

Pax - Passenger
(a) MBTA April 2016 flow ridership data was used
(b) MBTA April 2016 flow ridership data was used
(c) MBTA Bus 2016 Fall Composite Day Load Profiles was used

c. Step 3: Existing Transit System Utilization

By dividing the ridership in Step 2 by the capacity in Step 1, utilization rates were obtained. Table 10.c.1 presents existing utilization levels in terms of V/C (Volume to capacity) ratios.

Table 10.c.1 Existing Transit Service Peak Hour Utilization / MBTA Ridership

Route and Direction	(a) AM Capacity Policy	(b) AM Peak Hour Ridership	(c) AM Peak Hour V/C	(a) PM Capacity Policy	(b) PM Peak Hour Ridership	(c) PM Peak Hour V/C
Orange Line						
Inbound Entering Community College	7,860	7,330	0.93	7,860	1,845	0.23
Inbound Exiting Community College	7,860	7,354	0.94	7,860	2,238	0.28
Outbound Entering Community College	7,860	1,573	0.20	7,860	7,035	0.90
Outbound Exiting Community College	7,860	1,012	0.13	7,860	6,719	0.85
Green Line						
Inbound Exiting Lechmere	2,020	634	0.31	2,020	728	0.36
Outbound Entering Lechmere	2,020	400	0.20	2,020	459	0.23
MBTA Bus						
69 Inbound Entering	324	107	0.33	162	54	0.33
69 Inbound Exiting	324	0	0.00	162	0	0.00
69 Outbound Entering	324	0	0.00	162	0	0.00
69 Outbound Exiting	324	24	0.07	162	67	0.41
80 Inbound Entering	162	91	0.56	216	19	0.09
80 Inbound Exiting	162	0	0.00	216	0	0.00
80 Outbound Entering	162	0	0.00	162	0	0.00
80 Outbound Exiting	162	14	0.09	162	84	0.52
87 Inbound Entering	216	37	0.17	162	43	0.27
87 Inbound Exiting	216	0	0.00	162	0	0.00
87 Outbound Entering	162	0	0.00	162	0	0.00
87 Outbound Exiting	162	19	0.12	162	38	0.23
88 Inbound Entering	162	117	0.72	162	31	0.19
88 Inbound Exiting	162	0	0.00	162	0	0.00
88 Outbound Entering	216	0	0.00	216	0	0.00
88 Outbound Exiting	216	20	0.09	216	111	0.51

Notes:
(a) Capacity from step 1, Table 10.a.1
(b) Peak hour ridership from step 2, Table 10.b.1
(c) Calculated V/C = ridership / capacity

As presented in Table 10.c.1, the existing Orange Line, Green Line and Bus Routes are operating within MBTA policy capacity with V/C ratios below 1.0. A V/C ratio of under 1.0 indicates that all passengers experience a safe and comfortable ride.

Although the existing Orange Line trains are operating within MBTA policy capacity, it is important to note that this analysis is conducted for the whole peak hour, and does not recognize the "peak of the peak" conditions which occurs within the peak hours. In practice, the Orange Line operates at a V/C ratio of over capacity during the ten to twenty minutes of "peak of the peak" conditions. There are also occurrences

where trains bunch together and do not operate on evenly spaced headways, leading to increased V/C at certain times and affecting rider experience. As a result, although the Orange Line operates within the MBTA policy capacity, in practice some overcrowding and delay is experienced by users.

d. Step 4: Development of Transit Project Trips

As discussed previously, the transit mode share for the Project is 36 percent for Office and 13 percent for Hult uses.

The transit analysis was initially conducted prior to a slight shift in the Project Program. Since the analysis, the Fitness Center has been reduced by approximately 68 SF. The transit Project trips have been reduced by 1 transit trip during the evening peak hour, however the analysis has not been updated since this slight change would not impact the results of the transit analysis. Accordingly, the Project is expected to generate 176 new transit trips (140 entering, 36 exiting) during the AM peak hour and 222 new transit trips (70 entering, 152 exiting) during the PM peak hour as shown previously in Table 3.a.8 and summarized in Table 10.d.1 below.

Table 10.d.1 Project-Generated Transit Trips

	Morning Peak Hour			Evening Peak Hour		
	In	Out	Total	In	Out	Total
Fitness Center	5	5	10	14	10	24
Office	50	7	57	10	46	56
Hult Students and Staff Faculty	85	24	109	46	96	142
Total	140	36	176	70	152	222

Mode Share surveys were conducted at the Hult International Business School to determine the existing usage of each transit option by employees and residents. It is expected that new employees and residents in the area will follow similar ridership trends as summarized in Table 10.d.2

Table 10.d.2 Transit Distribution

Route and Direction	AM Peak Hour		PM Peak Hour	
	% OUT	%IN	% OUT	%IN
Orange Line				
Inbound	36.5%	91.3%	11.4%	70.1%
Outbound	63.5%	8.7%	88.6%	29.9%
Green Line				
Inbound	100.0%	0.0%	100.0%	0.0%
Outbound	0.0%	100.0%	0.0%	100.0%
Bus Routes				
69 Inbound	0.0%	30.1%	0.0%	36.7%
69 Outbound	31.7%	0.0%	22.4%	0.0%
80 Inbound	0.0%	25.8%	0.0%	13.1%
80 Outbound	18.1%	0.0%	27.9%	0.0%
87 Inbound	0.0%	10.5%	0.0%	29.3%
87 Outbound	24.6%	0.0%	12.7%	0.0%
88 Inbound	0.0%	33.5%	0.0%	20.9%
88 Outbound	25.6%	0.0%	36.9%	0.0%

Approximately 2-3 percent of existing users utilize other transit options in the area . This is a nominal percentage compared to the Orange Line, Green Line and Bus Route usage and therefore not incorporated into the detailed V/C analysis.

The transit trip distribution was applied to the Project transit trips resulting in Project-generated transit trips per transit line as shown Tables 10.d.3 and Table 10.d.4 for the AM and PM peak hours, respectively.

Table 10.d.3 AM Peak Hour Project-generated Trips by Line

Route and Direction	Trips OUT (Boardings)	Trips IN (Alightings)	Trips Total
Orange Line			
Inbound	14	22	37
Outbound	1	39	40
Green Line			
Inbound	10	0	10
Outbound	0	38	38
Bus Routes			
69 Inbound	0	11	11
69 Outbound	3	0	3
80 Inbound	0	10	10
80 Outbound	2	0	2
87 Inbound	0	4	4
87 Outbound	2	0	2
88 Inbound	0	13	13
88 Outbound	2	0	2
		Total	172

Approximately 4 trips will be using other transit modes for a total of 176 AM Peak Hour Project-generated transit trips.

Table 10.d.4 PM Peak Hour Project-generated Trips by Line

Route and Direction	Trips OUT (Boardings)	Trips IN (Alightings)	Trips Total
Orange Line			
Inbound	46	3	50
Outbound	20	27	47
Green Line			
Inbound	41	0	41
Outbound	0	19	19
Bus Routes			
69 Inbound	0	7	7
69 Outbound	9	0	9
80 Inbound	0	2	2
80 Outbound	11	0	11
87 Inbound	0	5	5
87 Outbound	5	0	5
88 Inbound	0	4	4
88 Outbound	15	0	15
		Total	215

Approximately 7 trips will be using other transit modes for a total of 222 PM Peak Hour Project-generated transit trips.

As presented, about 45 percent of trips are anticipated to use the Orange Line, while the Green Line and Bus Routes each absorb near equal proportions of the remaining trips. A small minority of trips are expected to use other transit options.

e. Step 5: Build Transit Usage Utilization

The estimated transit trips per line were added to the existing ridership volumes to develop the "Build Condition" utilization scenario, where Existing+Project trips are assumed to be on the transit lines. Resulting V/C ratios are presented in Table 10.e.1.

Table 10.e.1 Build Condition Transit Service Peak Hour Utilization / MBTA Ridership

Route and Direction	AM Capacity Policy (from Step 1 above)	AM Peak Hour Ridership (from Step 2+3 above)	AM Peak Hour V/C	PM Capacity Policy (from Step 1 above)	PM Peak Hour Ridership (from Step 2+3 above)	PM Peak Hour V/C
Orange Line						
Inbound Entering Community College	7,860	7,352	0.94	7,860	1,848	0.24
Inbound Exiting Community College	7,860	7,368	0.94	7,860	2,284	0.29
Outbound Entering Community College	7,860	1,612	0.21	7,860	7,062	0.90
Outbound Exiting Community College	7,860	1,013	0.13	7,860	6,739	0.86
Green Line						
Inbound Exiting Lechmere	2,020	644	0.32	2,020	769	0.38
Outbound Entering Lechmere	2,020	438	0.22	2,020	478	0.24
MBTA Bus						
69 Inbound Entering	324	118	0.36	162	61	0.38
69 Inbound Exiting	324	0	0.00	162	0	0.00
69 Outbound Entering	324	0	0.00	162	0	0.00
69 Outbound Exiting	324	27	0.08	162	76	0.47
80 Inbound Entering	162	100	0.62	216	22	0.10
80 Inbound Exiting	162	0	0.00	216	0	0.00
80 Outbound Entering	162	0	0.00	162	0	0.00
80 Outbound Exiting	162	16	0.10	162	95	0.59
87 Inbound Entering	216	41	0.19	162	49	0.30
87 Inbound Exiting	216	0	0.00	162	0	0.00
87 Outbound Entering	162	0	0.00	162	0	0.00
87 Outbound Exiting	162	21	0.13	162	43	0.27
88 Inbound Entering	162	130	0.80	162	35	0.21
88 Inbound Exiting	162	0	0.00	162	0	0.00
88 Outbound Entering	216	0	0.00	216	0	0.00
88 Outbound Exiting	216	22	0.10	216	126	0.58

As presented in Table 10.e.1, most transit lines are expected to experience a negligible increase in the V/C ratio.

The Orange Line, currently the closest to operating at full capacity, is expected to see an increase in V/C of 0.01 or less per line, resulting in negligible impacts to current rider experience. Similarly, the Green Line V/C is expected to increase by 0.02 or less and will remain well within MBTA's capacity policy.

Although some Bus Routes, such as 88 Inbound Entering in the AM experience some increase in volume, no route approaches the policy capacity limit established by the MBTA.

Future Transit Improvements

Future improvements to the Orange Line will address overcrowding and bunching issues with new Orange Line cars. The new rolling stock, expected to be in service in 2019, will decrease headways from 6 to 4.5 minutes and are expected to make it easier to maintain the scheduled headways. It is anticipated that the capacity increase related to the new Orange Line train cars coming online is approximately 30 percent.

The Green Line at Lechmere Station will be impacted by the approved Green Line Extension Project. Instead of service terminating at Lechmere, the Green Line will continue northwest through Somerville and terminate at College Avenue in Medford. The Green Line extension is expected to be completed in 2022.

11. Pedestrian Analysis

Pedestrian crossing volumes at study intersections are presented in Figure 2.c.3 and 2.c.4. The results of pedestrian level-of-service (PLOS) analysis at intersection crosswalks are presented in Tables 11.a.1 for signalized intersections, respectively during both the morning and evening peak hours. Equation 18-5 from the Highway Capacity Manual 2000 has been used to determine the delays at signalized intersections in the study area.

Pedestrian level-of-service at signalized intersections is dictated by the portion of the signal cycle dedicated to pedestrian crossings. Accordingly, increasing pedestrian volumes does not alter pedestrian level of service at signalized intersections, and no changes in PLOS are projected under build or future conditions, due to the EF Project.

Table 11.a.1 Signalized Intersection - Pedestrian Level of Service Summary

Intersection	Crosswalk	AM Peak Hour 2017 Existing	AM Peak Hour 2017 Build	AM Peak Hour 2022 Future	PM Peak Hour 2017 Existing	PM Peak Hour 2017 Build	PM Peak Hour 2022 Future
O'Brien Highway at Water Street	South (east side)	-	-	C	-	-	C
	South (west side)	-	-	B	-	-	B
	East	-	-	B	-	-	B
O'Brien Highway at North First Street	North (East ½)	-	-	C			B
	North (West ½)	-	-	C	-	-	C
	South	-	-	E	-	-	C
	East	-	-	B	-	-	C
	West	-	-	D	-	-	D
O'Brien Highway at Cambridge Street / East Street	North	D	D	n/a	D	D	n/a
	East	C	C	A	C	C	A
	South	D	D	D	D	D	C
	South (Cambridge Median to channelized island)	C	C	n/a	C	C	n/a
	West	n/a	n/a	B	n/a	n/a	C
	West (Cambridge St RT)	B	B	B	B	B	B
O'Brien Highway at Land Boulevard / Charlestown Avenue/Gilmore Bridge	North	D	D	D	E	E	E
	South	E	E	n/a	E	E	n/a
	Southwest	n/a	n/a	B	n/a	n/a	B
	East	n/a	n/a	E	n/a	n/a	E
	West	E	E	E	E	E	E
O'Brien Highway at Museum Way	North	E	E	E	E	E	E
	East	D	D	C	E	E	C
	South	E	E	E	E	E	D

The Project Site is well served by pedestrian facilities including sidewalks, the North Point Park, cross-walks and multi-use paths. As shown in Figure 1.d.2, Pedestrian infrastructure within the study area allows for great connectivity to and from the Lechmere and Science Park MBTA Green Line Stations and the Community College MBTA Orange Line Station as well as surrounding neighborhoods in Cambridge, Somerville and Boston. The Project site is being designed to accommodate pedestrian routes around the site and behind the building to provide a potential connection to the Brian P Murphy staircase.

Status of the Inlet Bridge

The Inlet Bridge is a planned pedestrian bridge intended to connect Monsignor O'Brien Highway in front of the Museum of Science to a landing in North Point Park. It is one of many infrastructure components that is part of the Central Artery

mitigation commitments. According to the City of Cambridge, the bridge has been designed to the 25% completion level.

12. Bicycle Analysis

As shown in Figure 12 and summarized in Table 12.a.1, the study area is well served by bicycle facilities within the study area.

Table 12.a.1 Bicycle Accommodations

Street	Segment	Existing Accommodation	Planned Improved Accommodation
East Street	MOB to North Point Blvd	Bike Lane	
North Point Boulevard	East Street to Education Street	Bike Lane	
North Point Boulevard	East Street to North First Street	Not Existing	Planned Multi-Use Path
MOB	Museum Way to Land Blvd	No Accommodations	Planned Bike Lane
MOB	Land Blvd to Water Street	No Accommodations	Planned Cycle Track
Museum Way	MOB to North Point Blvd	Bike Lane	
Education Street	Museum Way to North Point Blvd	Bike Lane	

The Project Site and North Point neighborhood are well served by bicycle facilities including bike lanes, the North Point Park, and multi-use paths as shown in Figure 13. Currently, the North Point park connects to Charlestown via the North Bank Pedestrian Bridge. Cyclists from Somerville will be able to access the Project Site and the North Point area once the Somerville Community path has been extended. The multi-use path to be provided in front of the project site will serve as a critical connection to this full network. With the DivcoWest redesign of Monsignor O'Brien Highway, a cycle track will be implemented between Land Boulevard and Water Street.

The New Charles River Basin Master Plan had originally called for a path along the north side of the Site that would connect the path along the Lynch Family Skate Park to the Brian Murphy Staircase. Most of this new path would fall outside the limits of the Project Site, so the Proponent cannot provide this particular connection (although the Site Plan has been designed to accommodate the path should it ever be constructed on nearby parcels). Furthermore, when walking around the Site, the Proponent discovered that the most intuitive route from the Brian Murphy Staircase is in fact to continue around the Twenty/20 building and join the multi-use path along North Point Boulevard. This route proceeds through open plaza areas and broad streets, while a path on the north side of the Site would be in the shadow of the I-95 highway ramps and in close proximity to the DCR maintenance yard and MWRA pump station with little street visibility. Thus, the Proponent will focus on building the missing connection along North Point Boulevard.

Bicycle Parking

The Building will provide 55 short-term and 264 long term bicycle parking spaces per the City of Cambridge Bicycle Parking zoning requirements. As shown in Figures F.1-F.4 bicycle parking is an integral part of the site and long-term bicycle parking has been designed per the City of Cambridge's guidelines.

Conflicting Bicycle/Vehicle Movements

The conflicting movements at all study area intersections are presented in Table 12.a.2 for existing, build and future conditions.

Table 12.a.2 Conflicting Bicycle/Vehicle Movements at Study Intersections

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume[a]	Conflicting Vehicle Movements			
				Existing 2017		Build 2017	
				Right Turn[b]	Left Turn[c]	Right Turn[b]	Left Turn[c]
Monsignor O'Brien Hwy at Water St	AM	NB	3	15	-	15	-
	PM	NB	13	30	-	30	-
Monsignor O'Brien Hwy at East St/Cambridge St	AM	EB	2	265	15	265	15
		WB	1	30	30	36	30
		SB	4	85	450	85	450
		NB	2	50	85	50	107
	PM	EB	0	500	40	500	40
		WB	5	75	150	99	150
		SB	3	55	245	55	245
		NB	12	5	45	5	55
Monsignor O'Brien Hwy at Land Blvd	AM	EB	4	240	265	255	265
		WB	9	135	145	146	145
		SB	34	565	230	565	234
		NB	5	295	140	298	140
	PM	EB	4	425	185	431	185
		WB	4	115	415	120	415
		SB	9	250	260	250	276
		NB	18	375	340	387	340
Monsignor O'Brien Hwy at Museum Way	AM	NB	6	105	25	113	40
	PM	NB	2	85	35	88	41
East St at North Point Blvd	AM	EB	1	10	55	10	61
	PM	EB	0	20	105	20	132
North Point Boulevard at North St	AM	WB	30	10	10	10	10
	PM	WB	107	10	15	10	15

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume[a]	Conflicting Vehicle Movements Existing 2017 Right Turn[b]	Existing 2017 Left Turn[c]	Build 2017 Right Turn[b]	Build 2017 Left Turn[c]
Museum Way at Education St	AM	NB	8	80	10	80	10
	PM	NB	26	45	15	45	15
Museum Way at North Point Blvd	AM	EB	84	145	30	154	30
	PM	EB	17	110	60	147	60
EFI Driveway at North Point Blvd	AM	EB	90	35	5	35	5
	PM	EB	22	0	0	0	0
Education St at North Point Blvd	AM	EB	53	25	1	25	1
		WB	11	10	50	10	50
		SB	4	15	20	15	20
		NB	7	15	4	15	4
	PM	EB	22	20	10	20	10
		WB	54	10	20	10	20
		SB	4	50	15	50	15
		NB	2	25	5	25	5
EFII Driveway at Education St	AM	NB	12	45	0	45	0
	PM	NB	13	1	0	1	0

a Thru bicycle volume at the approach
b advancing vehicle volume
c opposing vehicle volume

Transportation Demand Management Plan

As part of the existing Parking and Transportation Demand Management (PTDM) plan with the City of Cambridge, EFI and EFII are required to conduct an annual monitoring effort and report. EF conducted the annual survey and biennial driveway counts in October, 2016. As part of this City of Cambridge permitting process, EF will work with the City of Cambridge PTDM officer to amend the existing EFI and EFII PTDM plan to include the EFIII and EFIV buildings. The goal of the Project's TDM plan is to reduce the use of single occupant vehicles (SOV's) by encouraging carpooling and vanpooling, bicycling, walking, and increased use of the area's public transportation system by employees and visitors. The original PTDM plan and recent updated status for the EFI and EFII buildings is summarized as follows:

- Existing PTDM Measure: As demand for bike parking spaces increases, EF will accommodate an increased number of long-term bike parking spaces, if necessary by removing automobile parking spaces.

2016 Status - EF is monitoring the bike capacity and is prepared to add bike racks in the EFII garage by removing a parking space if necessary.

- Existing PTDM Measure: Restaurant patrons and employees will not be eligible to park in the garage, but if EF opens the garage to the restaurant patrons or employees in the future, it will seek an amendment that includes TDM measures for the restaurant.

  2016 Status – EF has not experienced any issues related to Lingo Restaurant's parking demand. The convenient access to EF via public transportation and the multi-use pathway network has made it easy for employees and visitors of Lingo Restaurant to access the Restaurant without using a vehicle.

- Existing PTDM Measure: Market rate parking passes for the garage are currently issued on a first-come first-served basis to employees and students. However, because the EF students are short-term (11 months), international in origin and typically do not own cars, they rarely request parking passes. If the number of students requesting parking passes increases, in the future EF will need to implement additional TDM measures that apply to students, as set forth in a PTDM Plan amendment.

  2016 Status - Market rate parking passes continue to be issued on a first come/first serve basis. We have not experienced an increased demand to park in the EF garage by Hult students because they do not own vehicles during their short stay in Cambridge.

- Existing PTDM Measure: Join the Charles River Transportation Management Association (CRTMA).

  2016 Status - EF will join the CRTMA by July, 2017.

- Existing PTDM Measure: Promote the location and convenience of access to public transportation, and pedestrian/bicycle accommodations. Information will be available on brochures, the company website, and other materials.

  2016 Status - EF provides public transportation advertisements and information on the internal staff website, online student portal, employee brochures, and new staff orientation materials.

- Existing PTDM Measure: Hold an annual employee transportation information event.

  2016 Status - EF conducts transportation information sessions during its biweekly new staff orientation as well as provides information for all staff during its annual Wellness Week events in the fall.

- Existing PTDM Measure: Designate an On-Site Transportation Coordinator (OTC) Ongoing.

  2016 Status - EF's office manager serves as the on-site transportation coordinator. She is available to help employees and students find information on transportation alternatives.

- Existing PTDM Measure: OTC will compile and distribute up-to-date transportation packets explaining all commute options to all new employees and students as part of their orientation package.

  2016 Status - Transportation packets are included in all new employee and student orientation packages, largely in digital form.

- Existing PTDM Measure: Develop and maintain a transportation information bulletin board located in a central area. Information on MBTA schedules are provided at a centralized location.

  2016 Status - EF provides information and links to websites on Globalnet, EF's internal website. Hult International Business School posts MBTA schedules in convenient locations for students and staff on the MyHult internal website.

- Existing PTDM Measure: Continue to make MBTA passes available on site.

  2016 Status - Ongoing.

- Existing PTDM Measure: Provide free shuttle service.

  2016 Status - EF provides its employees and students with a customized, direct shuttle service to the Red and Orange Line MBTA stations to make it convenient for its employees and students to utilize public transportation.

- Existing PTDM Measure: Commit to purchasing multi-ride ticket books from the CRTMA for those employees that will commute using the EZRide in order to make this option available for its employees. The CRTMA has confirmed that EF will be able to purchase the multi-ride ticket books for use by employees and students.

  2016 Status - EF will purchase multi-ride ticketbooks and make them available on a regular basis at the front desk. This will be advertised on the internal EF website on the "transportation" tab so its accessible at all times.

- Existing PTDM Measure: Transit benefit up to $255 per month as identified under the Commuter Choice provision of the Federal Tax Code.

  2016 Status - Complete.

- Existing PTDM Measure: Commits to providing transit subsidies to those employees that commute via transit and meet the following qualifying criteria:

  • Employees must have more than five (5) years of tenure at the company;

  • Employees must be traveling from Commuter Rail Zones 5-9 or greater or by Commuter Boat to take advantage of the subsidy. This subsidy will consist of a 50 percent match from EF towards the cost of a T-pass to qualified employees. The subsidy is intended to provide an incentive to long-term, long-distance employees to use transit rather than drive personal vehicles to the site. The subsidies will

only be available to those employees using transit or those that commit to switch from driving alone to transit.

2016 Status - Ongoing.

- Existing PTDM Measure: Commit to changing two of the visitor spaces in the existing garage (which are in high visibility locations) to carpool use only to encourage carpooling to the site. EF will monitor the use of these spaces and record the number of organized carpool and vanpools. If additional spaces are required, EF will re-evaluate measures to accommodate the additional carpool vehicles.

  2016 Status – EF will convert two visitor spaces to carpool spaces in the EFI garage.

- Existing PTDM Measure: EF will allow those employees that commit to switch from a drive-alone commute to a carpool commute for a predetermined time period (six months, for example) to move to the top of the waiting list for parking passes. This ensures that the first available openings for garage spaces will go to those employees that have committed to carpool.

  2016 Status - Employees who have committed to carpooling are given preference for parking passes.

- Existing PTDM Measure: Provide carpool/vanpool outreach activities during the year, to publicize the benefits of carpooling and ridesharing, aimed specifically at those employees that drive alone to work, and that cannot take transit.

  2016 Status - EF conducts transportation information sessions during its biweekly new staff orientation as well as provides information for all staff during its annual Wellness Week events.

- Existing PTDM Measure: Provide internal ride matching system that allows employees desiring to carpool to contact each other. EF will also work with CRTMA and the statewide travel options program MassRIDES to encourage employees in ride matching activities. Information on ridesharing will be posted in a central location and included in any EF newsletters.

  2016 Status - EF's internal website, Globalnet, has a message board for employees to post communications regarding carpooling.

- Existing PTDM Measure: Provide maps of available multi-use paths within the proposed cafeteria/restaurant for patrons to make them aware of these non-motorized options of travel to and from the site.

  2016 Status - Ongoing.

- Existing PTDM Measure: Contract with MyBike to provide bicycle services for employees and students. The MyBike service comes to the EF campus on the second Tuesday of every month and provides discounted tune-ups for bicycle users. MyBike will also pick up bicycles, repair them at their shop, and return

them to the EF campus. The service was initiated in May 2011 and is gaining more users every month.

2016 Status - EF provides discounted MyBike rates for employees and students, which are listed on both internal websites.

- Existing PTDM Measure: Sheltered bike parking for 22 bicycles will be provided in the new campus expansion building. A separate entrance for this bike room will be provided so that users will not be required to pass through the garage. This will complement the 56 bicycle spaces in the existing EF building garage and the 4 bicycle racks around the existing EF building. Employees in either building will be able to use the bicycle spaces as these are not assigned.

  2016 Status - Complete. The interior bike room is accessible from the exterior via a keycard system.

- Existing PTDM Measure: Additional outdoor bicycle racks will also be provided near the building and near the terminus of North Point Boulevard. Each location will provide secure racks for 10 bicycles.

  2016 Status - Complete.

- Existing PTDM Measure: All employees and students who ride or walk to work will have access to a shower within the proposed building.

  2016 Status - There are locker rooms and showers in both of EF's buildings, which are fulling accessible to staff and students 24/7.

- Existing PTDM Measure: Indoor and outdoor bicycle parking will meet design requirements of Article 6 of the Cambridge Zoning Ordinance and the City of Cambridge Bicycle Parking Guide. Approximately 122 parking spaces will be provided in the garage; therefore 13 bicycle parking spaces are required and EF commits to provide 22 indoor and 20 outdoor bicycle spaces.

  2016 Status - Complete.

- Existing PTDM Measure: The design of the bicycle parking spaces complies with both Article 6.49 of the Cambridge Zoning Ordinance and the City of Cambridge Bicycle Parking Guide.

- *2016 Status - Complete. The bicycle parking required under zoning complies with the City of Cambridge Bicycle Parking Guide.*

- Existing PTDM Measure: Commit to purchase 20 bicycles to house at the site for the use of employees. These bikes will be available free of charge, and will essentially be "loaner" bicycles to be used while employees existing bicycles are repaired and/or to encourage the use of bicycling.

  2016 Status - Per the amendment dated May 20, 2014, the TDM measure requiring EF to purchase 20 bicycles was replaced by a requirement that EF donate a Hubway bicycle share station, which included a 23-dock station, 23 bicycles, and three years of operational

costs. The Hubway station was installed at the corner of North Point Boulevard and Education Street in July 2014.

- Existing PTDM Measure: An Emergency Ride Home program (ERH) will be provided to all employees who commute by non-SOV mode at least 3 days per week.

  2016 Status - EF provides its employees and students with a customized, direct shuttle service to the Red and Orange Line MBTA stations to make it convenient for its employees and students to utilize public transportations. EF also reimburses employees for taxi service when they need a ride home on an Emergency basis.

- Existing PTDM Measure: Details of the ERH program will be submitted to, and approved by, the PTDM Officer prior to approval of the first Certificate of Occupancy. ERH services may be provided internally or through a third party administrator, such as the CRTMA.

  2016 Status - Completed.

- Existing PTDM Measure: Contact the various car-sharing services available in Cambridge to locate a parking space in the vicinity of the buildings. EF will contact the City regarding the possibility of permitting an existing loading zone space in front of the existing EF building to be used as a car-sharing space. Information on car-sharing membership will be provided in a central location with the other information on alternative transportation.

  2016 Status - EF will continue to investigate the possibility of attracting a car sharing service. There are currently two Zipcars available for rent at Archstone North Point, which is less than 5 minutes from EF's campus. An additional Zipcar vehicle is parked at the Lechmere T stop.

- Existing PTDM Measure: To encourage the use of alternative transportation, EF will work with the Cambridge Office of Workforce Development to continue to expand employment opportunities for Cambridge residents.

  2016 Status – Ongoing.

- Existing PTDM Measure: EF commits to charging employees at least $150 per month (not less than market rate) to park in any non-HOV parking spaces in the existing garage.

  2016 Status - The current parking rate for employees is $155/month.

Planning Board Special Permit Criteria

Consistent with Section IV, "Guidelines for Presenting Information to the Planning Board" of the City of Cambridge "Transportation Impact Study Guidelines," Sixth Revision dated November 28, 2011; this section presents a summary of potential impacts to the transportation network as a result of the proposed Project. Full Build conditions have been analyzed against the Planning Board Special Permit Criteria.

According to the guidelines, when one or more of the indicators is exceeded, it will be indicative of a potentially adverse impact on City's transportation network; however, the Planning Board will consider mitigation efforts, their anticipated effectiveness, and other information that identifies a reduction in adverse traffic impacts.

Criterion A - Project Vehicle Trip Generation

Table A-1 presents the Project vehicle trip generation criterion. Project vehicle trip generation is based on ITE trip rates, adjusted for local mode split and vehicle occupancy rates as discussed previously.

Table A-1 Project Vehicle Trip Generation

Time Period	Criteria (trips)	Build	Exceeds Criteria?
Weekday Daily	2,000	710	No
Weekday AM Peak Hour	240	76	No
Weekday PM Peak Hour	240	90	No

The Project is not expected to exceed the Planning Board criteria for daily, morning peak and evening peak Project vehicle trip generation under the Build program.

Criterion B - Vehicular LOS

The criteria for a Project's impact to traffic operations at signalized intersections are summarized in Table B-1 below. These criteria are evaluated for each signalized study-area intersection and presented in Table B-2.

Table B-1 Criterion: Vehicular Level of Service

Existing	With Project
VLOS A	VLOS C
VLOS B, C	VLOS D
VLOS D	VLOS D or 7% roadway volume increase
VLOS E	7% roadway volume increase
VLOS F	5% roadway volume increase

Table B-2 Vehicular Level of Service

	AM Peak Hour				PM Peak Hour			
Intersection	Existing Condition	Build Condition	Traffic Increase	Exceeds Criteria?	Existing Condition	Build Condition	Traffic Increase	Exceeds Criteria?
Monsignor O'Brien Hwy at Cambridge St/East St	C	C	1.1%	No	C	C	1.4%	No
Monsignor O'Brien Hwy at Land Blvd/ Charlestown Ave	F	F	0.7%	No	F	F	0.8%	No
Monsignor O'Brien Hwy at Museum Way	B	B	1.2%	No	B	B	1.7%	No

Criterion C – Traffic on Residential Streets

This criterion considers the magnitude of Project vehicle trip generation during any peak hour that may reasonably be expected to arrive and/or depart by traveling on a residential street. The criteria, based on a Project-induced traffic volume increase on any two-block residential street segment in the study area, are summarized in Table C-1. The results are presented in Table C-2.

Table C-1 Criterion: Traffic on Residential Streets

Parameter 1: Amount of Residential [1]	Parameter 2: Current peak Hour Street Volume (two-way vehicles)		
	< 150 VPH	150 – 400 VPH	> 400 VPH
1/2 or more	20 VPH[2]	30 VPH [2]	40 VPH [2]
> 1/3 but < 1/2	30 VPH [2]	45 VPH [2]	60 VPH [2]
1/3 or less	No Max.	No Max.	No Max.

1 Amount of residential for a two block segment as determined by first floor frontage
2 Additional Project vehicle trip generation in vehicles per lane, both directions
Vph vehicles per hour

Table C-2 Traffic on Residential Streets

			AM Peak Hour			PM Peak Hour		
Roadway	Reviewed Segment	Amount of Residential	Existing	Project Trips	Exceeds Criteria?	Existing	Project Trips	Exceeds Criteria?
East Street	O'Brien Hwy to North Point Blvd	1/3 or less	225	32	No	270	39	No
North Point Boulevard	East St to Leighton St	1/2 or more	215	32	Yes	255	39	Yes
	North St to Museum Way	1/3 or less	295	33	No	280	46	No
O'Brien Highway	Land Blvd to Leighton St	1/2 or more	2,510	11	No	2,430	5	No
	Leighton St to East St/Cambridge St	1/2 or more	2,465	0	No	2,385	0	No
Museum Way	O'Brien Hwy to Education St	1/3 or less	450	33	No	365	46	No
	Education St to North Point Blvd	1/3 or less	315	33	No	285	46	No

*volume interpolated from nearest data available in study area

Criterion D – Lane Queue

The criteria for a project's impact to queues at signalized intersections are summarized in Table D-1 below. These criteria are evaluated for each lane group at study-area signalized intersections and presented in Table D-2.

Table D-1 Criterion: Vehicular Queues at Signalized Intersections

Existing	With Project
Under 15 vehicles	Under 15 vehicles, or 15+ vehicles with an increase of 6 vehicles
15 or more vehicles	Increase of 6 vehicles

Table D-2 Length of Vehicle Queues at Signalized Intersections

		AM Peak Hour			PM Peak Hour		
Intersection	Movement	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
Monsignor O'Brien Hwy at Cambridge St/East St	Cambridge St EB thru/left	1	1	No	3	3	No
	Cambridge St EB right	0	0	No	0	0	No
	East St WB left/thru/right	2	2	No	2	3	No
	MOB NB left	5	5	No	5	5	No
	MOB NB thru/right	3	3	No	10	10	No
	MOB SB left	2	3	No	1	1	No
	MOB SB thru	10	10	No	5	5	No
	MOB SB right	2	2	No	1	1	No
Monsignor O'Brien Hwy at Land Blvd/ Charlestown Ave	Land Blvd EB left	5	5	No	~13	~13	No
	Land Blvd EB thru	8	8	No	~17	~17	No
	Land Blvd EB right	0	0	No	2	2	No
	Charlestown Ave WB left	7	7	No	6	6	No
	Charlestown Ave WB thru/right	~39	~39	No	~22	~22	No
	MOB NB left	~10	~10	No	7	8	No
	MOB NB thru	9	9	No	9	9	No
	MOB NB right	5	5	No	6	7	No
	MOB SB left	~6	~6	No	~14	~14	No
	MOB SB Thru	~13	~13	No	7	7	No
	MOB SB right	~11	~11	No	2	3	No
Monsignor O'Brien Hwy at Museum Way	Museum Way WB left	3	3	No	4	4	No
	Museum Way WB right	0	0	No	1	1	No
	MOB NB thru/right	2	2	No	3	4	No
	MOB SB left/thru	8	9	No	2	2	No

Criterion E – Pedestrian and Bicycle Facilities

Criteria 1: Pedestrian Delay

Pedestrian delay is a measure of the pedestrian crossing delay on a crosswalk during the peak hour as determined by the pedestrian level of service analysis in the HCM 2000.

Table E-1 presents the indicators for this criterion. Tables E-2 present the evaluation of PLOS criteria for each crosswalk at study area intersections under existing and full-build conditions.

Table E- 1 Criterion: Pedestrian Level-of-Service Indicators

Existing	With Project
PLOS A	PLOS A
PLOS B	PLOS B
PLOS C	PLOS C
PLOS D	PLOS D or increase of 3 seconds
PLOS E, F	PLOS D

Table E-2 Signalized Intersection Pedestrian Level-of-Service Summary

		AM Peak Hour			PM Peak Hour		
Intersection	Crosswalk	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
O'Brien Highway at Cambridge Street / East Street	North	D	D	No	D	D	No
	East	C	C	No	C	C	No
	South	D	D	No	D	D	No
	South (Cambridge Median to channelized island)	C	C	No	C	C	No
	West (Cambridge St RT)	B	B	No	B	B	No
O'Brien Highway at Land Boulevard / Charlestown Avenue/Gilmore Bridge	North	D	D	No	E	E	Yes
	South	E	E	Yes	E	E	Yes
	West	E	E	Yes	E	E	Yes
O'Brien Highway at Museum Way	North	E	E	Yes	E	E	Yes
	East	D	D	No	E	E	Yes
	South	E	E	Yes	E	E	Yes

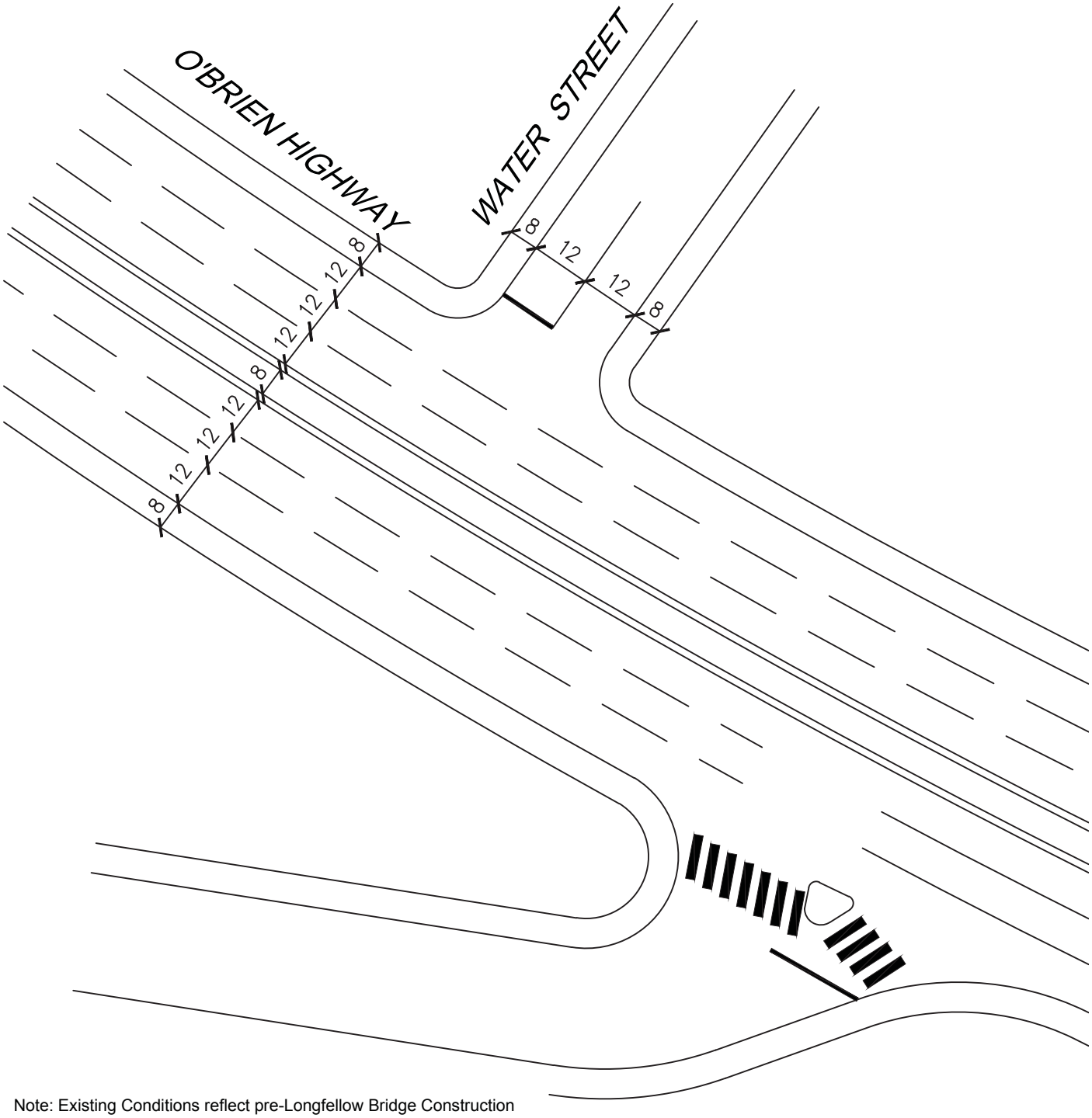
Criteria 2 & 3: Safe Pedestrian and Bicycle Facilities

Table E-4 summarizes the presence of pedestrian and bicycle facilities for all streets adjacent and nearby to the Project site.

Table E-3 Pedestrian and Bicycle Facilities

Adjacent Street	Link (between)	Sidewalks or Walkways Present?	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present?	Exceeds Criteria?
East Street	MOB Hwy to North Point Blvd (west side)	Yes	No	Yes	No
	MOB Hwy to North Point Blvd (east side)	Yes	No	Yes	No
North Point Boulevard	East St to Leighton St (north side)	Yes	No	Yes	No
	East St to Leighton St (south side)	Yes	No	Yes	No
	Leighton St to Museum Way (north side)	Yes	No	Yes	No
	Leighton St to Museum Way (south side)	Yes	No	Yes	No
	Museum Way to Education St (north side)	Yes	No	Yes	No
	Museum Way to Education St (south side)	Yes	No	Yes	No
Museum Way	MOB Hwy to Education Street (west side)	Yes	No	Yes	No
	MOB Hwy to Education Street (east side)	Yes	No	Yes	No
	Education St to North Point Blvd (west side)	Yes	No	Yes	No
	Education St to North Point Blvd (east side)	Yes	No	Yes	No

TIS Figures



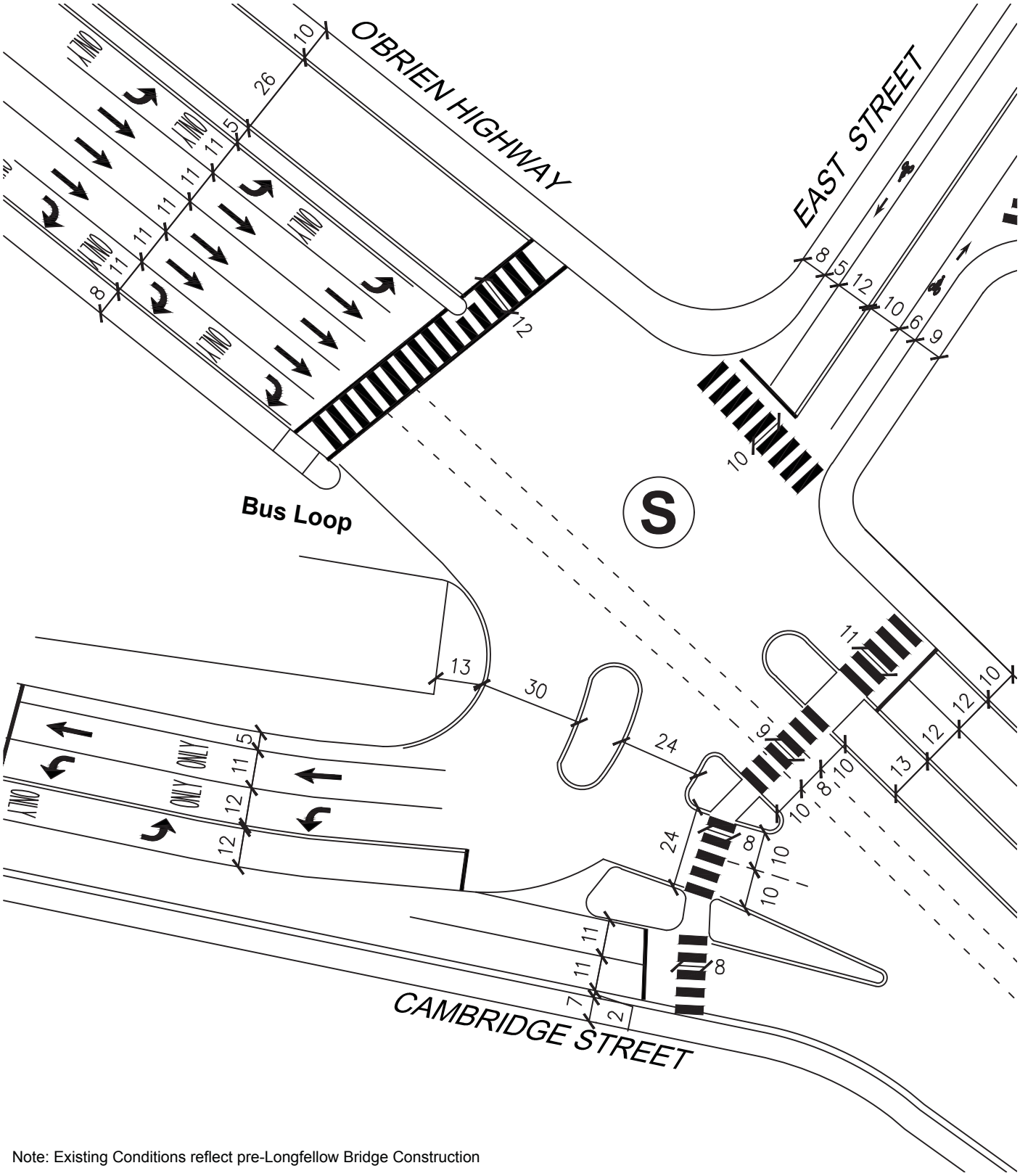
Note: Existing Conditions reflect pre-Longfellow Bridge Construction

0 20 40 Feet

Figure 1.b.1

Monsignor O'Brien Highway at Water Street

EF Education First III TIS
Cambridge, Massachusetts



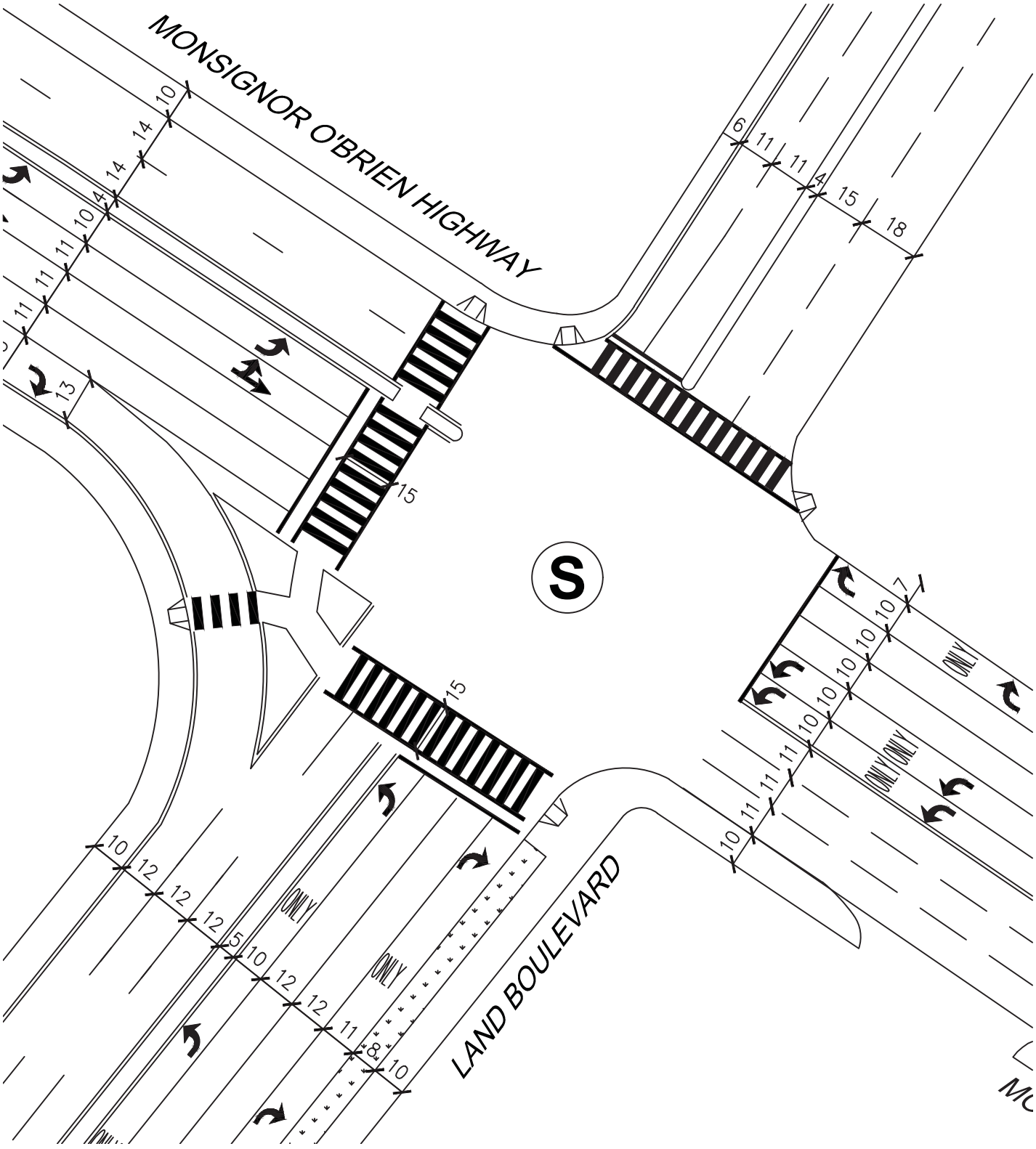
Note: Existing Conditions reflect pre-Longfellow Bridge Construction

0 20 40 Feet

Figure 1.b.2

Monsignor O'Brien Highway at
East Street/Cambridge Street

EF Education First III TIS
Cambridge, Massachusetts

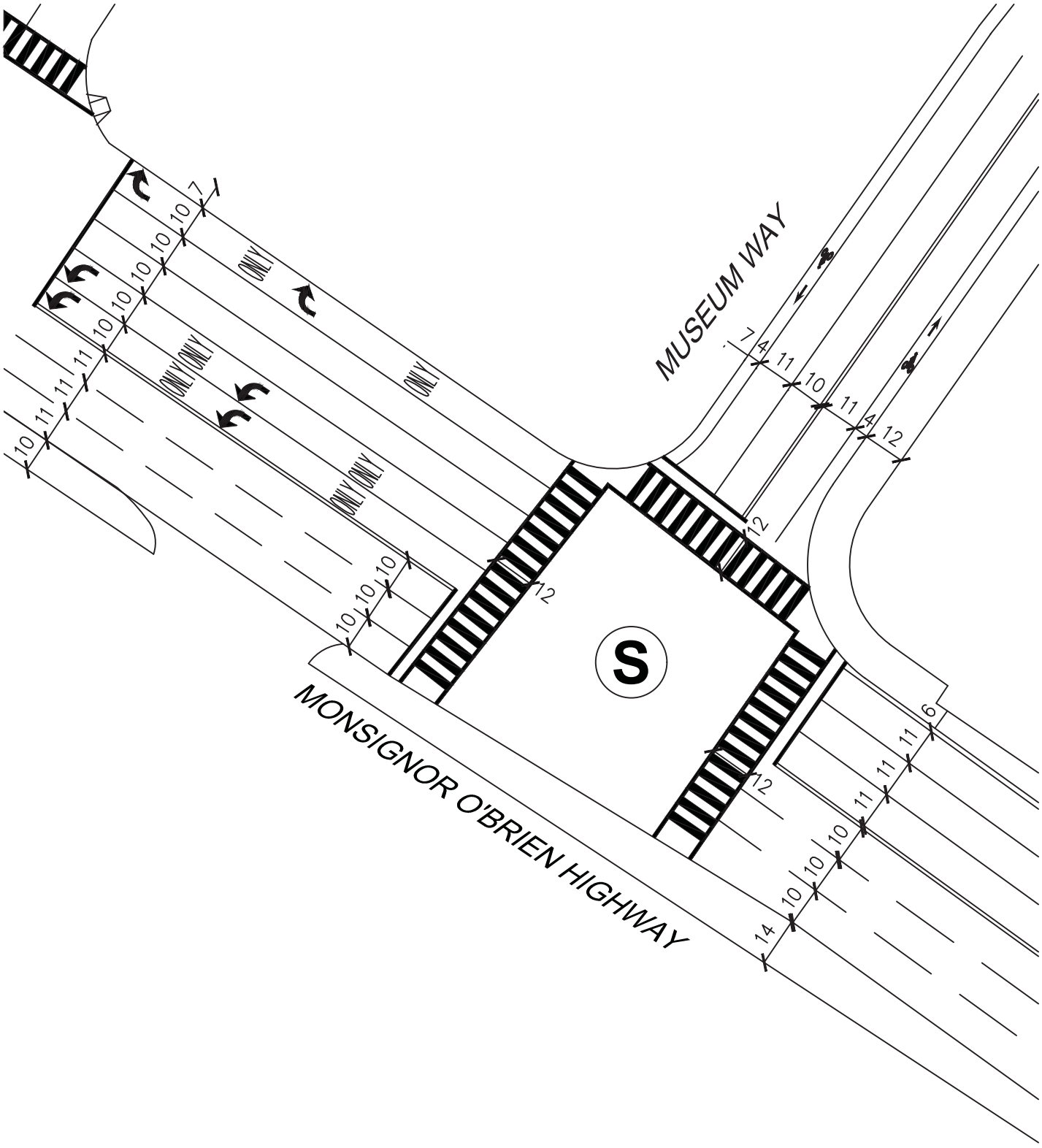


0 20 40 Feet

Figure 1.b.3

Monsignor O'Brien Highway at
Charlestown Avenue/Land Boulevard

EF Education First III TIS
Cambridge, Massachusetts

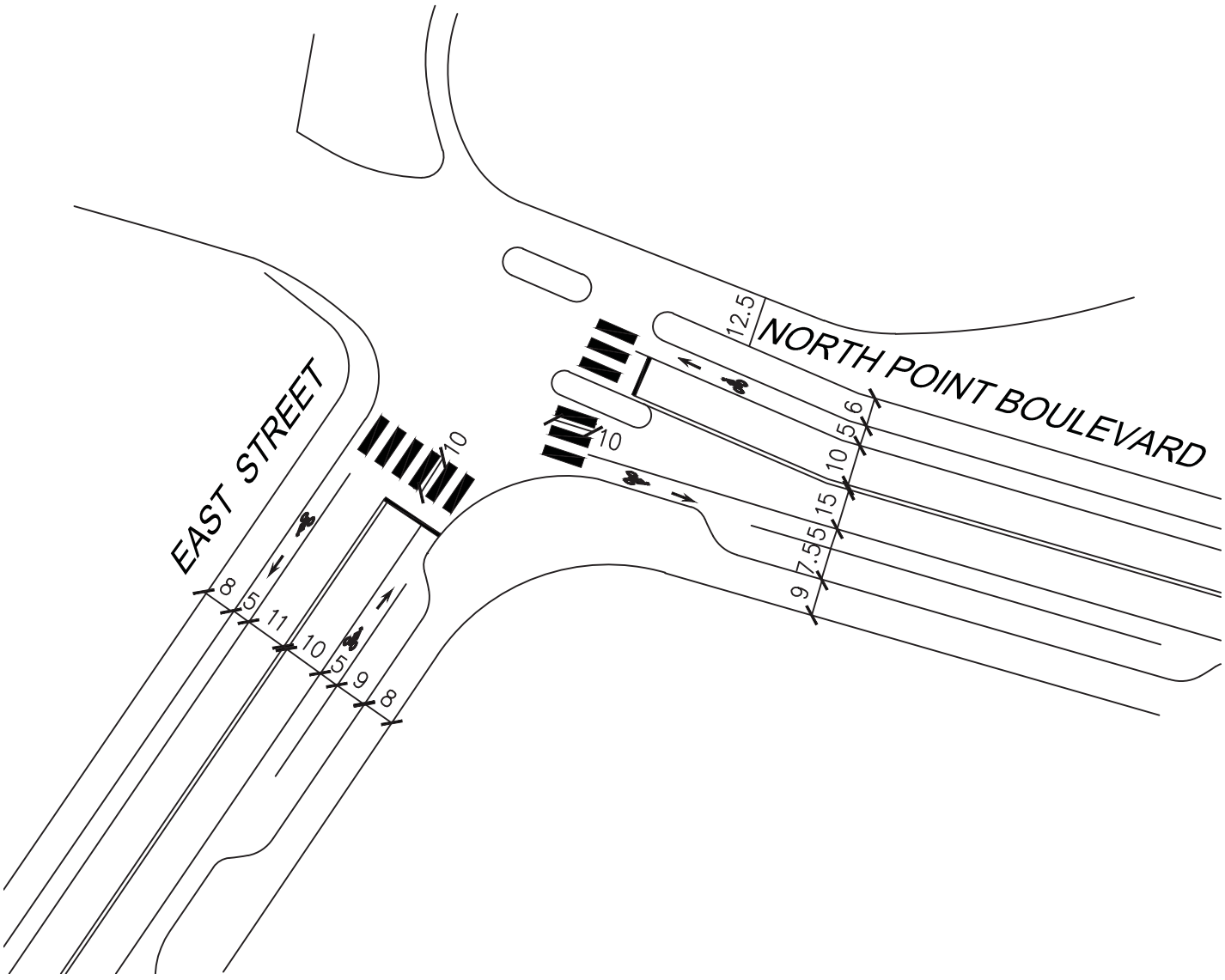


0 20 40 Feet

Figure 1.b.4

Monsignor O'Brien Highway at Museum Way

EF Education First III TIS
Cambridge, Massachusetts

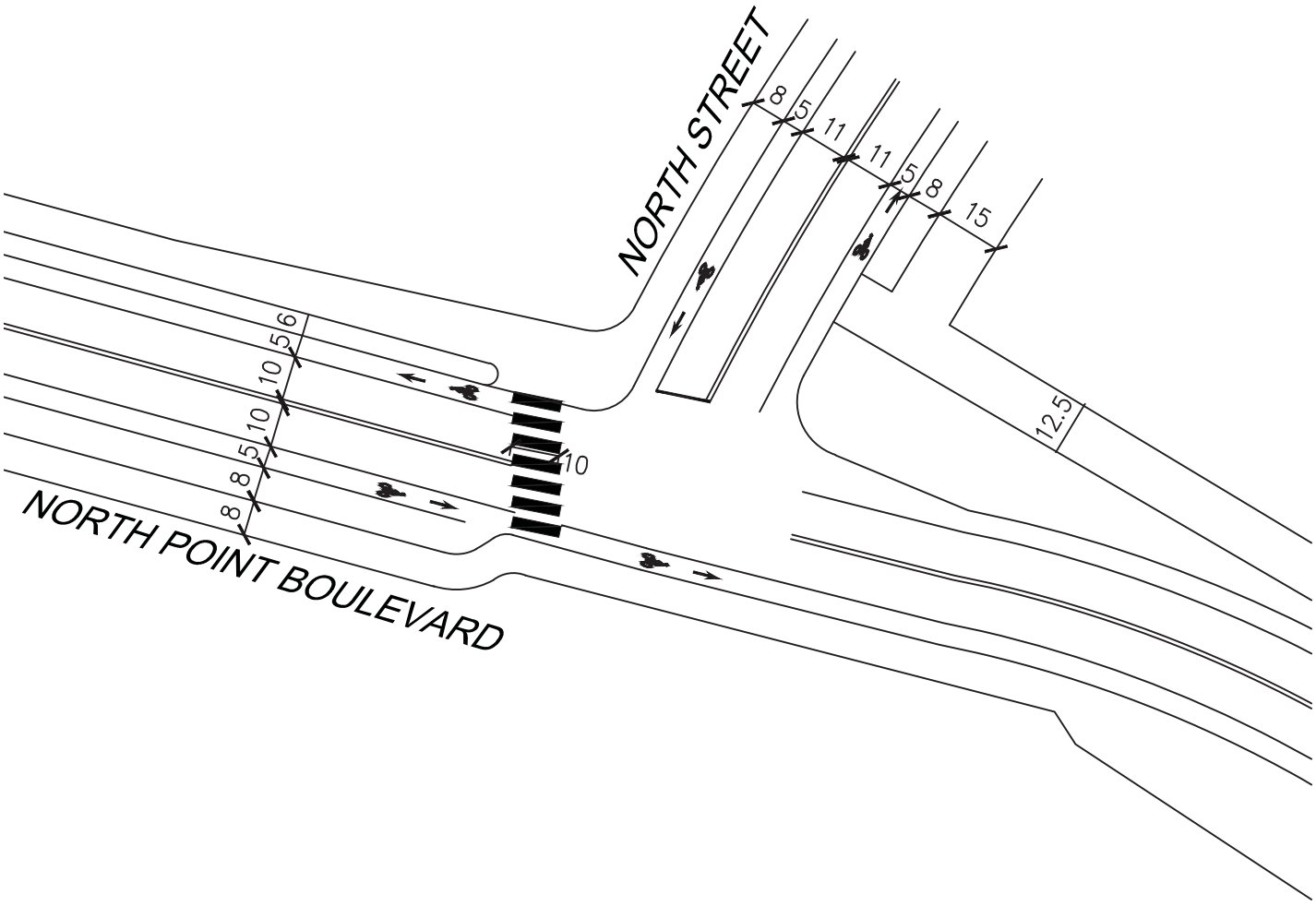


0 20 40 Feet

Figure 1.b.5

East Street at North Point Boulevard

EF Education First III TIS
Cambridge, Massachusetts

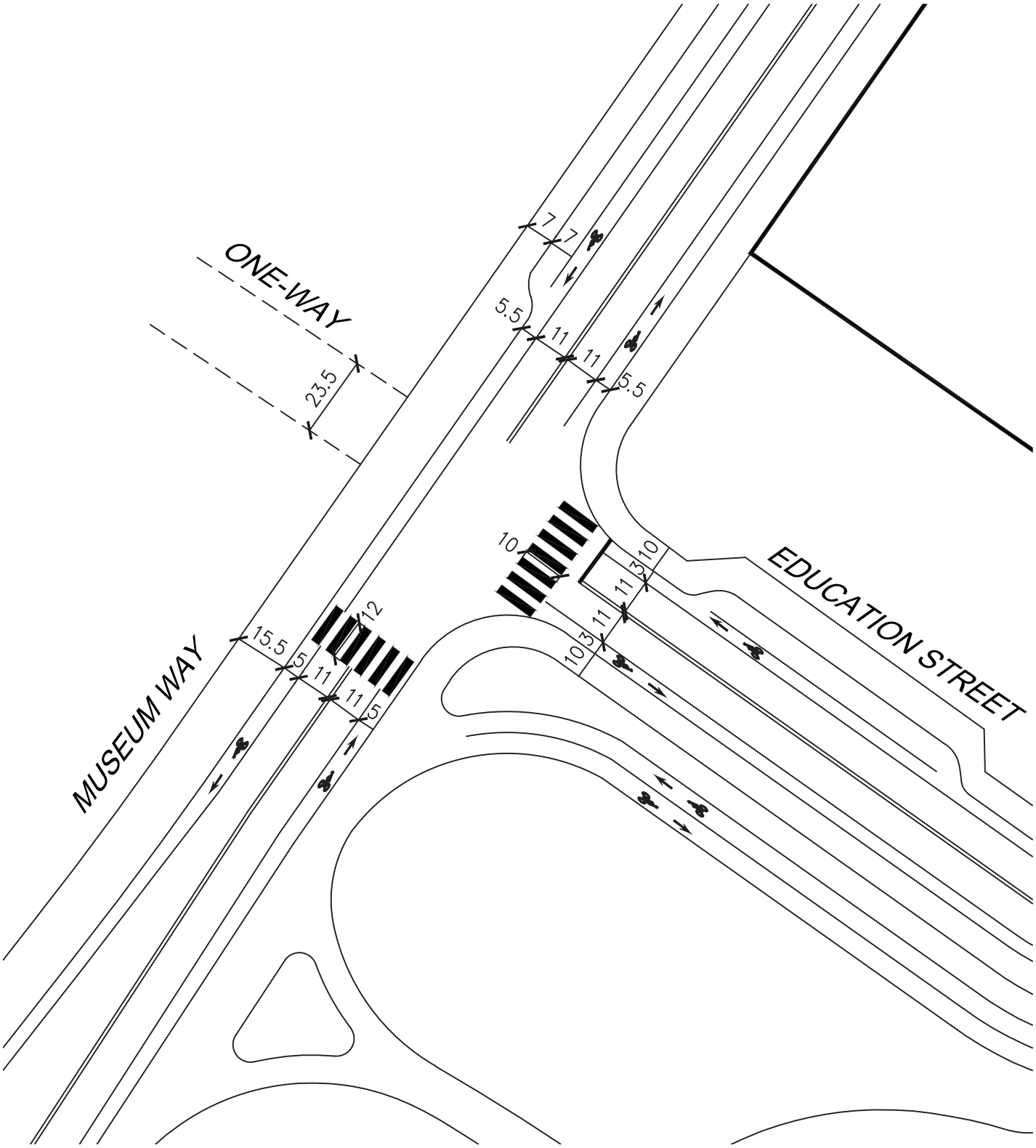


0 20 40 Feet

Figure 1.b.6

North Point Boulevard at North Street

EF Education First III TIS
Cambridge, Massachusetts

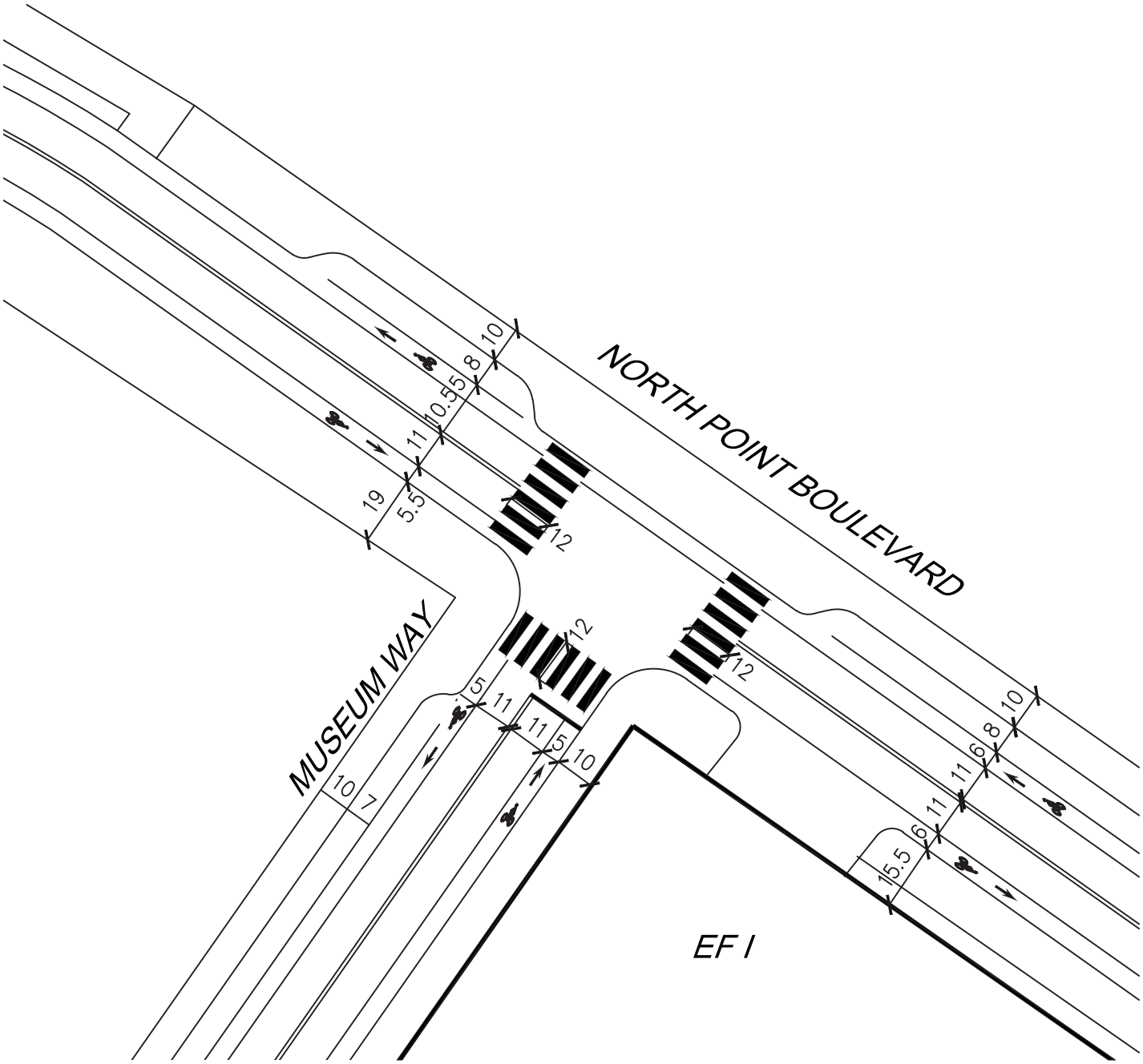


0 20 40 Feet

Figure 1.b.7

Museum Way at Education Street

EF Education First III TIS
Cambridge, Massachusetts



0 20 40 Feet

Figure 1.b.8

Museum Way at North Point Boulevard

EF Education First III TIS
Cambridge, Massachusetts

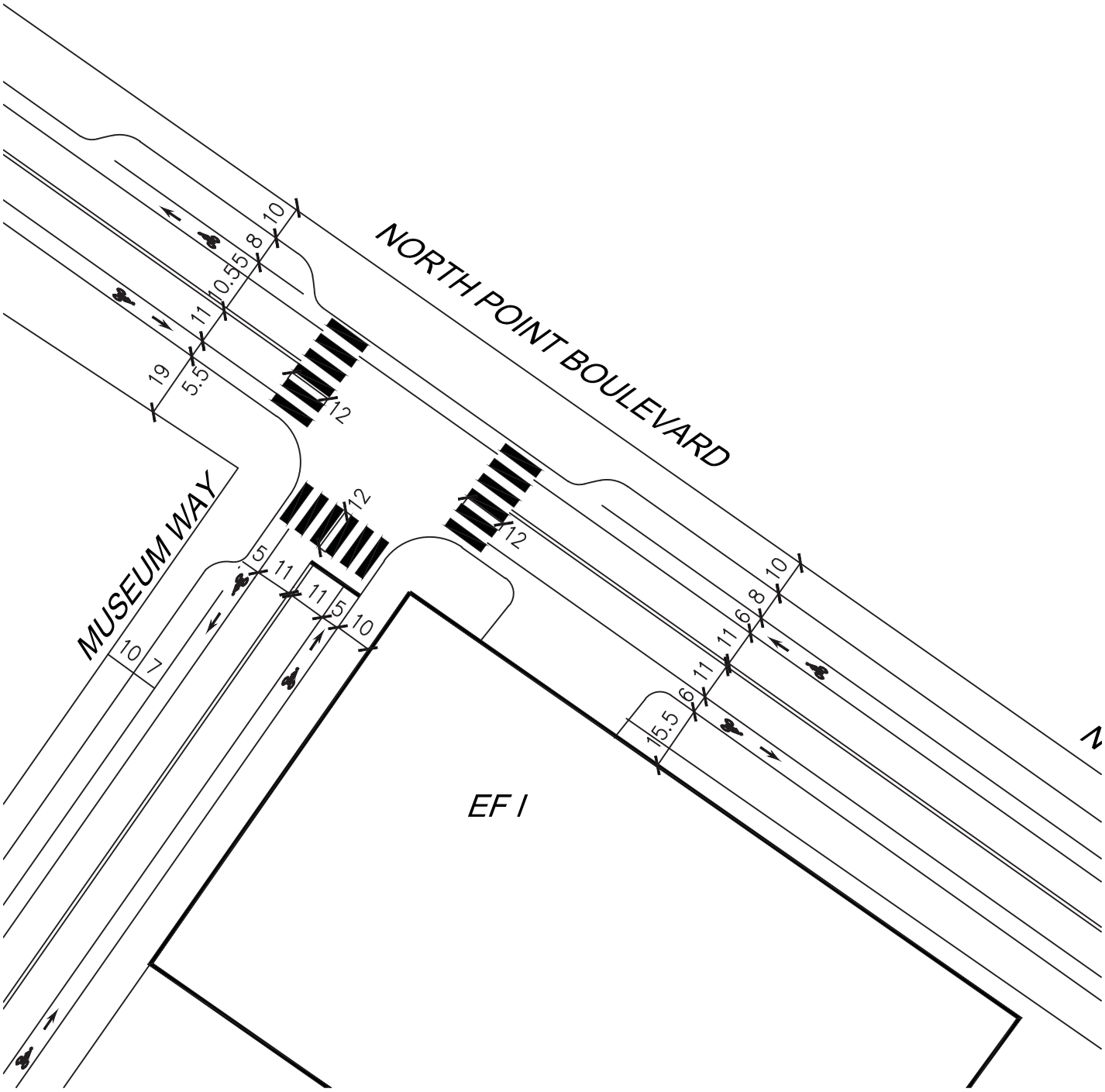


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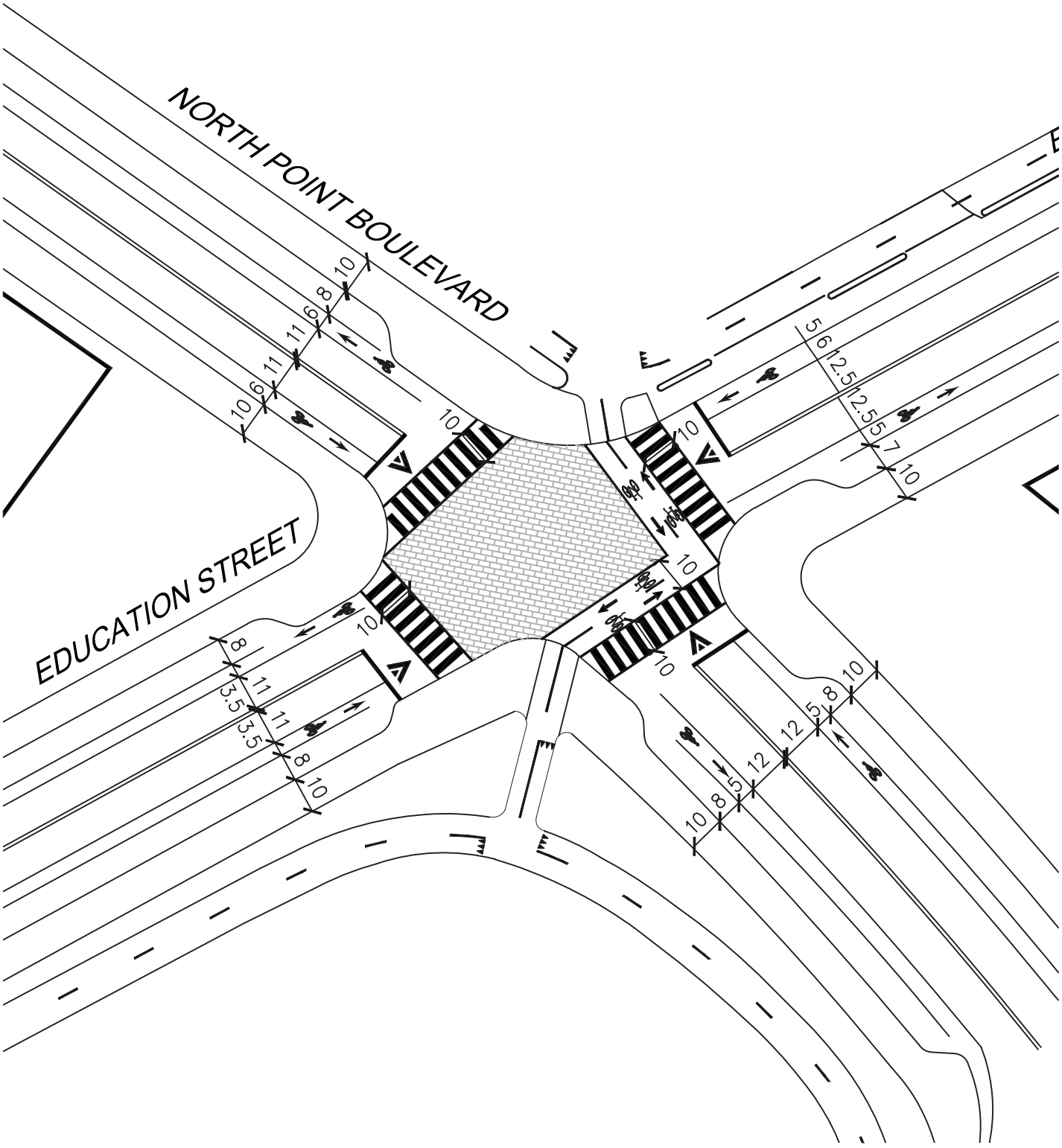
Figure 1.b.9

EFI Driveway at North Point Boulevard

EF Education First III TIS
Cambridge, Massachusetts

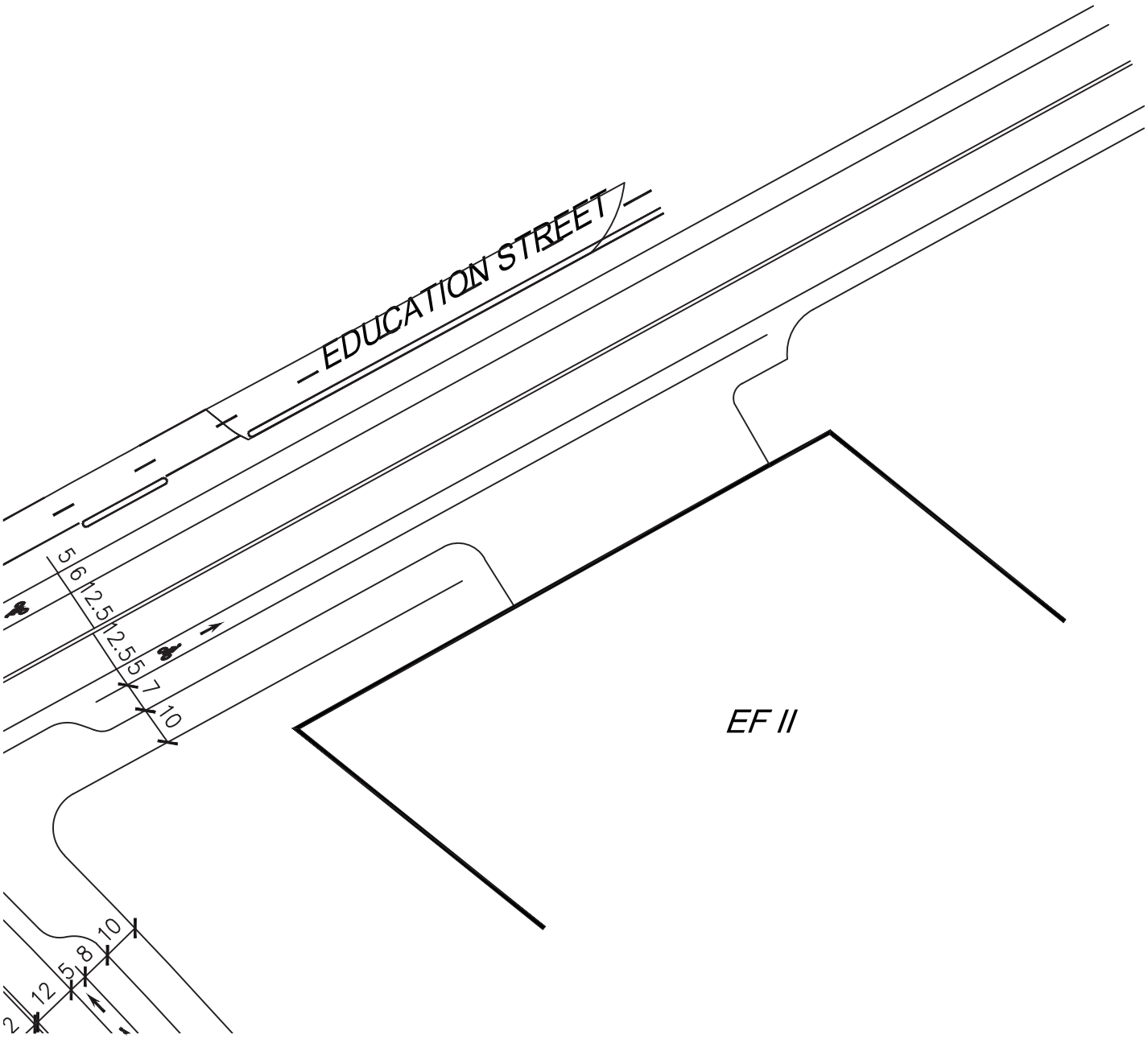


0 20 40 Feet

Figure 1.b.10

Education Street at North Point Boulevard

EF Education First III TIS
Cambridge, Massachusetts



0 20 40 Feet

Figure 1.b.11

EF II Driveway at Education Street

EF Education First III TIS
Cambridge, Massachusetts

Source: ArcGIS Online Bing Aerial

Figure 1.d.1

Public Transportation Map

EF Education First III TIS
Cambridge, Massachusetts

Source: ArcGIS Online Bing Aerial, MassDOT

Figure 1.d.2

Pedestrian Access to Public Transportation Map

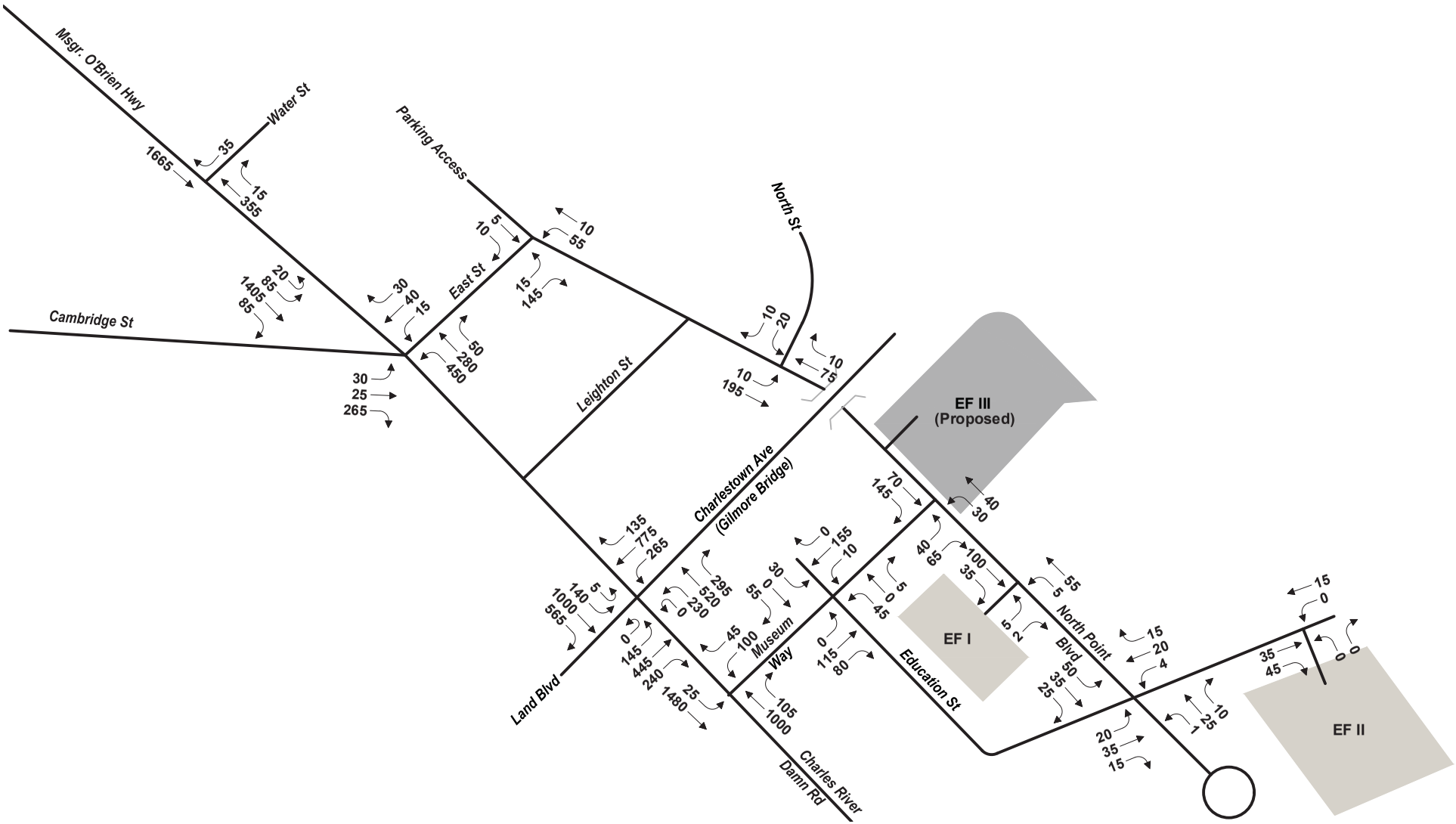
EF Education First III TIS
Cambridge, Massachusetts

Source: ArcGIS Online Bing Aerial, Cambridge GIS

Figure 1.e.1

Existing Land Use

EF Education First III TIS
Cambridge, Massachusetts



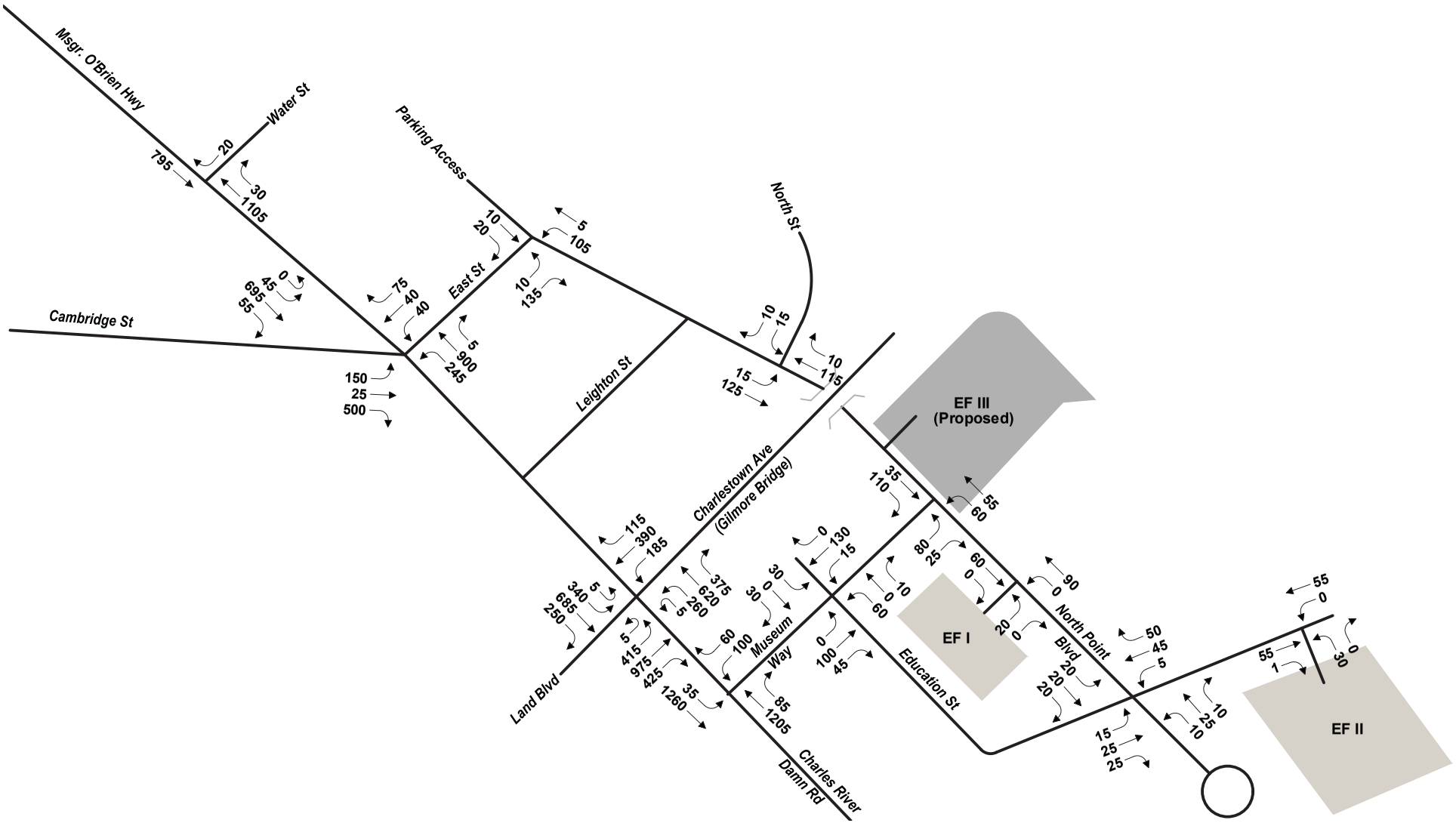
Note: MOB Intersections counted in May, 2012
North Point Intersections counted on September 21, 2016

Prepared By: VHB

Figure 2.c.1

2017 Existing Conditions
Traffic Volumes Morning Peak Hour

EF Education First III TIS
Cambridge, Massachusetts



Note: MOB Intersections counted in May, 2012
North Point Intersections counted on September 21, 2016

Prepared By: VHB

Figure 2.c.2

2017 Existing Conditions
Traffic Volumes Evening Peak Hour

EF Education First III TIS
Cambridge, Massachusetts

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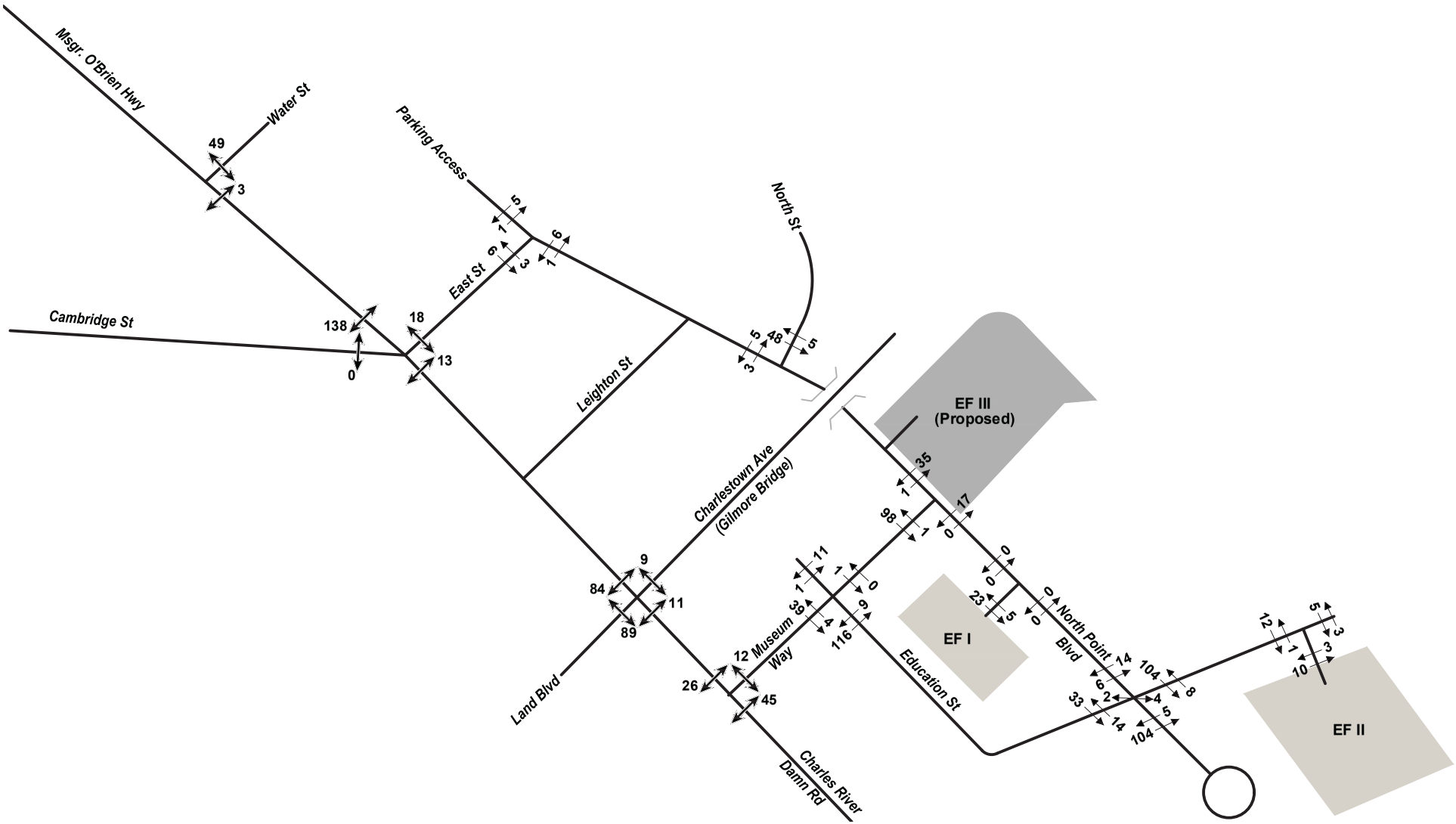

Note: MOB Intersections counted in May, 2012
North Point Intersections counted on September 21, 2016

Prepared By: VHB

Figure 2.c.3

2017 Existing Conditions
Pedestrian Volumes Morning Peak Hour

EF Education First III TIS
Cambridge, Massachusetts

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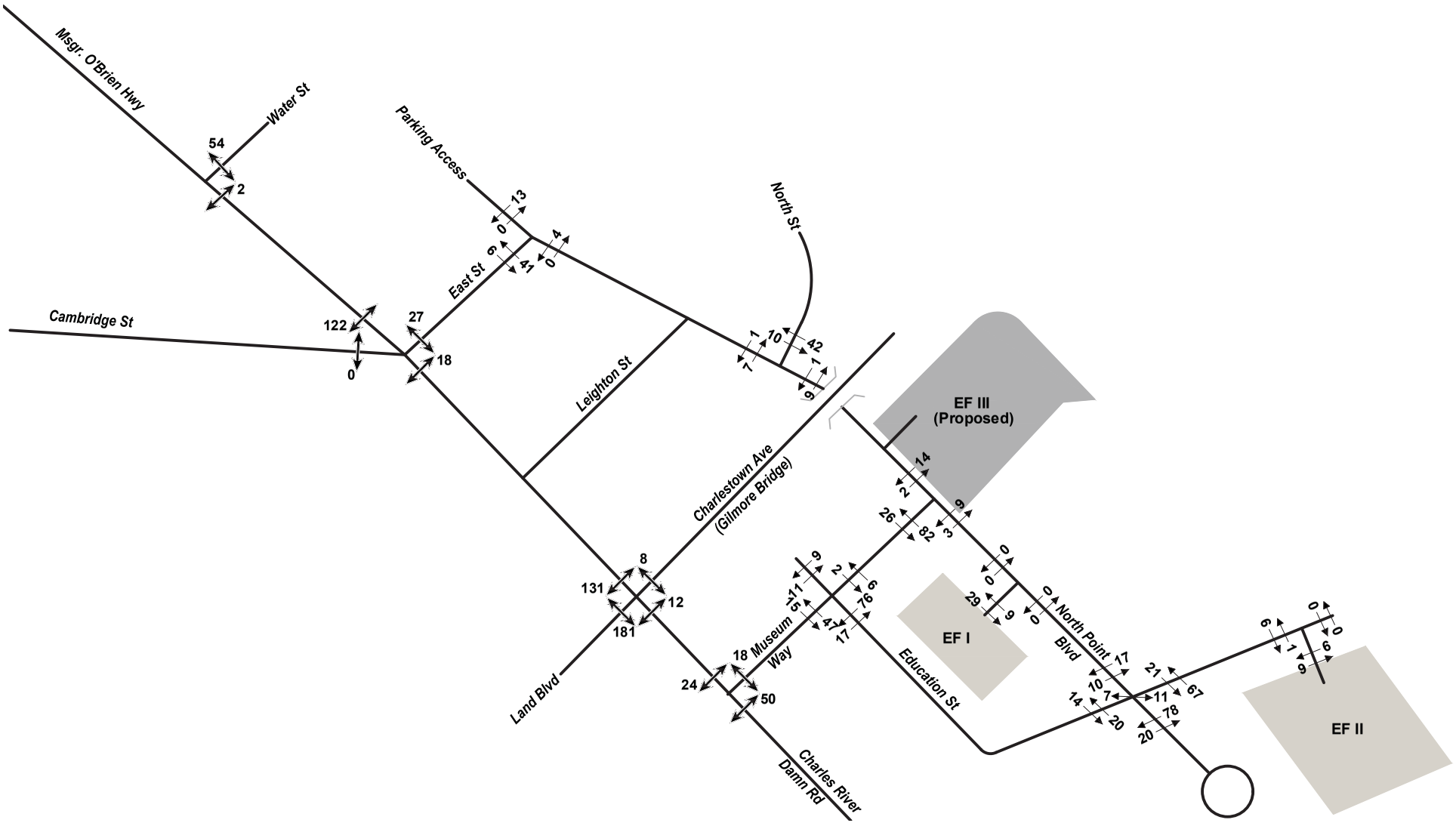


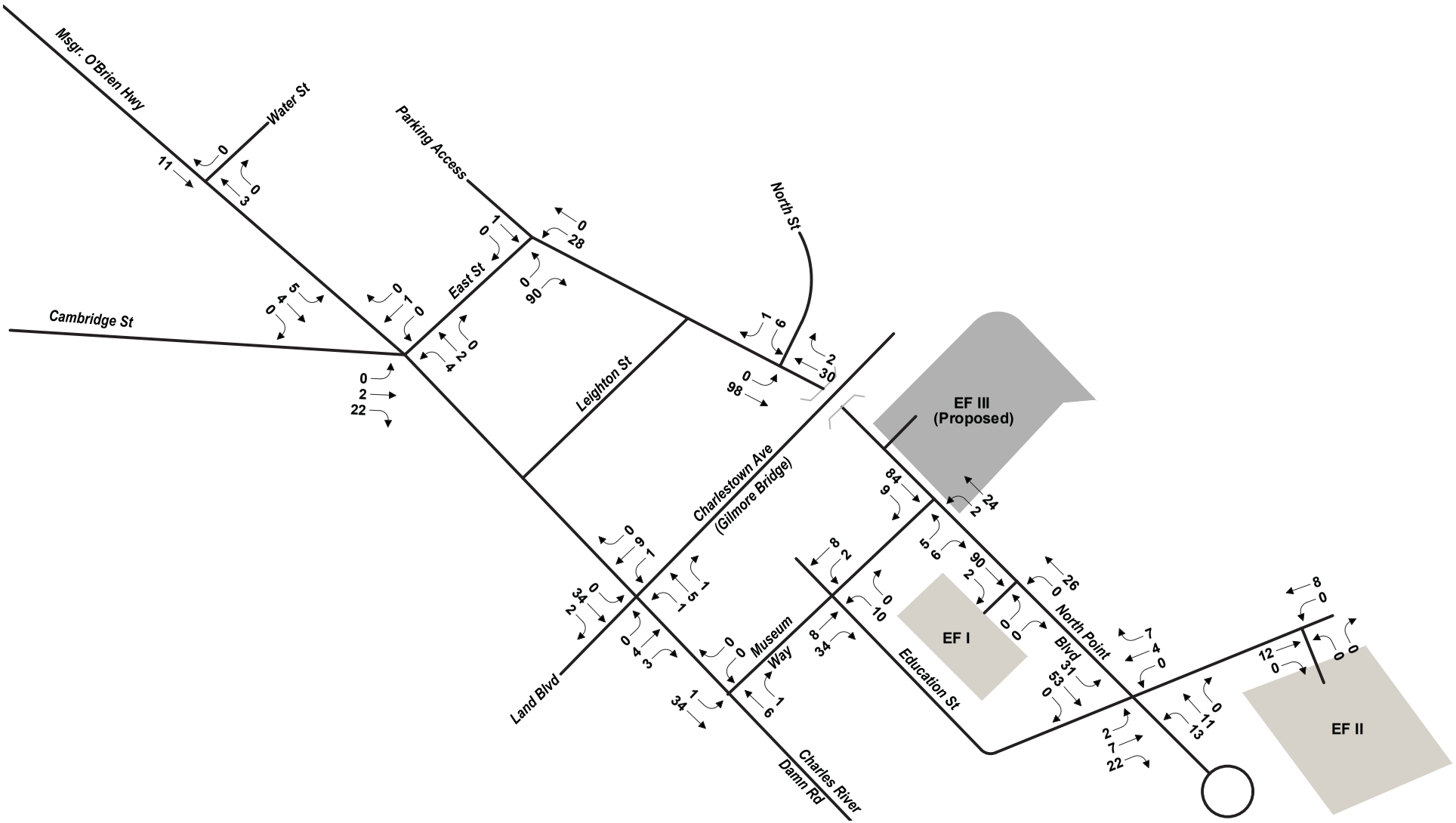
Note: MOB Intersections counted in May, 2012
North Point Intersections counted on September 21, 2016

Prepared By: VHB

Figure 2.c.4

2017 Existing Conditions
Pedestrian Volumes Evening Peak Hour

EF Education First III TIS
Cambridge, Massachusetts



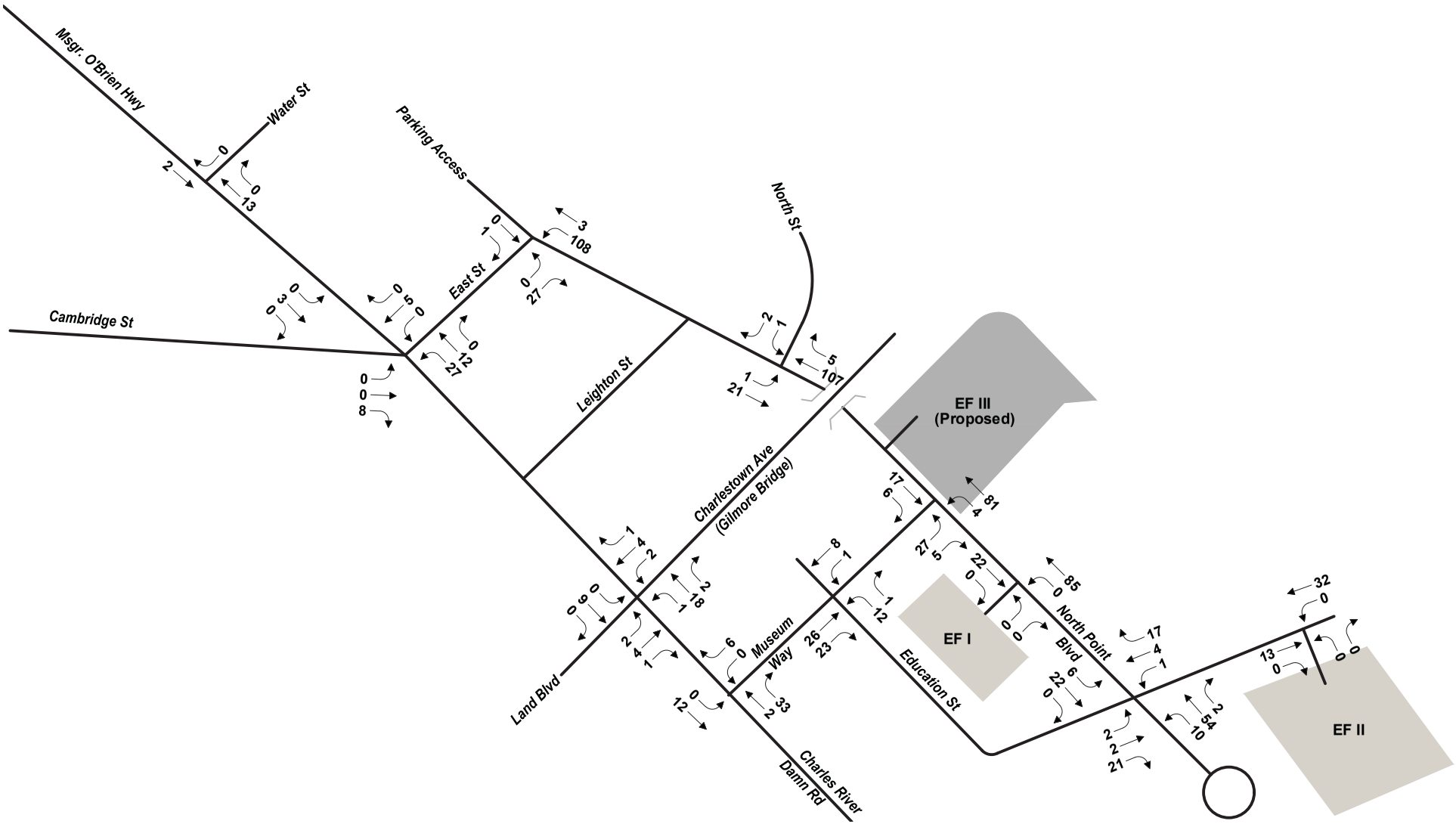
Note: MOB Intersections counted in May, 2012
North Point Intersections counted on September 21, 2016

Prepared By: VHB

Figure 2.c.5

2017 Existing Conditions
Bicycle Volumes Morning Peak Hour

EF Education First III TIS
Cambridge, Massachusetts



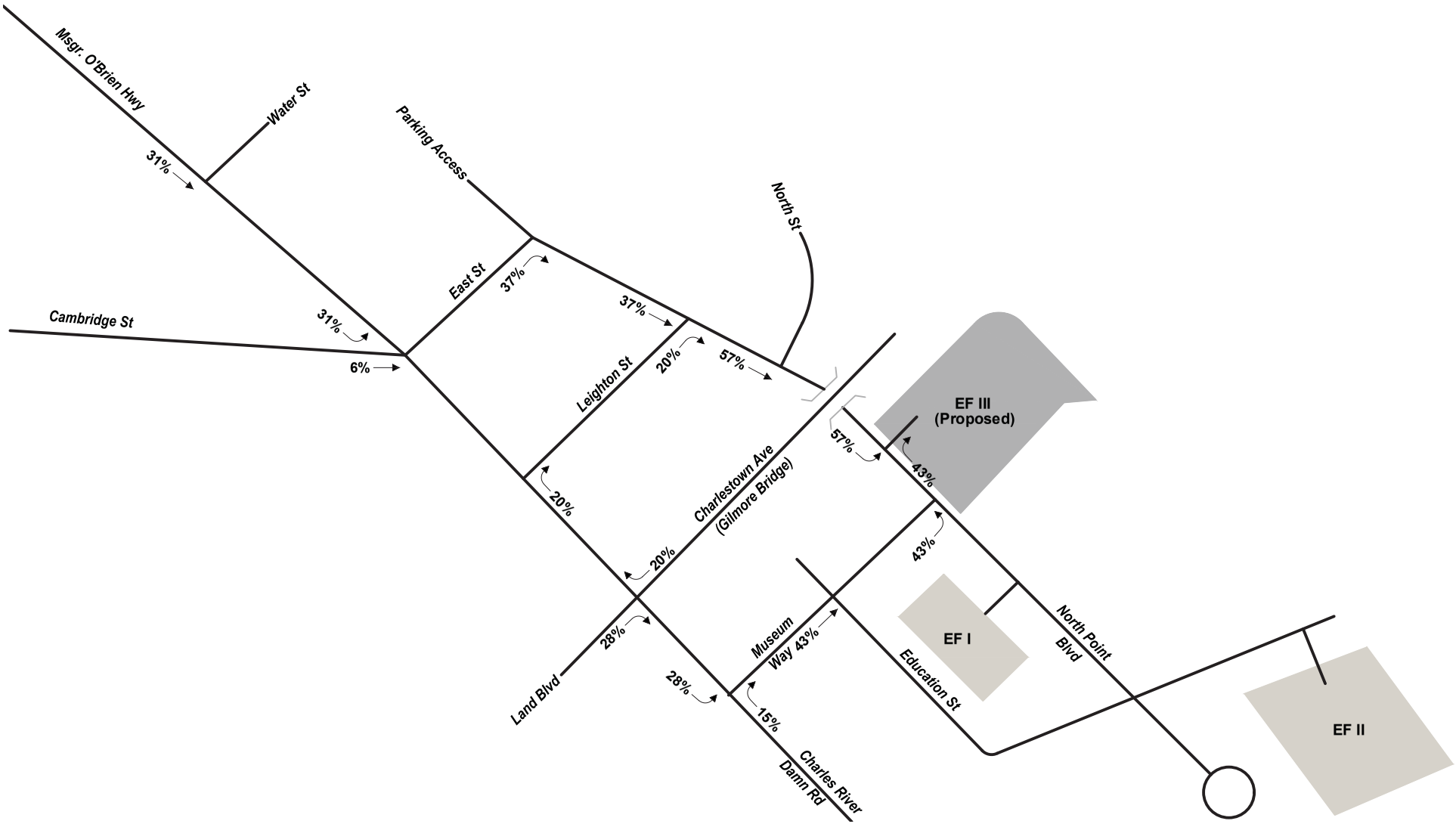
Note: MOB Intersections counted in May, 2012
North Point Intersections counted on September 21, 2016

Prepared By: VHB

Figure 2.c.6

2017 Existing Conditions
Bicycle Volumes Evening Peak Hour

EF Education First III TIS
Cambridge, Massachusetts

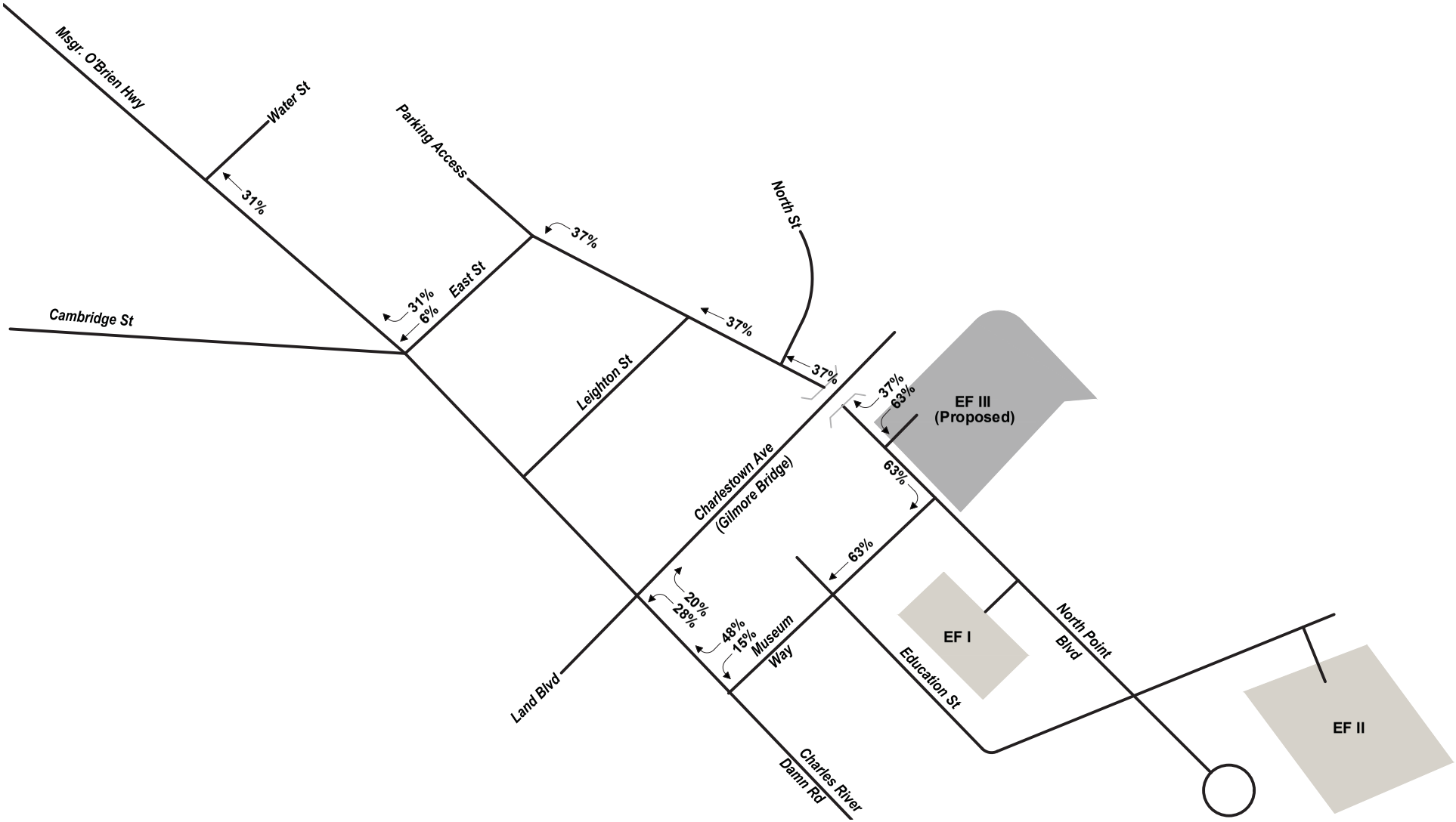


Prepared By: VHB

Figure 3.c.1

Trip Distribution Inbound - Employees
Existing Geometry

EF Education First III TIS
Cambridge, Massachusetts

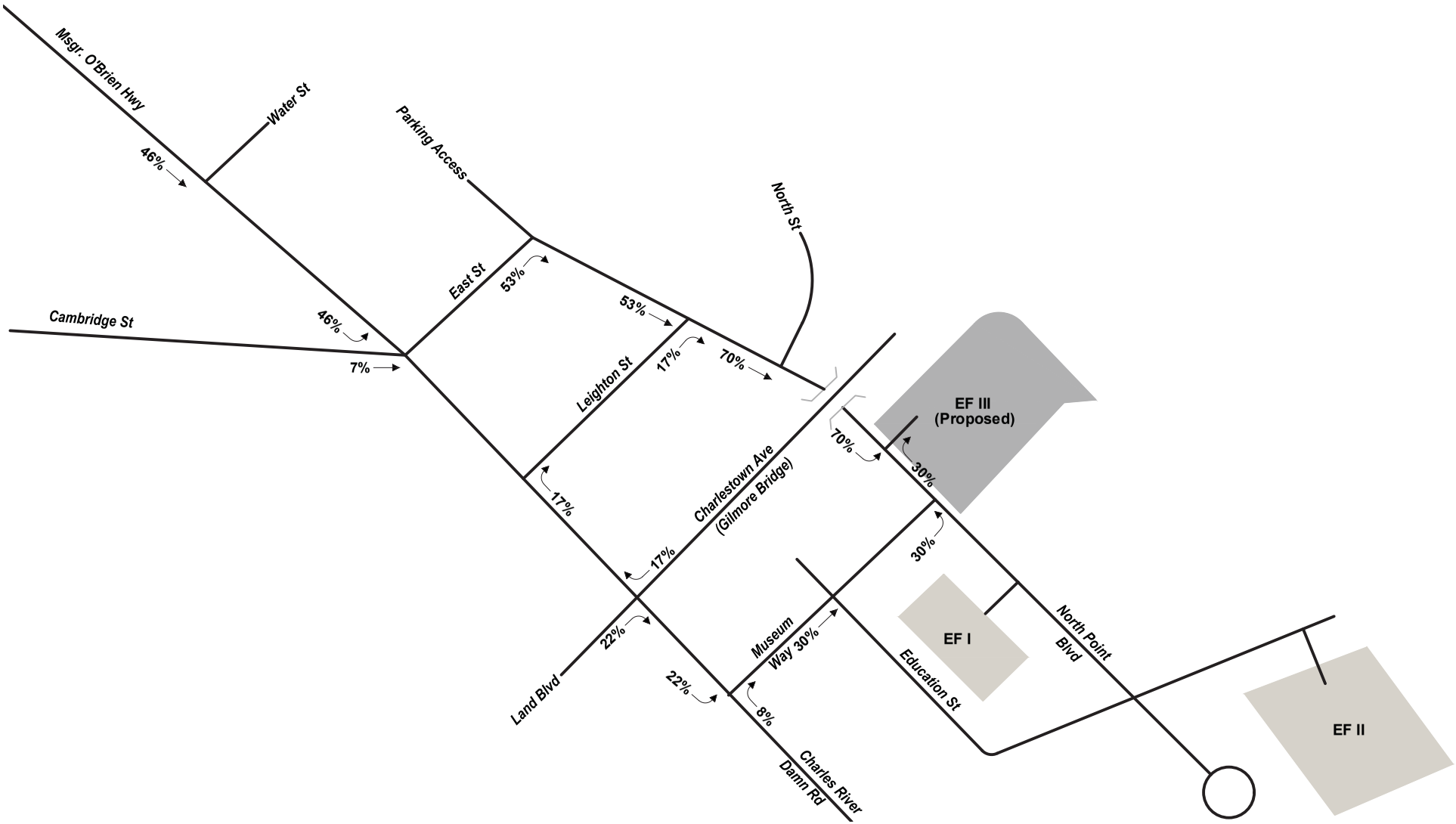


Prepared By: VHB

Figure 3.c.2

Trip Distribution Outbound - Employees
Existing Geometry

EF Education First III TIS
Cambridge, Massachusetts

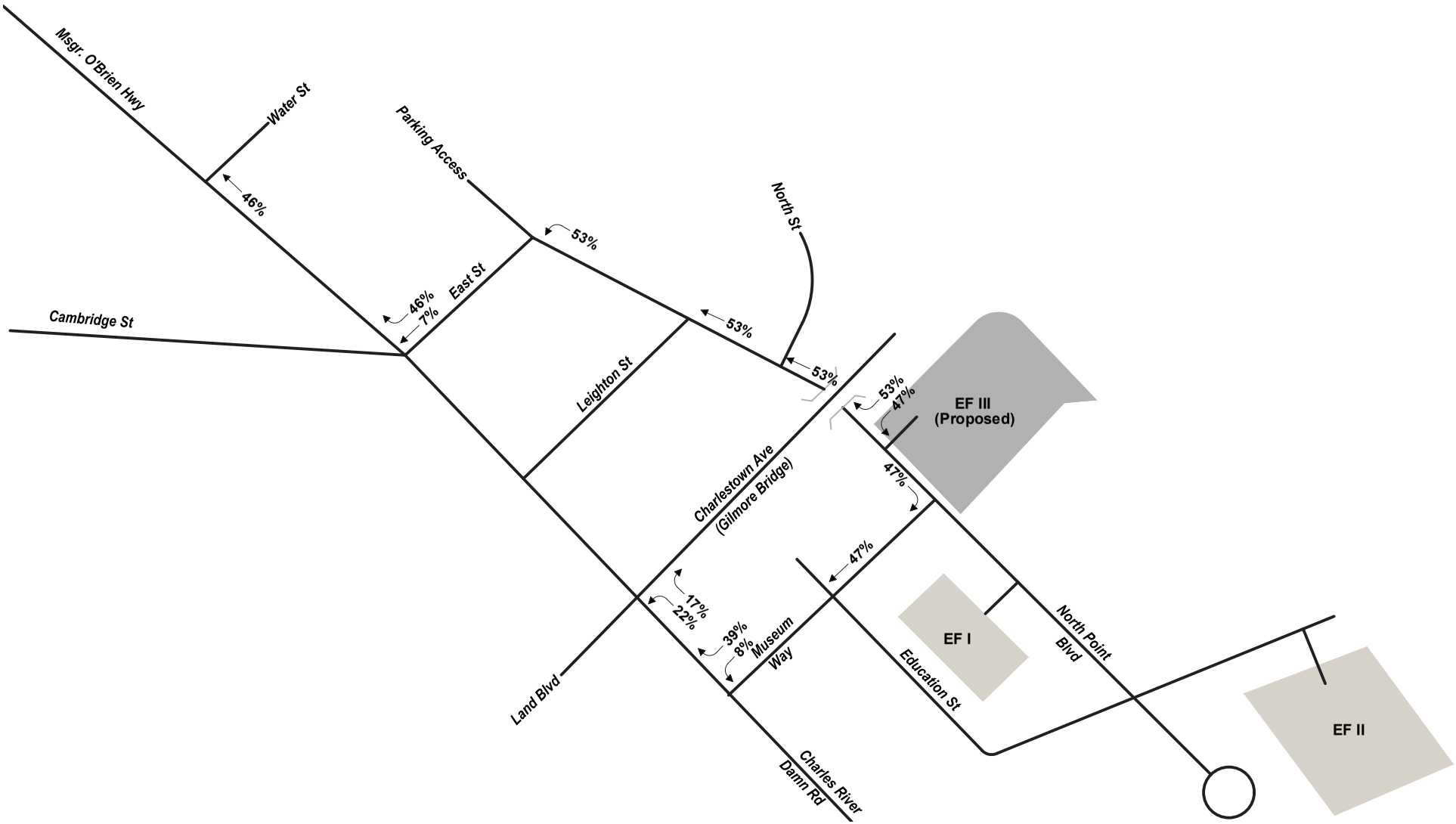


Prepared By: VHB

Figure 3.c.3

Trip Distribution Inbound - Hult
Existing Geometry

EF Education First III TIS
Cambridge, Massachusetts

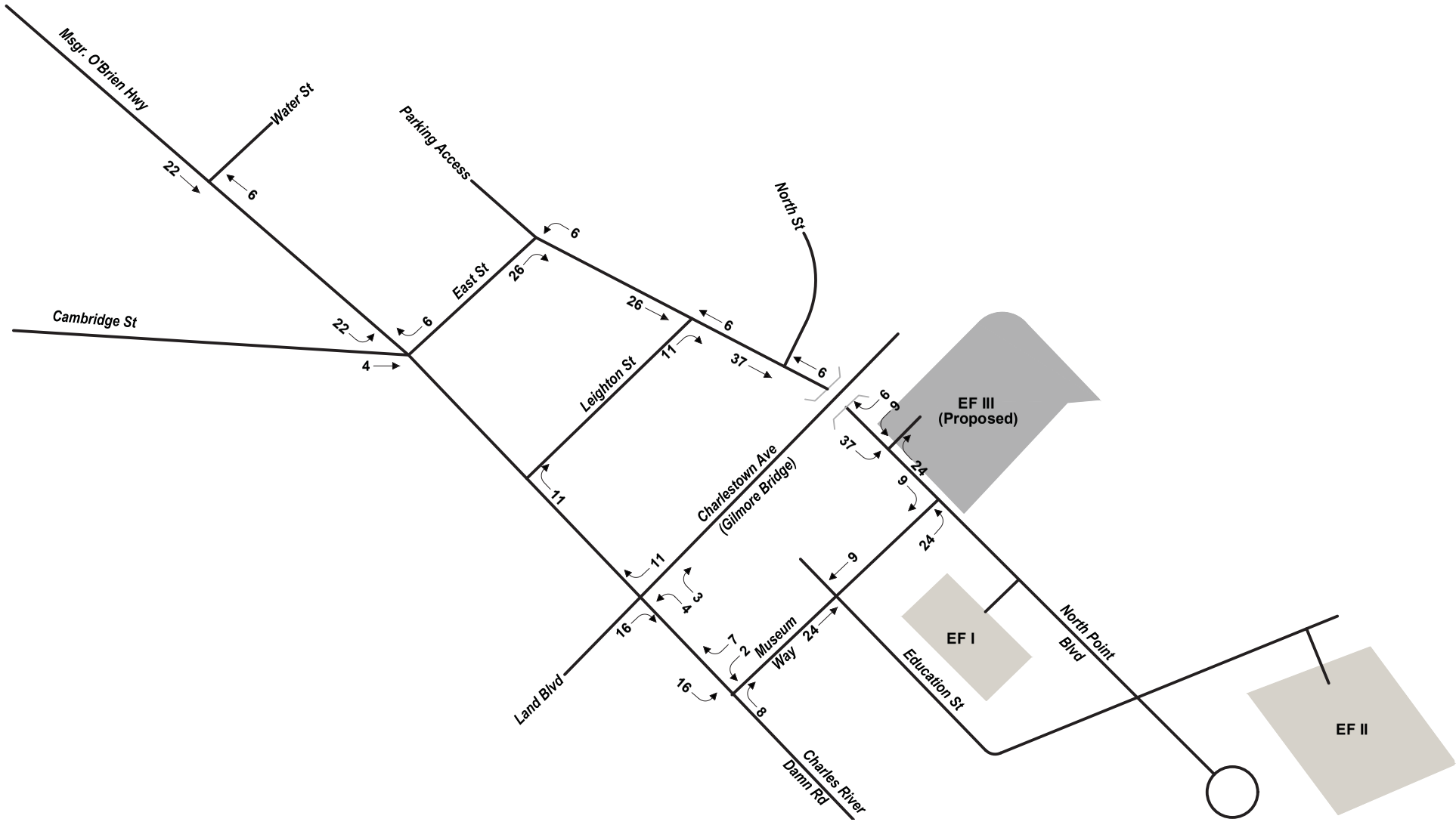


Prepared By: VHB

Figure 3.c.4

Trip Distribution Outbound - Hult
Existing Geometry

EF Education First III TIS
Cambridge, Massachusetts

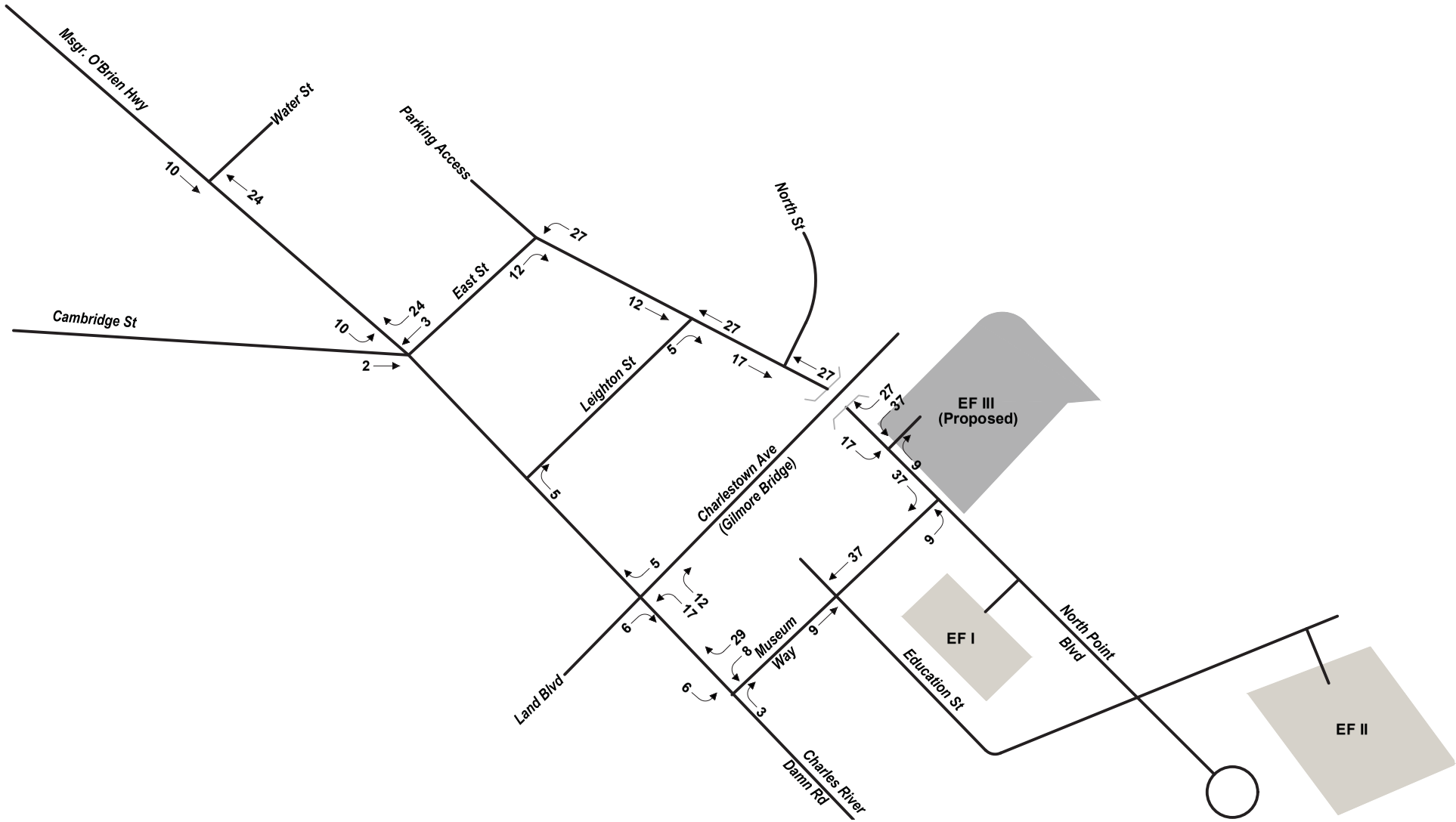


Prepared By: VHB

Figure 3.c.5

Project Generated Trips - Existing Geometry
Morning Peak Hour

EF Education First III TIS
Cambridge, Massachusetts



Prepared By: VHB

Figure 3.c.6

Project Generated Trips - Existing Geometry
Evening Peak Hour

EF Education First III TIS
Cambridge, Massachusetts

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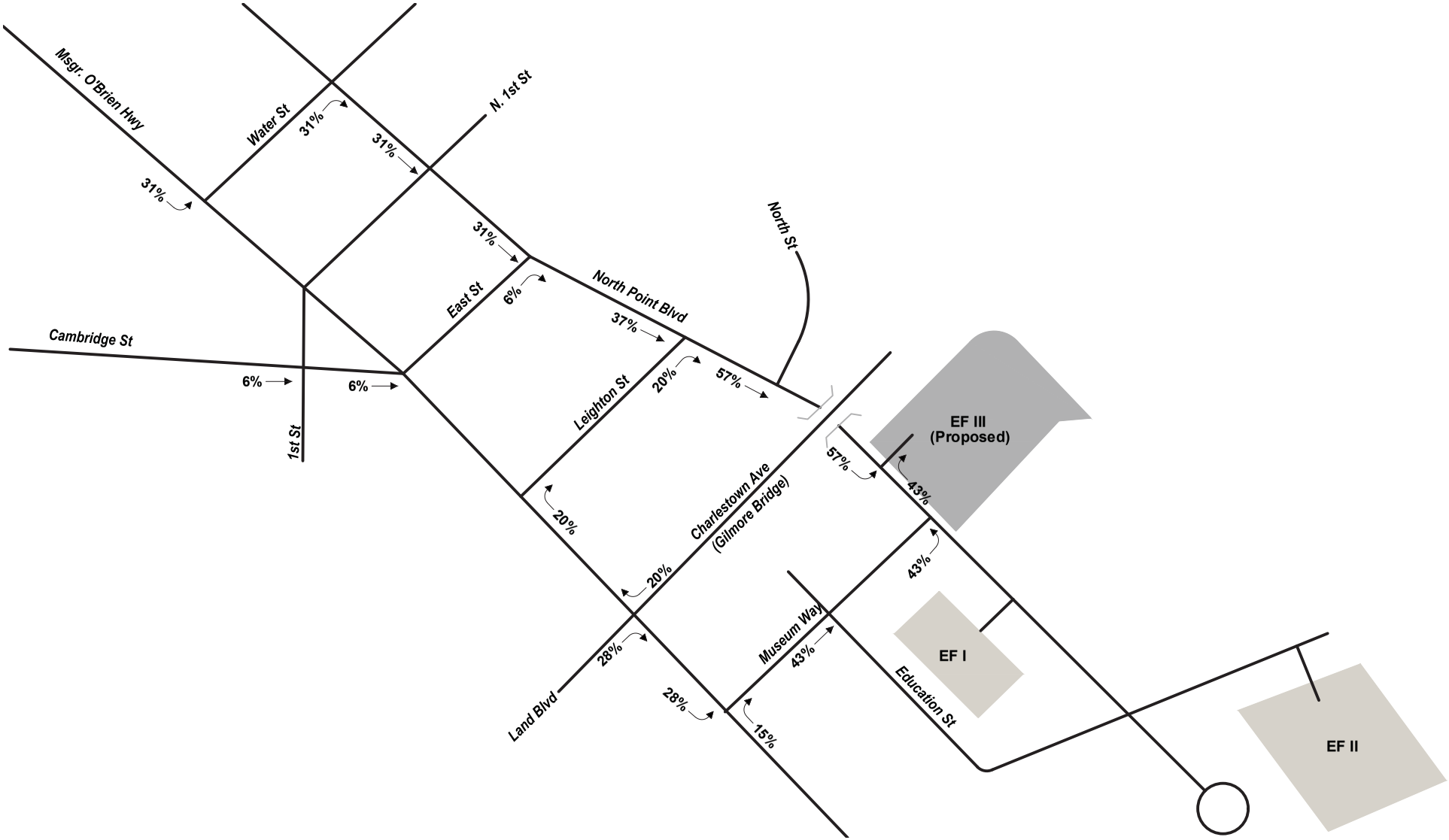

Prepared By: VHB

Figure 3.c.7

Trip Distribution Inbound - Employees
Future Geometry

EF Education First III TIS
Cambridge, Massachusetts

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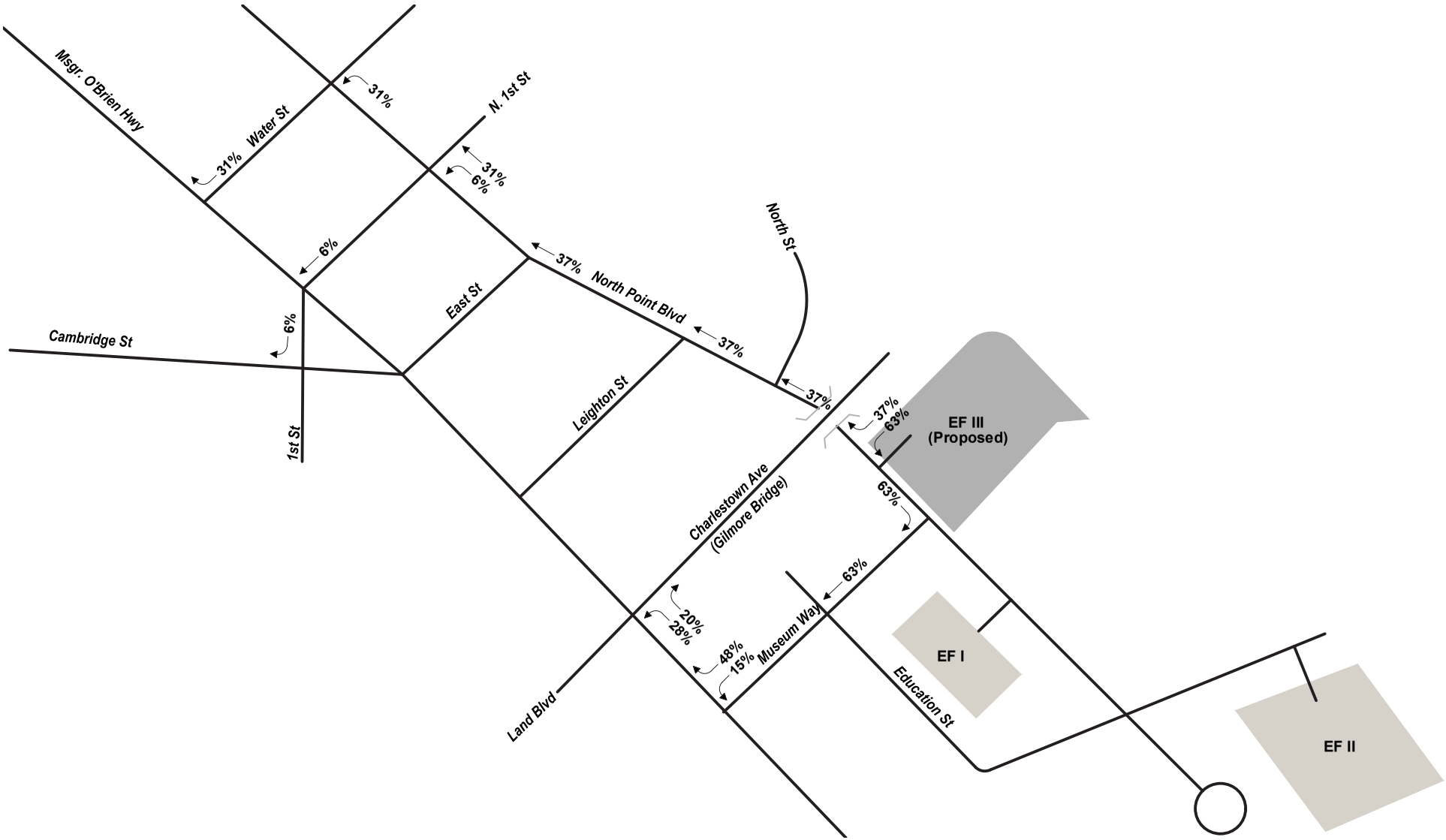

Prepared By: VHB

Figure 3.c.8

Trip Distribution Outbound - Employees
Future Geometry

EF Education First III TIS
Cambridge, Massachusetts

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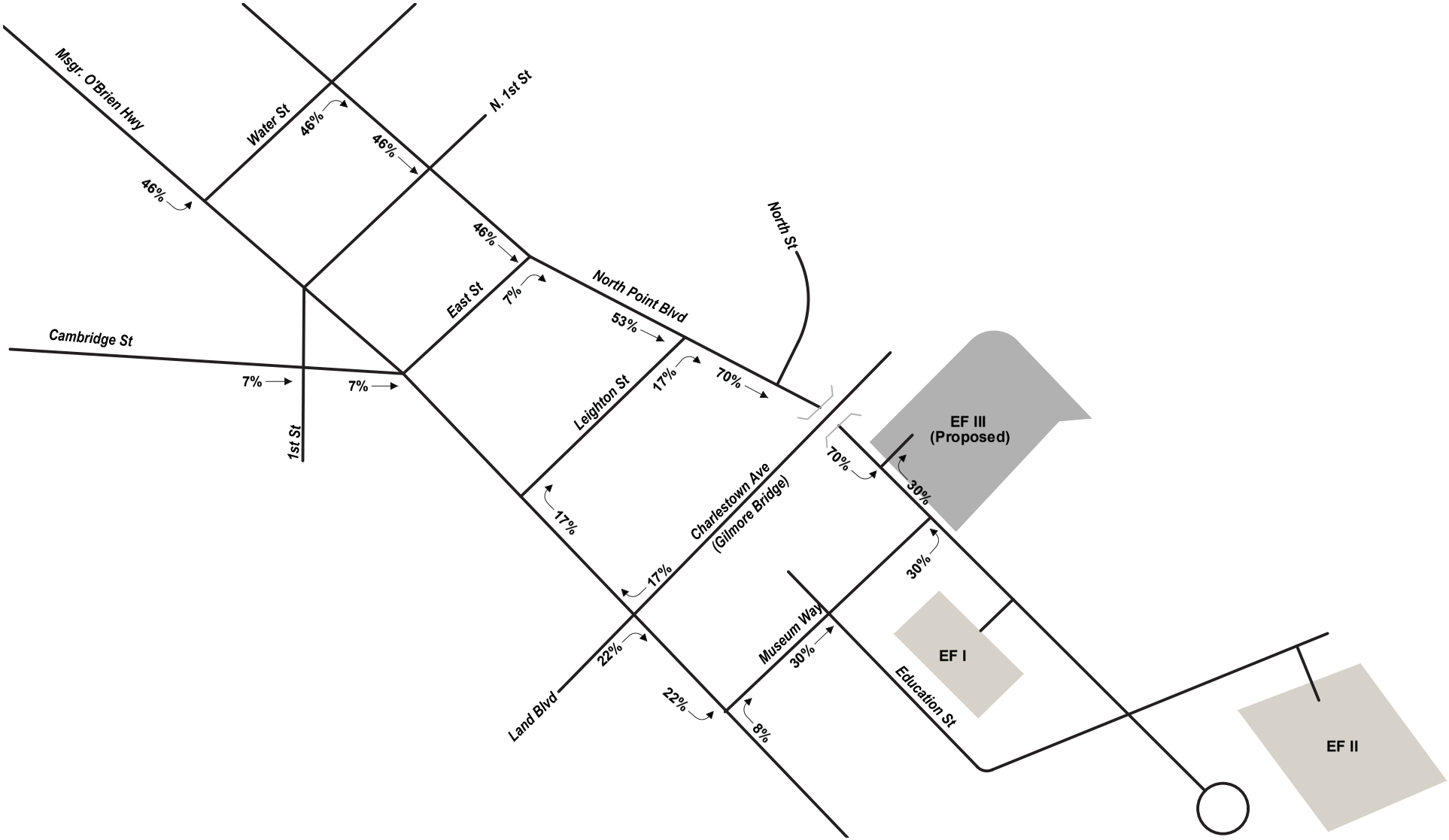

Prepared By: VHB

Figure 3.c.9

Trip Distribution Inbound - Hult
Future Geometry

EF Education First III TIS
Cambridge, Massachusetts

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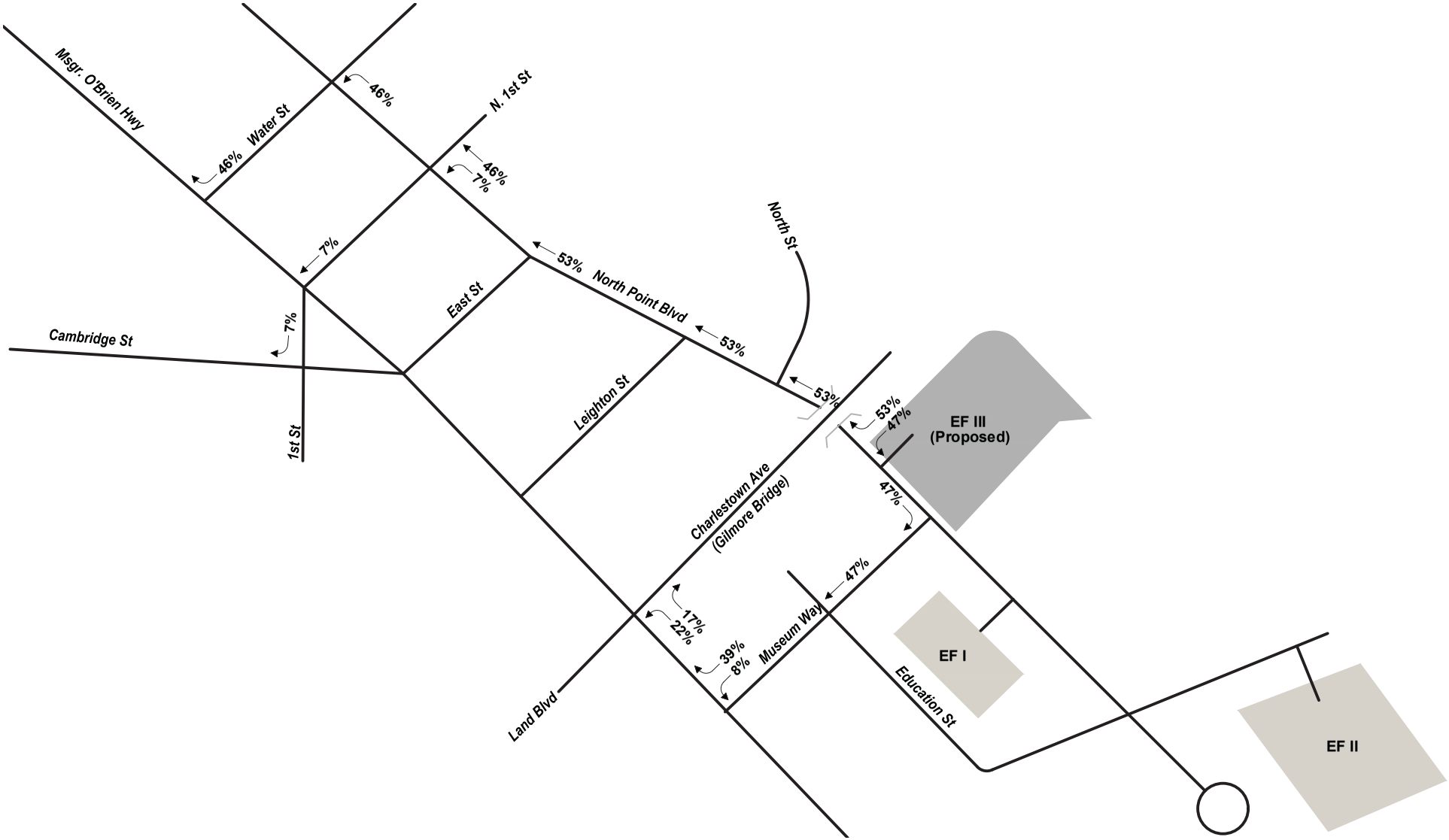

Prepared By: VHB

Figure 3.c.10

Trip Distribution Outbound - Hult
Future Geometry

EF Education First III TIS
Cambridge, Massachusetts

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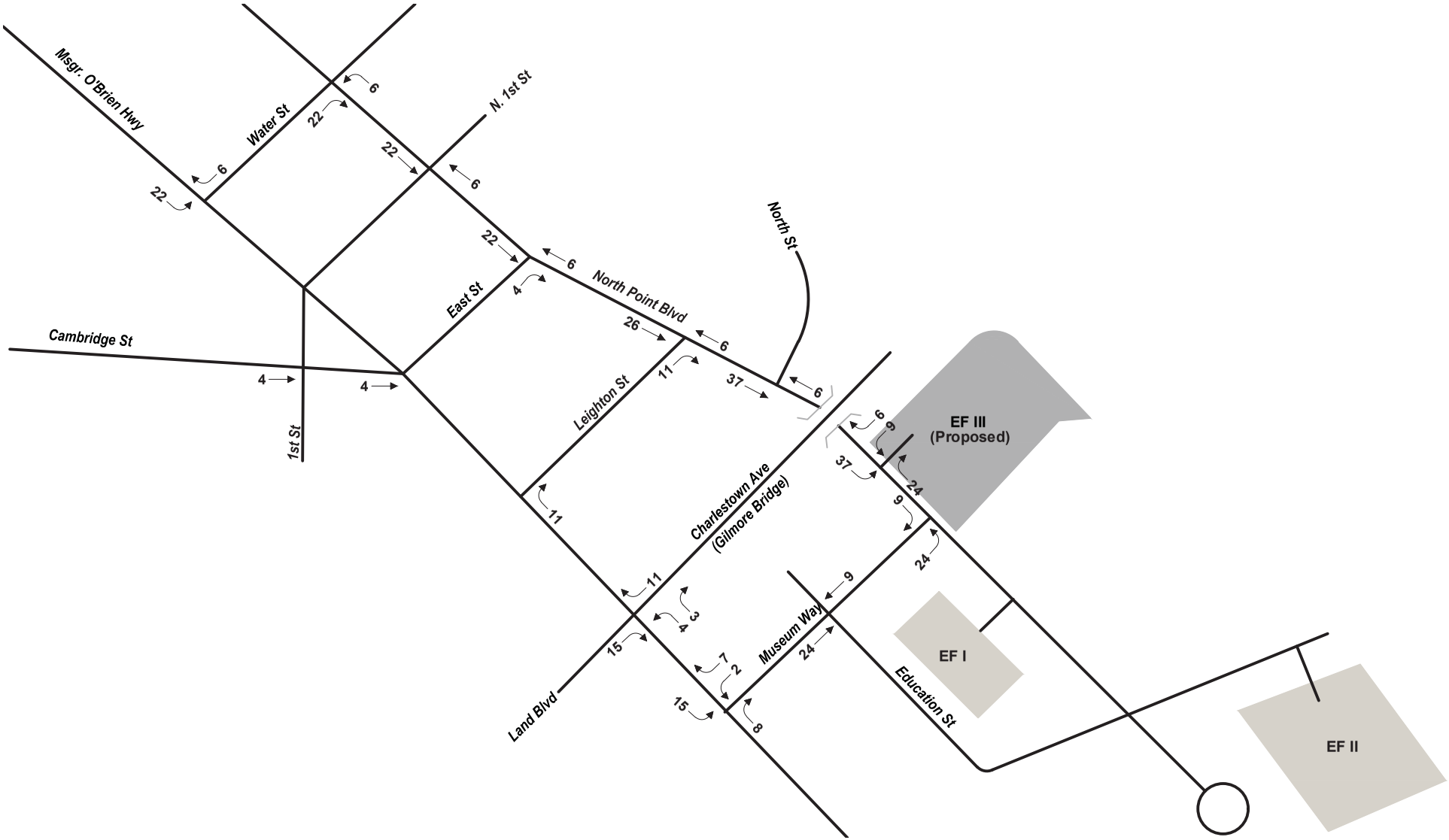

Prepared By: VHB

Figure 3.c.11

Project Generated Trips - Future Geometry
Morning Peak Hour

EF Education First III TIS
Cambridge, Massachusetts

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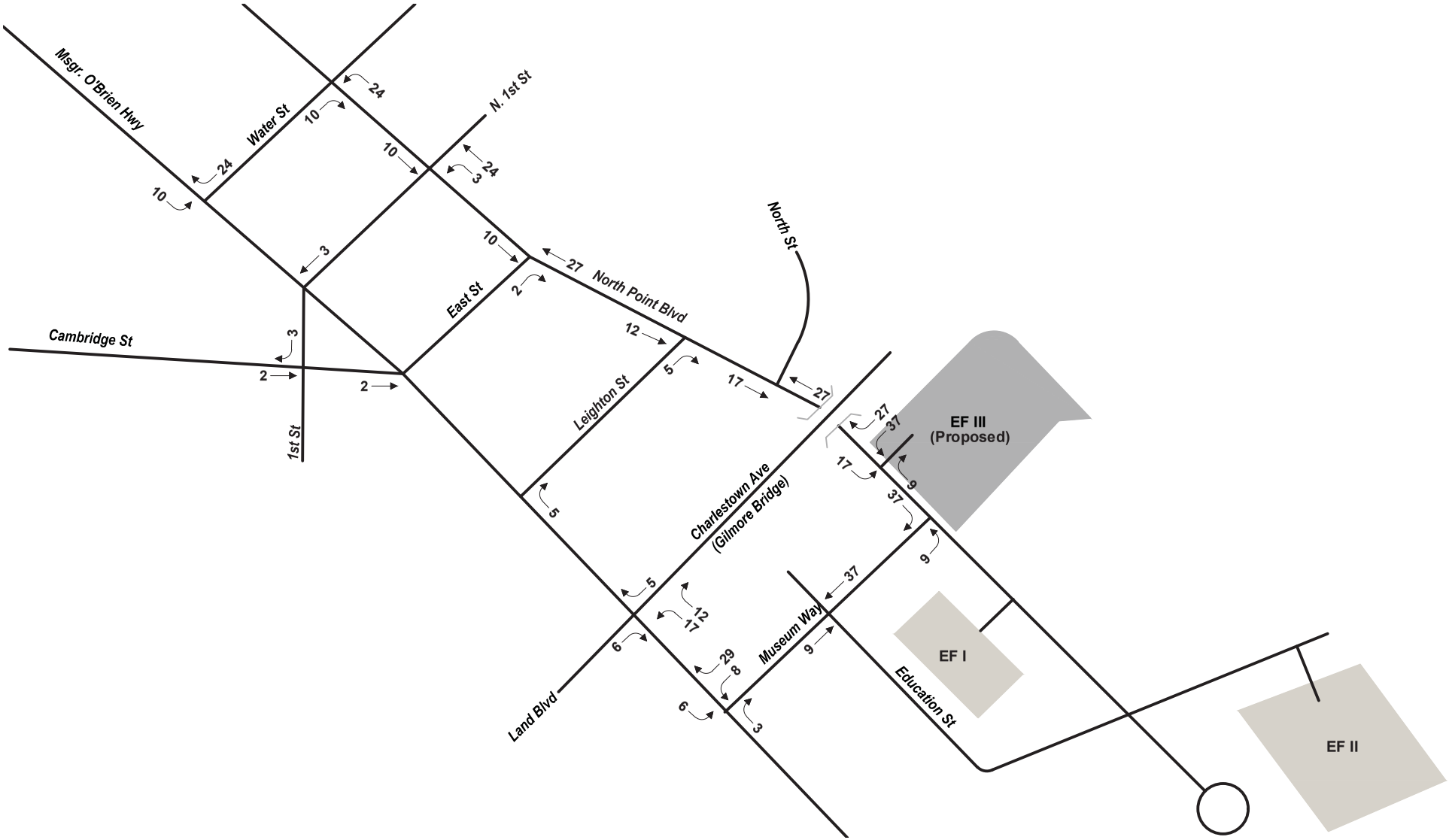
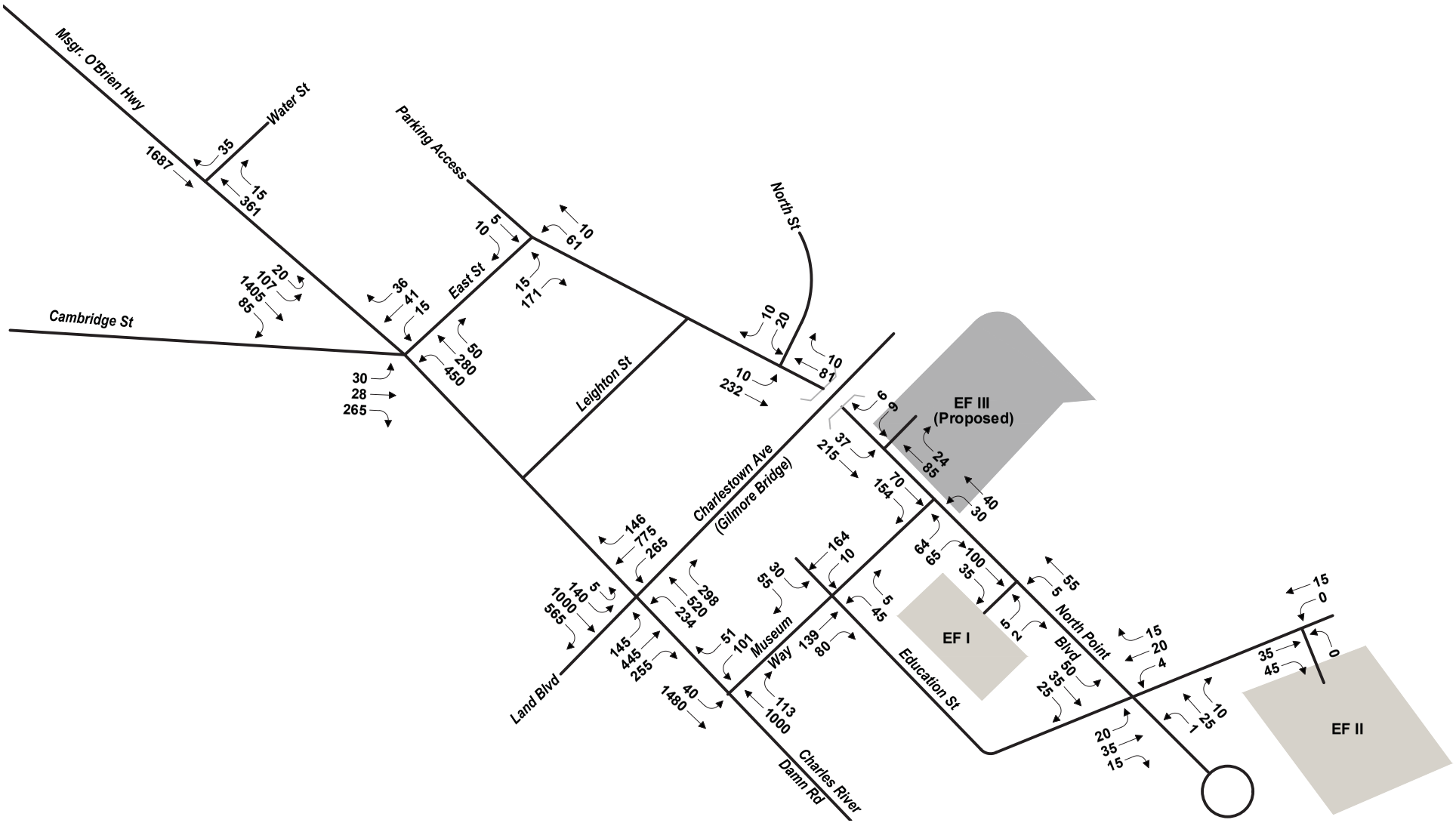


Prepared By: VHB

Figure 3.c.12

Project Generated Trips - Future Geometry
Evening Peak Hour

EF Education First III TIS
Cambridge, Massachusetts

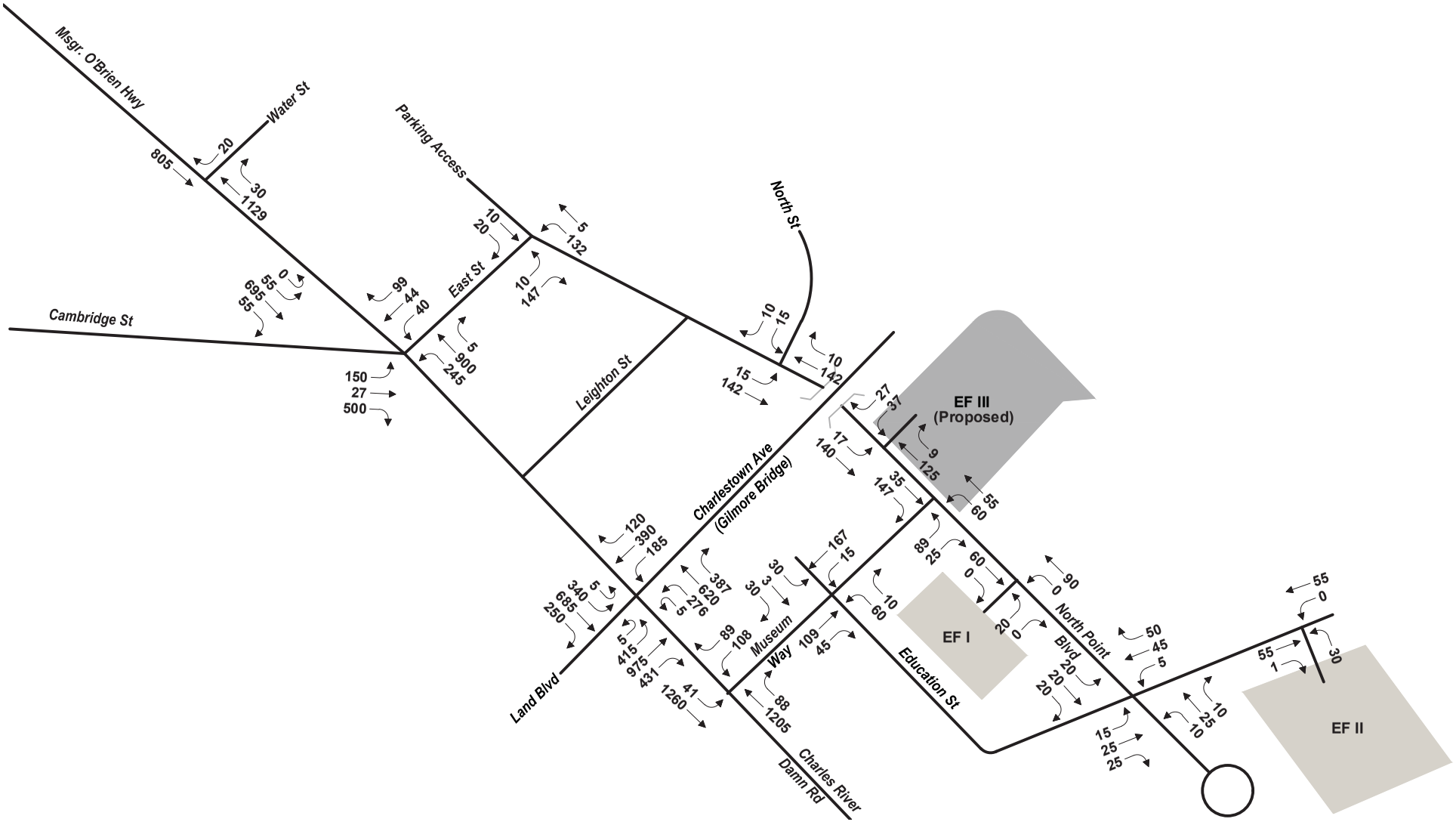


Prepared By: VHB

Figure 5.b.1

2017 Build Conditions - Existing Geometry
Vehicle Volumes Morning Peak Hour

EF Education First III TIS
Cambridge, Massachusetts



Prepared By: VHB

Figure 5.b.2

2017 Build Conditions - Existing Conditions
Vehicle Volumes Evening Peak Hour

EF Education First III TIS
Cambridge, Massachusetts

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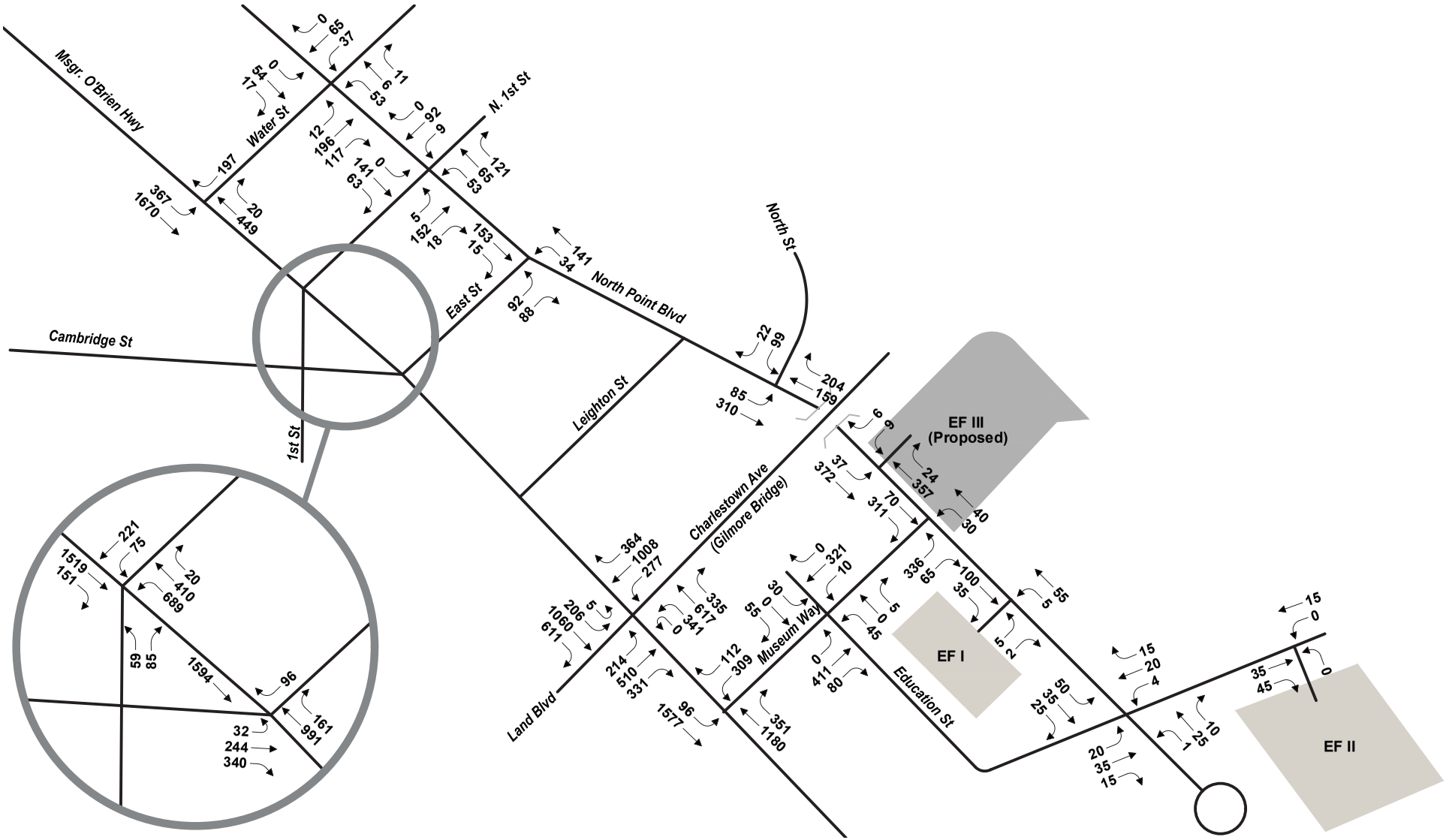

Prepared By: VHB

Figure 5.c.1

2022 Future Conditions - Future Geometry
Vehicle Volumes Morning Peak Hour

EF Education First III TIS
Cambridge, Massachusetts

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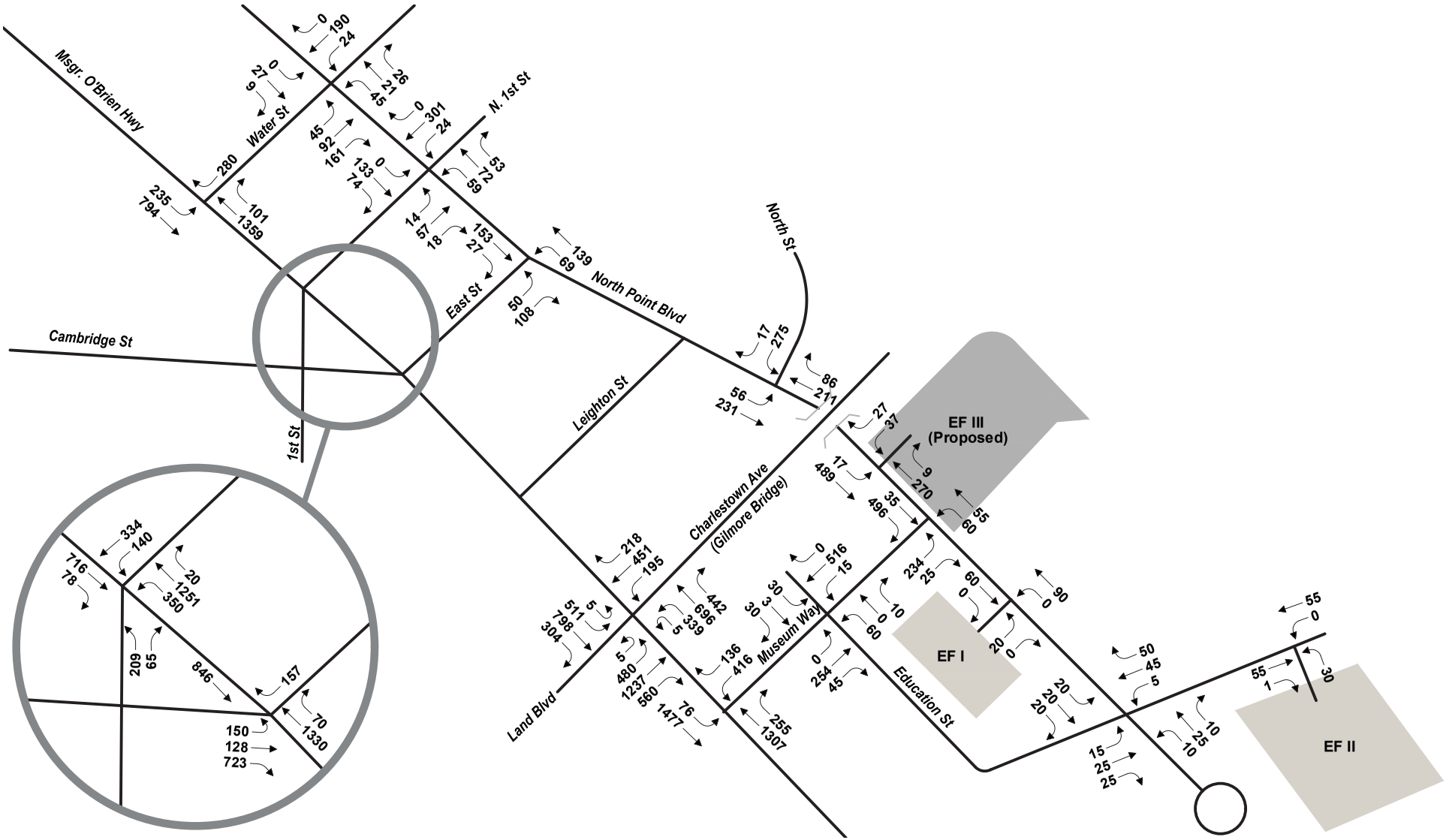
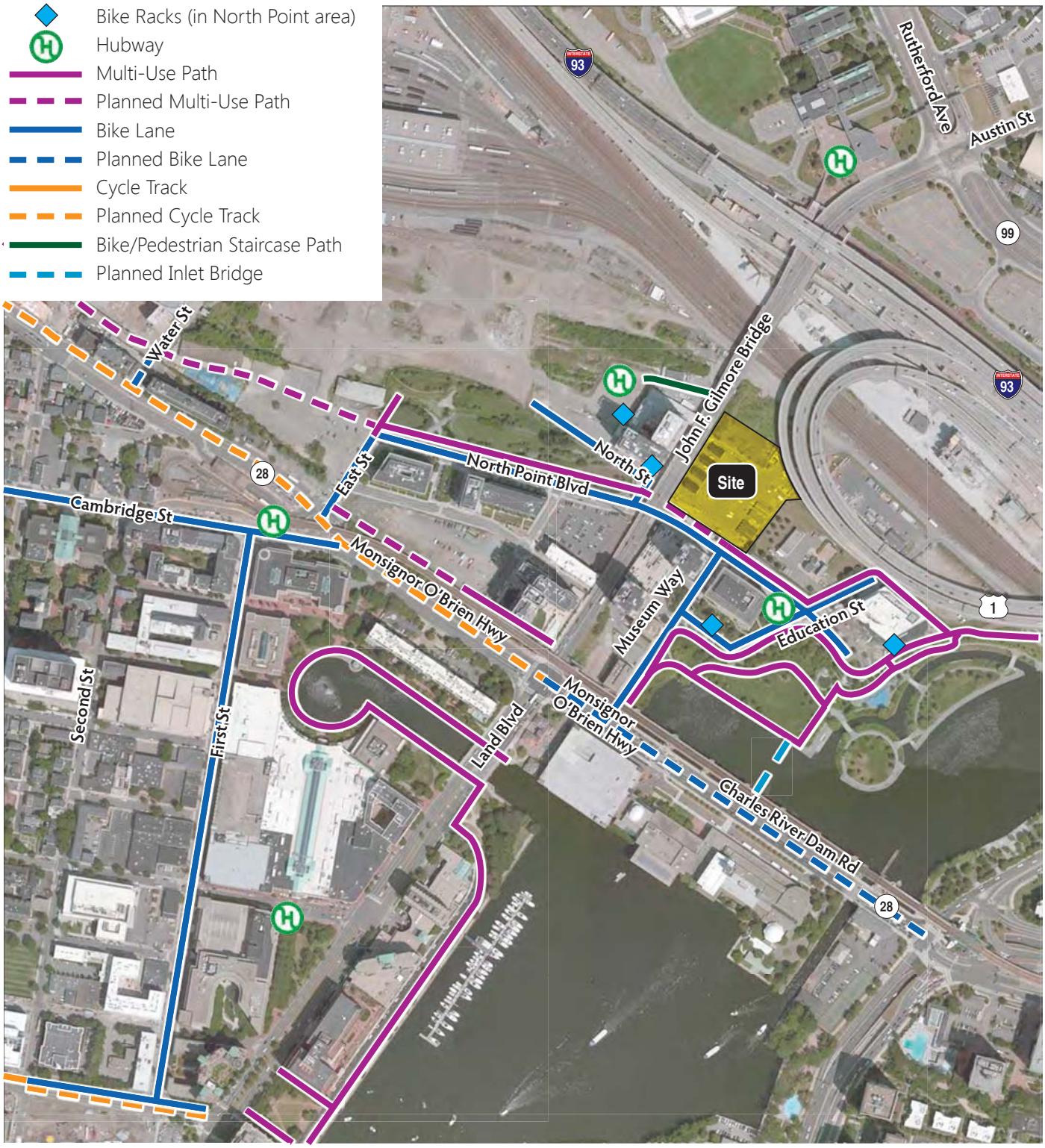


Prepared By: VHB

Figure 5.c.2

2022 Future Conditions - Future Geometry
Vehicle Volumes Evening Peak Hour

EF Education First III TIS
Cambridge, Massachusetts



Source: ArcGIS Online Bing Aerial

Figure 12

Bicycle and Pedestrian Facilities

EF Education First III TIS
Cambridge, Massachusetts

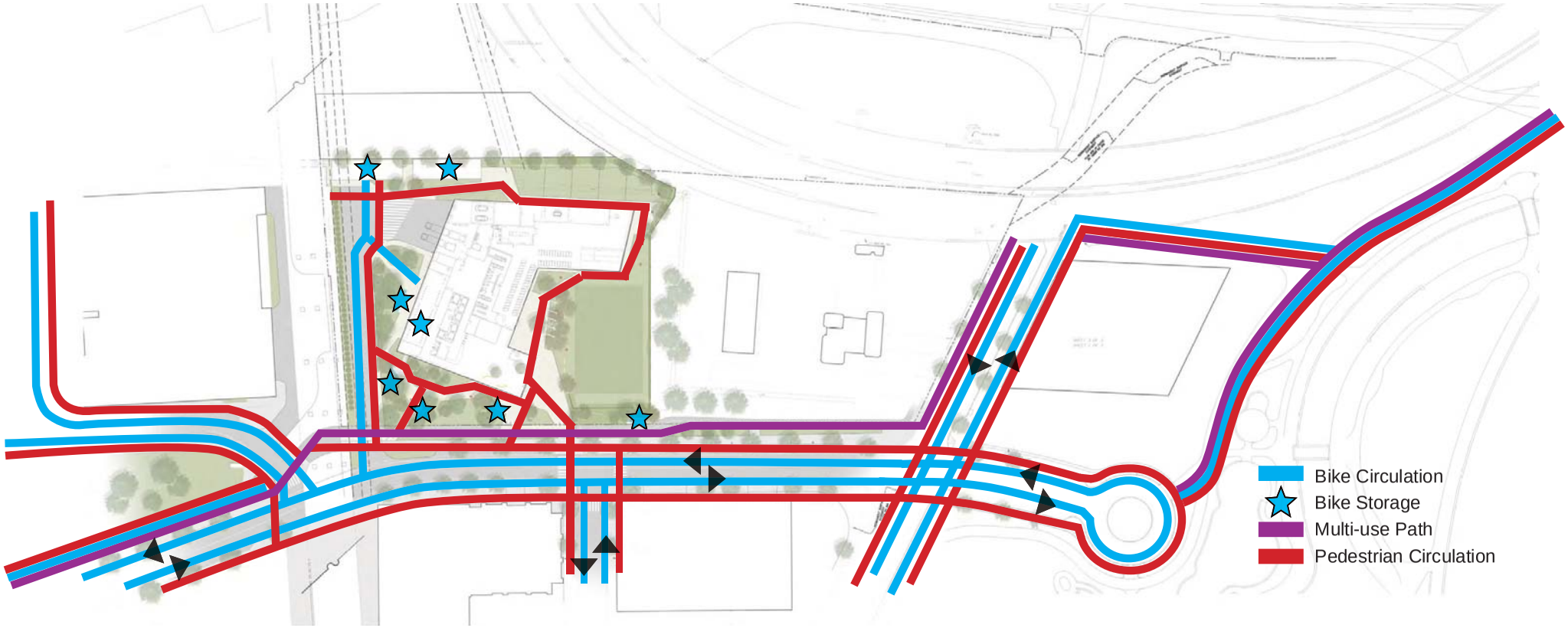


Figure 13

Bicycle, Multi-use Path and Pedestrian Circulation

EF Education First III TIS
Cambridge, Massachusetts

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The Green Engineer, Inc.

Sustainable Design Consulting

Article 22: Green Building Report

Submitted for Review: April 28, 2017

EF III - Education First Expansion Project

Cambridge, MA

Table of Contents

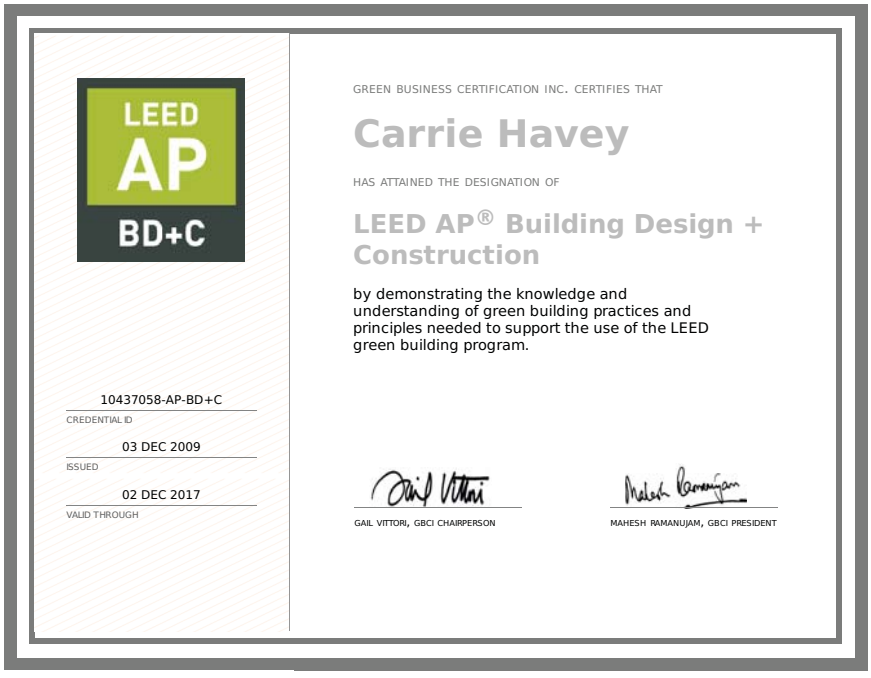
I. PROJECT DESCRIPTION

The EF Education First Expansion Project at North Point is meeting the Design Review Filing application requirement with a LEED Gold certification under the LEED-NC v4 rating system. The project scorecard will develop over the course of design, possible points may be achieved, and any updates to this report will be included in the Building Permit application.

EF III includes the construction of a new approximately 300,000 sf mixed-use building along with related site improvements and public open space on an approximately 2.87-acre site located on North Point Boulevard in Cambridge, MA. The building will be twelve stories and include a publically accessible gym and fitness center, bike room, and a lobby/gathering space.

II. AFFIDAVIT

I, Carrie Havey, do hereby affirm that I have thoroughly reviewed the supporting documents for LEED-NC v4 rating system and confirm that EF III meets the requirement for Gold with **62** points and **24** possible ('maybe') points. EF III in Cambridge, MA has been designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.



Carrie Havey, The Green Engineer, Inc.
LEED Administrator and Sustainability Consultant
Registered 12/03/2009

III. LEEDv4 NC SCORECARD SUMMARY

A. Please refer to the LEED credit summary below and the attached LEED-NC v4 Project Scorecard in Appendix A.

B. The Project anticipates exceeding the Gold Certification threshold of 60 credit points by attempting **62** credit points. Additionally the project has earmarked an additional **24** 'maybe' credit points that require further research; these credits will remain under consideration as the design continues to evolve.

LEED CREDIT SUMMARY	**Yes**	***Maybe***
Integrative Process	1 point	*0 possible points*
Location and Transportation	16 points	*0 possible points*
Sustainable Sites (SS)	6 points	*4 possible points*
Water Efficiency (WE)	9 points	*0 possible points*
Energy & Atmosphere (EA)	11 points	*13 possible points*
Materials & Resources (MR)	3 points	*4 possible point*
Indoor Environmental Quality (EQ)	7 points	*2 possible points*
Innovation in Design (ID)	6 points	*0 possible points*
Regional Priority (RP)	3 points	*1 possible points*
Total Points	**62 points**	***24 possible points***

IV. LEED Credit Narrative

The project meets the LEED-NC v4 Minimum Program Requirements and each of the required Prerequisites.

General Project Information

SITE AND BUILDING AREA	
Total Site Area within the LEED Project Boundary (LPB)	2.87 acres
Total Gross Square Feet[1]	300,000 SF
Building Footprint:	29,874 SF
TRANSPORTATION	
Parking Spaces	115
Bike Racks	264 long-term spaces
	55 short-term spaces
OCCUPANCY (Per LEED BD+C Reference Guide, Core & Shell Appendix 1)	
FTEs	300
Residential	500
Visitors	200 average daily

A. Integrative Process (IP)

IP Credit 1 Integrative Process 1 credit point

The project will meet the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings were held early and will be ongoing throughout the design process to assist the team in establishing shared sustainable design and energy efficiency goals for the project. Early design

phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. A water use analysis was conducted to aid in establishing water use reduction targets.

B. Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 1 credit point

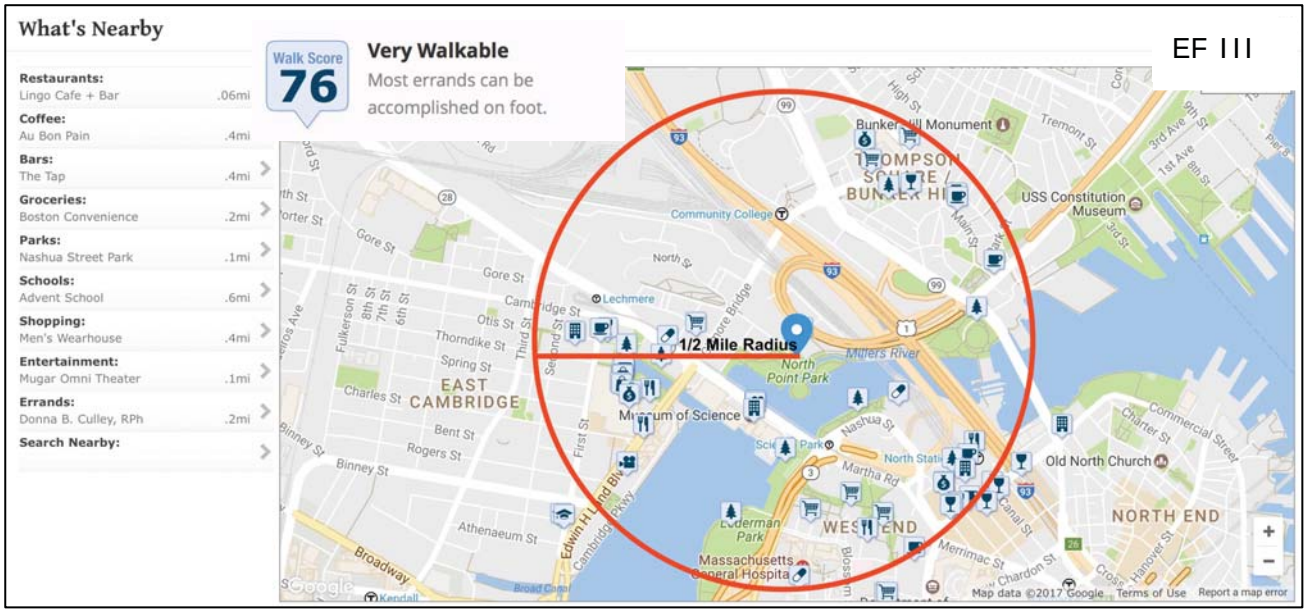
The project will meet the credit requirements by locating the building on land that has been previously developed.

LT Credit 3 High Priority Site — 2 credit points

Contaminated soil found onsite will be appropriately remediated. Testing and required remediation will be conducted in conjunction with the construction phase. The contaminants of concern include polynuclear aromatic hydrocarbons, metals, and petroleum constituents, as well as asbestos fibers in soil. With the exception of asbestos, these contaminants are typically encountered in urban areas that have been filled and where commercial and/or industrial activities took place.

LT Credit 4 Surrounding Density and Diverse Uses — 5 credit points

The project will meet Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. Additionally, the project will meet Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 8 publically available diverse uses in at least three separate use categories.



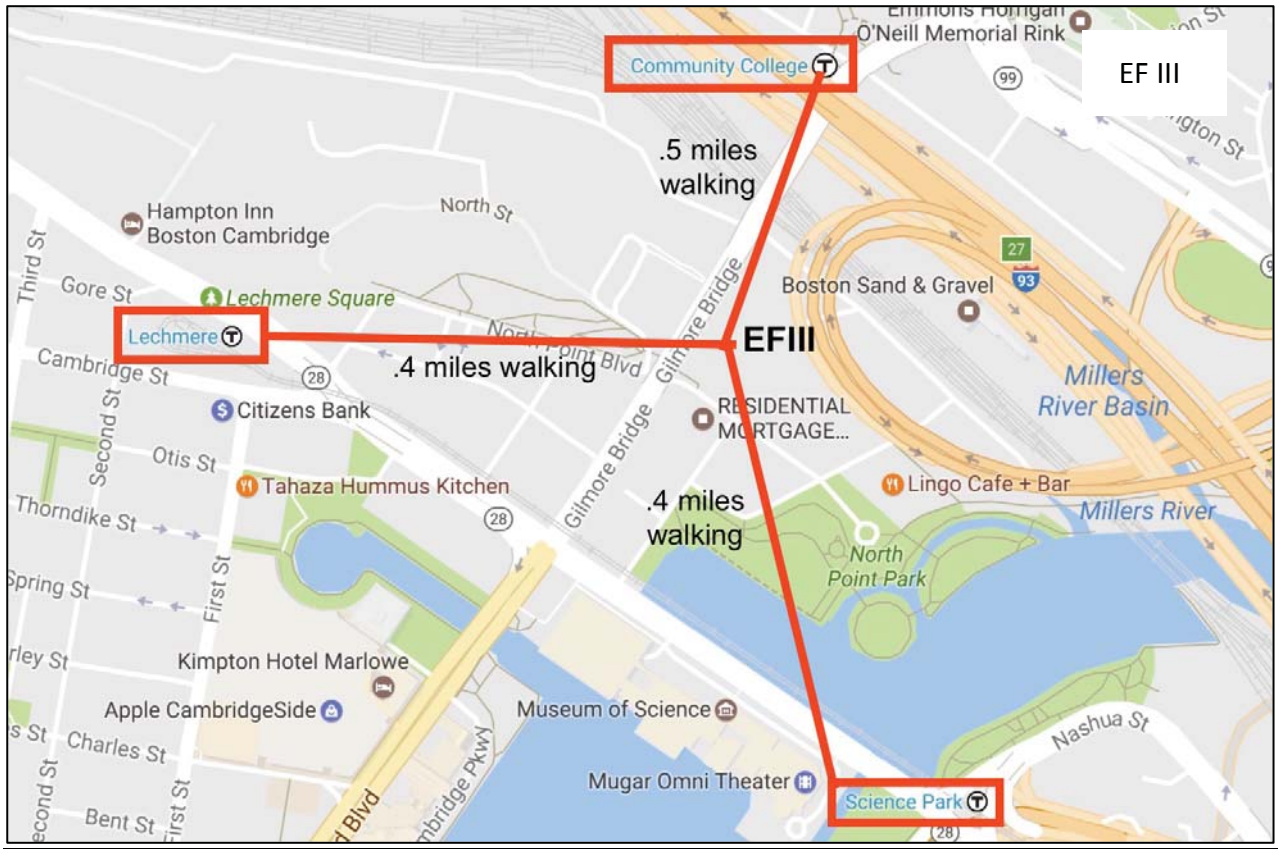
The project is located within ½ mile of the following 8 diverse uses:

Use Category	Use Type	Use Name
Community Serving Retail	Other retail	TJ Maxx

Community Serving Retail	Convenience Store	Boston Convenience
Services	Restaurant	Tahaza Hummus Kitchen
Services	Bank	Citizens Bank
Services	Restaurant	Sorelle Bakery Cafe
Civic Community Services	Cultural arts facility	Museum of Science
Civic and Community Facilities	Public park	Lechmere Canal Park
Civic and Community Facilities	Public park	North Point Park

LT Credit 5 Access to Quality Transit 5 credit points

The project is within half-mile walking distance of three MBTA stations: Lechmere station, Science Park station, and the Community College station. In addition, it is within ¼ mile of the EZ Ride bus line.



LT Credit 6 Bicycle Facilities 1 credit point

Exterior short-term and covered long-term bicycle storage is planned for visitors and regular occupants of the project. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access.

Based on the current design, Cambridge zoning requires that the number of spaces provided on the project be up to a total of 264 long-term bike spaces and 55 short-term bike parking spaces within 100 feet of the main building entrance. In addition to the bike racks, the project is planning to provide 14 showers with changing facilities on the first floor, along with showers in each dorm room. LEED requires 3 showers and changing rooms for full time employees.

EF III		
Bike Rack Spaces:	Short-Term (within 100' of the building)	Long-Term (inside the building)
2.5% of peak visitors	5	0
5% of FTEs	0	15
30% of all students (residents)	0	150
TOTAL REQUIRED	5	165

LT Credit 7 Reduced Parking Footprint 1 credit point

The project will have a total of 115 parking spaces (on level 2 and level 3 of the building). In addition to not exceeding minimum local zoning regulation, the total parking capacity demonstrates at least a 40% reduction below the base ratios recommended by the Parking Consultants Council. The project is planning to provide preferred carpool parking for at least 6 spaces (5% of the total parking capacity).

LT Credit 8 Green Vehicles 1 credit point

115 parking spaces will be provided for the project. In addition, the following will be provided:

1. 6 LEFE spaces (5% of total parking capacity) located in preferred locations throughout the parking area.
2. 3 electric vehicle charging stations

EF III			
Parking Spaces	5% LEFE	2% EVCS	5% Carpool
115	6	3	6

C. Sustainable Sites (SS)

SS Prerequisite 1: Construction Activity Pollution Prevention Required

The construction manager will be required to submit and implement an appropriate SWPPP/Erosion and Sedimentation Control (ESC) Plan for construction activities related to the construction of the project. The ESC Plan will conform to the erosion and sedimentation requirements of the applicable NPDES regulations and specific municipal requirements for the City of Cambridge. Additionally, the ESC Plan will address management and containment of dust and particulate matter generated by on site demolition and construction activities. Civil design drawings will include measures for the implementation of the ESC plan.

SS Credit 1: Site Assessment 1 credit point

A comprehensive site assessment was completed as part of the MEPA filing of the Environmental Impact Report. The design team will continue to study topography, hydrology,

climate, vegetation, soils, human use, and human health effects specific to the EF III project site to inform the design.

SS Credit 2: Site Development - Protect or Restore Habitat — 1 maybe point

The project plans include native and drought tolerant plants. The project team is evaluating whether the project will meet the requirement to restore 30% of all portions of the site identified as previously developed.

SS Credit 3 Open Space — 1 maybe point

The design of the site will have significant open space areas and an emphasis on stormwater quantity and quality control. Open space areas will be public and have views of the Charles River and North Point Park. Calculations have not yet been done to determine if at least 25% of the open space being provided will be vegetated with plants materials other than natural turf grass, as required for this credit.

SS Credit 4 Rainwater Management — 2 credit points

The project will implement a stormwater management plan that decreases the volume of stormwater runoff and that captures and treats runoff using acceptable best management practices (BMP's). The project is being designed to manage runoff to meet the 95th percentile of local rainfall events.

A combination of natural and structural BMP measures may be designed for the site. Rainwater control measures will be investigated, engineered and refined as the project continues with the design process.

The Project will reduce the peak rate and total volume of runoff for the 25-year design storm in the post-development condition to meet the two-year predevelopment condition, as required by Cambridge Department of Public Works (CDPW). The Project will maximize infiltration to the ground to the greatest extent practicable, replace impervious cover with absorptive landscaped areas, and explore the use of rainwater capture for use within the building. Landscaping will also be designed to minimize required irrigation, potentially sharing rainwater capture for irrigation use during times of drought.

SS Credit 5 Heat Island Reduction — 2 credit points

The roof and non-roof hardscape materials will include light-colored surfaces to reduce the overall heat island effect impact on the project site. The roof membrane will be a high albedo roof product with an initial SRI value of 82 at a minimum. In addition, there will be a roof terrace covered with light colored pavers and plantings. Trees and plantings around the site will provide shade. Paving materials will target an initial SR value of 33 minimum. In addition, all parking will be under cover inside the building.

SS Credit 6 Light Pollution Reduction — 1 credit point

The project plans to meet uplight and light trespass requirements by complying with the LEED v4 BUG Rating method. The project site is classified under Lighting Zone 3 as per the Illuminating Engineering Society and International Darky Sky Association (IES/IDA) Model Lighting Ordinance User Guide. To meet credit requirements, the site lighting will not exceed the LEEDv4 allowable luminaire backlight, uplight and glare ratings for this lighting zone.

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required

Through the use of native/adaptive plant species selection and optimized irrigation system efficiency, the project's landscape water requirement (as calculated by the EPA WaterSense Water Budget Tool) will be reduced by at least 30% from the calculated baseline for the site's peak watering month.

WE Prerequisite 1 Water Use Reduction, 20% Reduction Required

Through the specification of low flush and flow and high efficiency plumbing fixtures, the project will reduce potable water consumption by at least 20% over the baseline calculated for the building (not including irrigation). In addition, all newly installed toilets, urinals, private lavatory faucets, and showerheads that are eligible for labeling will be WaterSense. Preliminary water use calculations are provided below.

Flush Fixture Type	**Baseline GPF**	**Design GPF**	**Uses/ Day**	**Baseline Annual Use (kGallons)**	**Design Annual Use (kGallons)**	**% Savings**
Water Closet	1.6gpf	1.1gpf	4230			
Urinal	1.0gpf	.125gpf	270			
Sub-TOTAL annual water savings				**2,569**	**1,710.5**	**33.5%**
Flow Fixture Type	**Baseline GPM/GPC**	**Design GPM/GPC**	**Uses/ Day**	**Baseline Annual Use/kGallons**	**Design Annual Use/kGallons**	**% Savings**
Public Lavatory	.5gpm	0.35gpm	1,000			
Shower for FTEs	2.5gpm	1.5gpm	300			
Kitchen Sink for FTEs	2.2gpm	1.5gpm	30			
Private Lavatory	2.5gpm	1gpm	2,500			
Residential Shower	2.5gpm	1.5gpm	500			
Residential Kitchen Sink	2.5gpm	1gpm	2,000			
Sub-TOTAL annual water savings				**7,552**	**4,019.5**	**47%**
TOTAL annual water savings				**10,121**	**5,730**	**43.38%**

WE Prerequisite 3 Building Level Water Metering Required

The project will meet the requirements of this prerequisite by installing permanent water meters that measure the total potable water use for the building and associated grounds. In addition to installing the meters, the project will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the project accepts LEED certification or typical occupancy, whichever comes first.

WE Credit 1 Outdoor Water Use Reduction 50% 2 credit points

The landscape design will incorporate native and adaptive plantings and will not use any potable water for irrigation.

WE Credit 2 Indoor Water Use Reduction 4 credit points

Through the specification of low flow and high efficiency plumbing fixtures, the project will implement water use reduction strategies that target 43% less potable water use annually when compared to EPA baseline fixtures for the building (not including irrigation). (Refer to the summary water use calculations provided under WE Prerequisite 1 above.)

WE Credit 3 Cooling Tower Water Use 2 credit points

The project will conduct a one-time potable water analysis for the cooling tower water and calculate the cycles of concentration. Through increasing the level of treatment in the make-up and/or condenser water, the project will achieve a minimum of 10 cycles of concentration before any of the parameters analyzed exceed their maximum allowable levels of concentration. The control parameters that are required to be assessed are: Ca, total alkalinity, SiO_2, Ci, and conductivity.

WE Credit 4 Water Metering 1 credit point

The project is planning to install permanent water meters for at least two of the following water subsystems: irrigation, indoor plumbing fixtures and fittings, domestic hot water, boilers with a projected annual use of 100,000 gallons or more than 500,000 BtuH, reclaimed water, or other process water.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required

A third party Commissioning Agent, (CxA) will be engaged by the owner for purposes of providing fundamental commissioning services for the building energy related systems including HVAC, lighting, domestic hot water systems and building envelope. The CxA will be required to perform the scope of work required to comply with the prerequisite in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC & R systems. Owner's Project Requirements (OPR) and Basis of Design (BOD) documents will be developed.

EA Prerequisite 2 Minimum Energy Performance Required

To meet the prerequisite, the building performance rating will demonstrate at a minimum, a 5% improvement in energy use by cost when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. A whole building design energy model will demonstrate the expected performance rating of the designed building systems. The project will also meet the 9th Edition of the MA Energy Code and stretch code requirements.

These requirements are met by the selection of efficient building mechanical systems and a high performance envelope. The proposed design incorporates a large number of energy efficiency measures including 4-Pipe fan coil units for apartment/dormitory areas, several VAV units serving common areas, and an Energy Recovery Unit (ERU) which supplies 16,000 cfm of ventilation air to the corridor areas in the dorm/apartment floors. These units are supplied with chilled water from (2) water-cooled centrifugal chillers with VFD operation, and are supplied with hot water from (2) condensing, gas-fired hot water boils.

EA Prerequisite 3 Building Level Energy Metering Required

To meet the requirements of this prerequisite, the project will install whole building energy meters for gas and electricity used by the project.

EA Prerequisite 4 Fundamental Refrigerant Management Required
CFC based refrigerants will not be used in the building HVAC & R systems.

EA Credit 1 Enhanced Commissioning 6 credit points
In addition to EAp1 Fundamental Commissioning and Verification requirements, enhanced, monitor-based, and envelope commissioning will be pursued. The building owner will be hiring a Commissioning Agent during the design phase to review the proposed design and ultimately confirm the building systems are installed and function as intended and desired.

Enhanced commissioning scope will include reviewing the owner's project requirements, and the basis of design, creating, distributing and implementing a commissioning plan, performing a design review of the project documents, witnessing on-site installations and testing and performing commissioning of installed HVAC, lighting, lighting controls and domestic hot water systems. In addition to the mechanical and electrical systems, fundamental and enhanced commissioning requirements will apply to the buildings thermal envelope. Monitor-based procedures measure and evaluate the performance of the energy and water consuming systems.

EA Credit 2 Optimize Energy Performance 5 credit points, 7 maybe points
Based on current design, preliminary energy model results indicate the project is meeting a 14% energy cost savings, or five (5) points, under LEED v4 (ASHRAE 90.1-2010).

EA Credit 5 Renewable Energy Production 3 maybe points
The project team is still evaluating on-site renewable/clean energy opportunities.

EA Credit 6 Enhanced Refrigerant Management 1 maybe point
The HVAC equipment installed in the building will use refrigerants that have low global warming and ozone depletion potential. Calculations need to be performed to confirm credit achievement.

EA Credit 7 Green Power and Carbon Offsets 2 maybe points
Education First will investigate the purchase of RECs and carbon offsets through a 5-year contract to offset a minimum of 50% of the building's energy use with renewable sources.

F. Materials and Resources (MR)

MR Prerequisite 1 Storage and Collection of Recyclables Required
Storage of collected recyclables will be accommodated on the ground floor of the project in a designated recycling area. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and disposal of two of the following: batteries, mercury-containing lamps, and electronic waste. In addition, there will be a recycling collection area on each dormitory floor. A contracted waste management company will collect the recyclables on a regular basis.

MR Prerequisite 2 Construction and Demolition Waste Management Planning Required
The project will meet the requirements of this prerequisite by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the project will include at least five materials (both structural and nonstructural) targeted for diversion.

MR Credit 1 Building Life Cycle Impact Reduction 3 maybe points

The project team is considering pursing a whole-building life-cycle assessment. To meet LEED requirements, the life-cycle assessment of the project's structure and enclosure must demonstrate a minimum of 10% reduction, compared with a baseline building, in at least three of the six impact categories, one of which must be global warming potential. The six impact categories are: global warming potential, depletion of the stratospheric ozone layer, acidification, eutrophication, formation of tropospheric ozone and depletion of nonrenewable energy resources.

MR Credit 2 Building Product Disclosure and Optimization: Environmental Product Declaration 1 credit point

The project will attempt this credit via Option 1. The technical specifications will include direction for the construction manager and their sub-contractors to provide and submit materials and products Environmental Product Declarations that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope. The project will work to provide documentation for 20 different permanently installed products sourced from at least five different manufacturers.

MR Credit 4 Building Product Disclosure and Optimization: Material Ingredients 1 maybe point

The project will attempt this credit via Option 1. The project manual will include the information and direction for the construction manager and their sub-contractors to provide and submit materials and products documentation identifying the chemical make-up. The documentation may be the manufacturer's inventory, Health Product Declarations or Cradle-to-Cradle certification.

MR Credit 5 Construction and Demolition Waste Management 2 credit points

The project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to divert a minimum of 75% of the demolition and construction waste generated on site from area landfills. Diverted material must specifically include at least four different material streams.

G. Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required

The building mechanical systems will be designed to meet or exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7 and/or applicable building codes. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance. Outdoor airflow monitors will be included in the project and there will be carbon monoxide monitors on each floor.

IEQ Prerequisite 2 Environmental Tobacco Smoke (ETS) Control Required

Smoking is prohibited in the building and within 25' of the building. Signage will be posted to indicate the interior and exterior no-smoking policy.

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 2 credit points

The project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas and compliant filtration media. Additionally, the project will include C02 monitoring in all densely occupied spaces.

IEQ Credit 2 Low Emitting Materials 1 credit point

The project will attempt this credit by meeting the compliance criteria for a minimum of two of the possible six compliant categories: interior paints and coatings; interior adhesives and sealants; flooring; composite wood; ceilings, walls, thermal and acoustic insulation; furniture.

IEQ Credit 3 Construction Indoor Air Quality Management Plan 1 credit point

The project manual will include direction for the Construction Manager to develop and implement an Indoor Air Quality Management plan in compliance with applicable control measures as stated in the SMACNA IAQ Guidelines for Occupied Buildings under construction 2nd Edition, 2007 ANSI/SMACNA 008-2008 Chapter 3. Additional measures will be implemented to ensure absorptive materials will be protected from moisture damage.

IEQ Credit 4 IAQ Assessment 1 maybe point

The project team is evaluating the timing of performing a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of gross floor area while maintaining an internal temperature of at least 60°F and no higher than 80°F and relative humidity no higher than 60%. Credit achievement will depend on the time available between construction completion and occupancy.

IEQ Credit 5 Thermal Comfort 1 credit point

The project HVAC systems will be designed to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy, with errata or a local equivalent. In addition, the project will be designed with individual thermal comfort controls for at least 50% of individual occupant spaces and group thermal comfort controls for all shared multi-occupant spaces.

IEQ Credit 6 Interior Lighting 1 credit point yes, 1 maybe point

The project will be designed with multi-level lighting controls for at least 90% of individual occupant spaces, and all shared multi-occupant spaces will have multi-zone control systems that enable occupants to adjust the lighting to meet group needs, with at least three lighting levels or scenes. In addition, the project team is evaluating the strategies required to meet Option 2 – Lighting Quality.

IEQ Credit 8 Quality Views 1 credit point

A direct line of sight to the outdoors will be provided for approximately 90% of the regularly occupied floor area. 90% of the regularly occupied floor area will also have quality views to the outdoors which may include multiple lines of sight; unobstructed views; views to landscaped areas, sky, pedestrian walkways, and streetscapes.

H. Innovation (IN)

INc1 Exemplary Performance: SSc5 Heat Island Reduction 1 credit point

The project will achieve exemplary performance for SSc5 Heat Island Reduction by meeting Option 1 for roof and non-roof measures, and additionally locating 100% of parking under cover.

INc2 Innovation: Green Housekeeping 1 credit point

Education First will explore the use green cleaning products and equipment in the common areas and provide a package for residents explaining the 'green living' components of the project.

INc3 Innovation: Exemplary Performance for Public Transit or Quality Views 1 credit point

The project will achieve exemplary performance for either LTc5 Public Transit or IEQc8 Quality Views.

INc4 and INc5 Innovation: To be determined 2 credit points

The team is exploring options to achieve the remaining 2 Innovation credits. Strategies being considered include: low mercury lighting, building exterior and hardscape management plan, integrated pest management, and energy reduction during construction.

INc6 LEED Accredited Professional 1 credit point

Many members of the team are LEED Accredited Professionals (AP's).

I. Regional Priority (RP)

Regional Priority Credits (RPCs) are established by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs and additional credit is awarded to the project. LEEDv4 RPCs applicable to the Cambridge area include: renewable energy production (3%/2 points), optimize energy performance (17%/8 points), high priority site (2 points), rainwater management (2 points), and indoor water use reduction (4 points). This project is tracking the following RPCs:

RPc1 WEc2 Indoor Water Use Reduction (4 points)	1 credit point
RPc2 LTc3 High Priority Site (2 points)	1 credit point
RPc3 MRc1 Building Life-Cycle Impact Reduction (2 points)	1 maybe point
RPc4 SSc4 Rainwater Management (2 points)	1 credit point

END OF DOCUMENT

LEED for New Construction and Major Renovation v4
Project Scorecard

Project: Education First - EFIII
Address: Cambridge, MA
Date: April 20, 2017

Targeted LEED v4 Rating: Silver or higher

Yes	Likely	Not Likely	No				
1	0	0	0	**Integrative Process**		1	Responsible
D	1			Prereq 1	**Integrative Process**	1	Team

Yes	Likely	Not Likely	No				
16	0	0	0	**Location and Transportation**		16	Responsible
D				0	Credit 1	**LEED for Neighborhood Development Location**	16	
D	1				Credit 2	**Sensitive Land Protection**	1	TGE
D	2				Credit 3	**High Priority Site**	2	VHB
D	5				Credit 4	**Surounding Density and Diverse Uses**	5	TGE
D	5				Credit 5	**Access to Quality Transit**	5	TGE
D	1				Credit 6	**Bicycle Facilities**	1	TGE, Willson
D	1				Credit 7	**Reduced Parking Footprint**	1	VHB
D	1				Credit 8	**Green Vehicles**	1	AKF

Yes	Likely	Not Likely	No				
6	0	4	0	**Sustainable Sites**		10	Responsible
C	Y			Prereq 1	**Construction Activity Pollution Prevention**	Required	VHB
D	1				Credit 1	**Site Assessment**	1	TGE
D			2		Credit 2	**Site Development - Protect or Restore Habitat**	2	Zen
D			1		Credit 3	**Open Space**	1	Zen
D	2		1		Credit 4	**Rainwater Management**	3	VHB
D	2				Credit 5	**Heat Island Reduction**	2	Wilson
D	1				Credit 6	**Light Pollution Reduction**	1	AKF

Yes	Likely	Not Likely	No				
9	0	1	1	**Water Efficiency**		11	Responsible
D	Y			Prereq 1	**Outdoor Water Use Reduction**	Required	Zen
D	Y			Prereq 2	**Indoor Water Use Reduction**	Required	AKF Group, Colburn Guvete. TGE
D	Y			Prereq 3	**Building-level Water Metering**	Required	AKF Group
D	2				Credit 1	**Outdoor Water Use Reduction**	2	Zen
D	4		1	1	Credit 2	**Indoor Water Use Reduction**	6	TGE
D	2				Credit 3	**Cooling Tower Water Use**	2	AKF Group
D	1				Credit 4	**Water Metering**	1	AKF Group

Yes	Likely	Not Likely	No				
11	7	6	9	**Energy and Atmosphere**		33	Responsible
C	Y			Prereq 1	**Fundamental Commissioning and Verification**	Required	
D	Y			Prereq 2	**Minimum Energy Performance**	Required	AKF Group
D	Y			Prereq 3	**Building-level Energy Metering**	Required	AKF / e3i
D	Y			Prereq 4	**Fundamental Refrigerant Management**	Required	AKF / e3i
C	6				Credit 1	**Enhanced Commissioning**	6	
D	5	5	2	6	Credit 2	**Optimize Energy Performance**	18	AKF Group

D				1	Credit 3	**Advanced Energy Metering**	1	AKF / e3i
C				2	Credit 4	**Demand Response**	2	EF, AKF / e3i
D			3		Credit 5	**Renewable Energy Production**	3	AKF / e3i
D		1			Credit 6	**Enhanced Refrigerant Management**	1	AKF / e3i
C		1	1		Credit 7	**Green Power and Carbon Offsets**	2	EF, TGE

Yes	Likely	Not Likely	No			
3	3	1	6	**Materials and Resources**	13	**Responsible**

D	Y				Prereq 1	**Storage & Collection of Recyclables**	Required	TGE, EF, Willson
C	Y				Prereq 2	**Construction and Demolition Waste Management Planning**	Required	Skanska
C		3		2	Credit 1	**Building Life-cycle Impact Reduction**	5	Wilson/ TGE
C	1			1	Credit 2	**Building Product Disclosure and Optimization**-Environmental Product Declarations	2	Skanska
C				2	Credit 3	**Building Product Disclosure and Optimization**-Sourcing of Raw Materials	2	
C			1	1	Credit 4	**Building Product Disclosure and Optimization**-Material Ingrediants	2	Skanska
C	2				Credit 5	**Construction and Demolition Waste Management**	2	Skanska

Yes	Likely	Not Likely	No			
7	0	2	7	**Indoor Environmental Quality**	16	**Responsible**

D	Y				Prereq 1	**Minimum IAQ Performance**	Required	AKF / e3i
D	Y				Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required	EF, TGE
D	2				Credit 1	**Enhanced IAQ Strategies**	2	AKF / e3i, Willson
C	1			2	Credit 2	**Low-Emitting Materials**	3	Willson, Skanska
C	1				Credit 3	**Construction IAQ Management Plan**	1	Skanska
C			1	1	Credit 4	**IAQ Assessment**	2	Skanska
D	1				Credit 5	**Thermal Comfort**	1	AKF / e3i
D	1		1		Credit 6	**Interior Lighting**	2	AKF / e3i
D				3	Credit 7	**Daylight**	3	Willson, TGE
D	1				Credit 8	**Quality Views**	1	TGE
D				1	Credit 9	**Acoustic Performance**	1	

Yes	Likely	Not Likely	No			
6	0	0	0	**Innovation**	6	**Responsible**

D	1				Credit 1	**Innovation in Design:** EP Heat Island Reduction	1	Team
D	1				Credit 2	**Innovation in Design:** Green Housekeeping	1	Team
D	1				Credit 3	**Innovation in Design:** EP for Views or Public Transit	1	Team
D	1				Credit 4	**Innovation in Design:** Ideas include - Building as an Ed. Tool, Clean construction, Learning controls for thermal comfort, Active Design, Community outreach and involvement, integrated pest management, low mercury lighting, building exterior and hardscape management plan, and energy reduction during construction.	1	Team
D	1				Credit 5	**Innovation in Design:** see above	1	Team
C	1				Credit 6	**LEED Accredited Professional**	1	TGE

Yes	Likely	Not Likely	No			
3	0	0	0	**Regional Priority**	4	

Regional Priority 02139

		0		Credit 1	**Regional Priority Credit: Renewable energy production - 2 pnts,**	1
1				Credit 2	**Regional Priority Credit: Indoor water use reduction - 4 pnts**	1
1				Credit 3	**Regional Priority Credit: High priority site - 2 pnts**	1
1				Credit 4	**Regional Priority Credit: Rainwater management - 2 pnts**	1
		0		Credit5	**Regional Priority Credit: Optimize energy performance - 8 pnts**	1

Yes	Likely	Not Likely	No		
62	10	14	23		110

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

FINAL REPORT

EDUCATION FIRST III

CAMBRIDGE, MA

PEDESTRIAN WIND COMFORT STUDY

RWDI #1700598

March 6, 2017

SUBMITTED TO

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EXECUTIVE SUMMARY

The wind conditions around the proposed Education First III Development are discussed in detail within the content of this report and may be summarized as follows:

- Appropriate wind comfort and safety conditions are expected at most test locations for the existing configuration. Uncomfortable and unsafe conditions are detected at exposed areas, especially during the winter.
- The proposed development and landscaping are expected to improve the overall wind conditions around the development, with a reduced number of uncomfortable and unsafe locations for the proposed development.
- Suitable wind conditions are generally predicted for both the summer and winter seasons especially for the on-site locations, including the main entrances to the proposed building and the Level 4 terrace.

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1 INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by Wilson Architects to consult on the pedestrian wind conditions for the proposed Education First III in Cambridge, MA. The purpose of the study was to assess the wind environment around the development in terms of pedestrian wind comfort and safety. The achievement of this objective included wind tunnel testing of a 1:300 scale model of the proposed development for the following configurations:

Configuration A - Existing:	Existing site buildings and existing and in-construction surroundings; and,
Configuration B - Proposed:	Existing and in-construction surroundings with the proposed development and landscaping.

The photographs in Figures 1a and 1b show the test model in RWDI's boundary-layer wind tunnel. The proposed development is a 12 story building including a 4 story podium. The test model was constructed using the design information and drawings listed in Appendix A. This report summarizes the methodology of wind tunnel studies for pedestrian wind conditions, describes the RWDI pedestrian wind comfort and safety criteria, presents the local wind conditions and their effects on pedestrians and provides conceptual wind control measures, where necessary.

The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site, and reviewed by the design team.

2 METHODOLOGY

As shown in Figures 1a and 1b, the wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1200 ft. radius of the study site. The boundary-layer wind conditions beyond the modelled area were also simulated in RWDI's wind tunnel. The model was instrumented with 89 wind speed sensors to measure mean and gust wind speeds at a full-scale height of approximately 5 ft. These measurements were recorded for 36 equally incremented wind directions.

Wind statistics recorded at the Boston Logan International Airport between 1991 and 2016 were analyzed for the Summer (May through October) and Winter (November through April) seasons. Figure 2 graphically depicts the directional distributions of wind frequencies and speeds for the two seasons. Winds are frequent from the southwest and northwest quadrants during the summer, with secondary winds present from the east. During the winter, the prevailing winds are from the northwest quadrant, with secondary winds from the southwest quadrant, as indicated by the wind roses. Strong winds of a mean speed greater than 20 mph measured at the

airport (at an anemometer height of 30 ft) occur more often in the winter (11.9%) than in the summer (4.4%). They are primarily from the northwester and northeasterly directions.

Wind statistics from the Boston Logan International Airport were combined with the wind tunnel data in order to predict the frequency of occurrence of full-scale wind speeds. The full-scale wind predictions were then compared with the RWDI criteria for pedestrian comfort and safety.

3 EXPLANATION OF CRITERIA

The RWDI pedestrian wind criteria are used in the current study. These criteria have been developed by RWDI through research and consulting practice since 1974 (References 1 through 6). They have also been widely accepted by municipal authorities as well as by the building design and city planning community.

RWDI Pedestrian Wind Criteria

Comfort Category	GEM Speed (mph)	Description
Sitting	≤ 6	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	≤ 8	Gentle breezes suitable for main building entrances, bus stops and other places where pedestrians may linger
Strolling	≤ 10	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park
Walking	≤ 12	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 12	Strong winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended

Notes: (1) Gust Equivalent Mean (GEM) Speed = max(mean speed, gust speed/1.85) ; and;
(2) GEM speeds listed above based on a seasonal exceedance of 20% of the time between 6:00 and 23:00.

Safety Criterion	Gust Speed (mph)	Description
Exceeded	> 56	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.

Notes: Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day.

A few additional comments are provided below to further explain the wind criteria and their applications.

- Both mean and gust speeds can affect pedestrian comfort and their combined effect is typically quantified by a Gust Equivalent Mean (GEM) speed, with a gust factor of 1.85 (References 1, 5, 7 and 8).

- Instead of standard four seasons, two periods of summer (May to October) and winter (November to April) are adopted in the wind analysis, because in a moderate or cold climate such as that found in Cambridge, there are distinct differences in pedestrian outdoor behaviors between these two time periods.

- Nightly hours between midnight and 5 o'clock in the morning are excluded from the wind analysis for wind comfort since limited usage of outdoor spaces is anticipated.

- A 20% exceedance is used in these criteria to determine the comfort category, which suggests that wind speeds would be comfortable for the corresponding activity at least 80% of the time or four out of five days.

- Only gust winds need to be considered in the wind safety criterion. These are usually rare events, but deserve special attention in city planning and building design due to their potential safety impact on pedestrians.

- These criteria for wind forces represent average wind tolerance. They are sometimes subjective and regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can also affect people's perception of the wind climate. Comparisons of wind speeds for different building configurations are the most objective way in assessing local pedestrian wind conditions.

4 PREDICTED WIND CONDITIONS

The predicted wind comfort and safety conditions pertaining to the two tested configurations are graphically depicted on a site plan in Figures 3a through 5b. These conditions and the associated wind speeds are presented in Table 1, located in the Tables section of this report.

Wind conditions comfortable for walking or strolling are appropriate for sidewalks. Lower wind speeds conducive to standing are preferred at main entrances where pedestrians are apt to linger. The following is a detailed discussion of the suitability of the predicted wind comfort and safety conditions for the anticipated pedestrian use of each area.

4.1 Entrances/Building Perimeter (Locations 1 through 17)

4.1.1 Existing Configuration

During the summer, the existing wind conditions at the site are comfortable for standing in general (Figure 3a). During the winter, higher wind speeds mainly comfortable for strolling are expected (Figure 4a). All tested locations in this area are expected to meet the safety criterion (Figure 5a).

4.1.2 Proposed Configuration

Major entrances of the proposed development are represented by Locations 1 and 3. The entrances of the proposed development are predicted to be comfortable for sitting or standing throughout the year, which are considered appropriate for the intended use. With the addition of the proposed development and landscaping to the site, the general wind conditions are expected to be comfortable for sitting or standing throughout the year, similar to the existing conditions. Due to the exposure to the strong westerly and northwesterly winds, higher wind speeds comfortable for strolling or walking are predicted on west side of the development throughout the year (Figures 3b and 4b). During the winter, marginally uncomfortable wind conditions are predicted at a service entrance along the west façade of the proposed development (Location 7 in Figure 4b). All tested locations in this area are expected to meet the safety criterion (Figure 5b).

4.2 Off-Site Walkways/Sidewalks (Locations 18 through 86)

4.2.1 Existing Configuration

During the summer, the offsite sidewalks and park areas are generally anticipated to be comfortable for strolling or walking (Figure 3a). One sidewalk location along North Point Blvd., to the southwest of the proposed development, is expected to be uncomfortable (Location 66 in Figure 3a). During the winter, wind speeds comfortable for strolling or walking are predicted on most sidewalk locations. Uncomfortable wind conditions exist at 21 off-site locations along the sidewalks and walkways (Locations 37, 45, 49 to 51, 54, 58 to 60, 63, 66, 67, 69 to 73, 75, 78, 80 and 83 in Figure 4a). Two off-site locations currently exceed the safety criteria for the existing configuration (Locations 51 and 80 in Figure 5a).

4.2.2 Proposed Configuration

In the proposed configuration, during the summer, with the inclusion of the proposed landscaping, the wind conditions at the off-site sidewalks are generally expected to remain similar or better compared to the existing conditions (Figure 3b). Uncomfortable wind conditions predicted for the existing configuration remain for the

same at Location 66 (Figure 3b), and an additional location along Charlestown Avenue to the northwest of the proposed development becomes marginally uncomfortable (Location 59 in Figure 3b). During the winter, wind conditions at off-site sidewalks are generally expected to be comfortable for walking or better (Figure 4b). When compared to the existing conditions, improved wind conditions with 10 uncomfortable locations are predicted for the proposed configuration (Locations 37, 59, 60, 63, 66, 72, 73, 75, 78 and 80 Figure 4b).

With the addition of the proposed development and landscaping, the number of safety exceedance is reduced from two to one (Location 80 in Figure 5b).

The addition of the proposed landscaping is expected to improve the overall wind conditions on and around the proposed development. Therefore, this positive design feature should be retained in the final design.

4.3 Level 4 Terrace (Locations 87 through 89)

Typically for a podium area, wind conditions that are comfortable for sitting or standing are desirable, depending upon the activity planned. This criterion is satisfied throughout the year (Locations 87 through 89 in Figures 3b, 4b and 5b).

5 APPLICABILITY

The wind conditions presented in this report pertain to the proposed Education First III development as detailed in the architectural design drawings listed in Appendix A. Should there be any design changes that deviate from this list of drawings, the wind condition predictions presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

6 REFERENCES

1. ASCE Task Committee on Outdoor Human Comfort (2004). *Outdoor Human Comfort and Its Assessment*, 68 pages, American Society of Civil Engineers, Reston, Virginia, USA.

2. Williams, C.J., Hunter, M.A. and Waechter, W.F. (1990). "Criteria for Assessing the Pedestrian Wind Environment," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.36, pp.811-815.

3. Williams, C.J., Soligo M.J. and Cote, J. (1992). "A Discussion of the Components for a Comprehensive Pedestrian Level Comfort Criteria," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.41-44, pp.2389-2390.

4. Soligo, M.J., Irwin, P.A., and Williams, C.J. (1993). "Pedestrian Comfort Including Wind and Thermal Effects," *Third Asia-Pacific Symposium on Wind Engineering*, Hong Kong.

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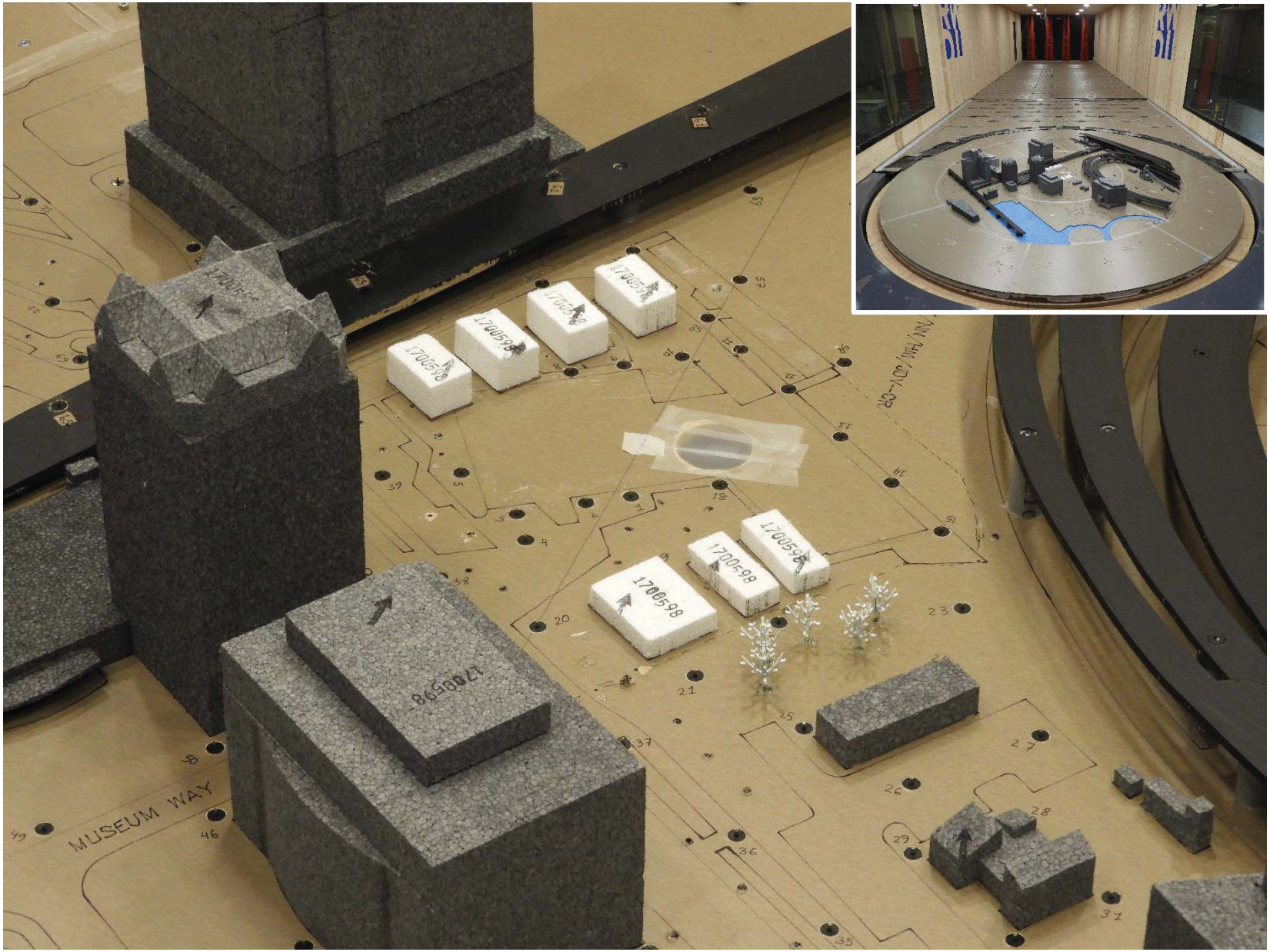
6. Williams, C.J., Wu, H., Waechter, W.F. and Baker, H.A. (1999). "Experiences with Remedial Solutions to Control Pedestrian Wind Problems," *Tenth International Conference on Wind Engineering*, Copenhagen, Denmark.

7. Lawson, T.V. (1973). "Wind Environment of Buildings: A Logical Approach to the Establishment of Criteria", *Report No. TVL 7321*, Department of Aeronautic Engineering, University of Bristol, Bristol, England.

8. Durgin, F. H. (1997). "Pedestrian Level Wind Criteria Using the Equivalent average", *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 66, pp. 215-226.

FIGURES



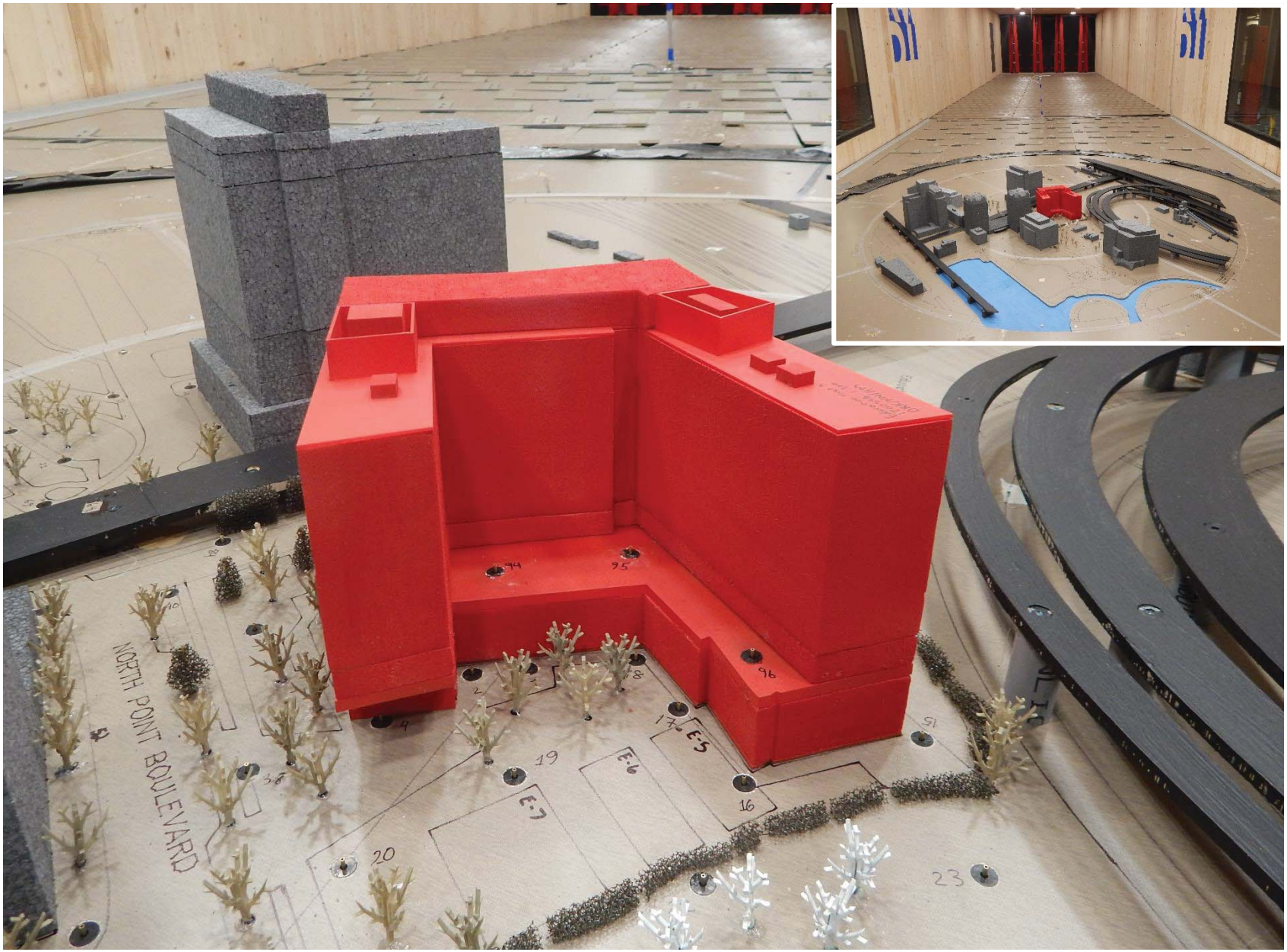
Wind Tunnel Study Model
Existing

Education First III – Cambridge, MA

Project #1700598

Figure No. 1a

Date: February 28, 2017



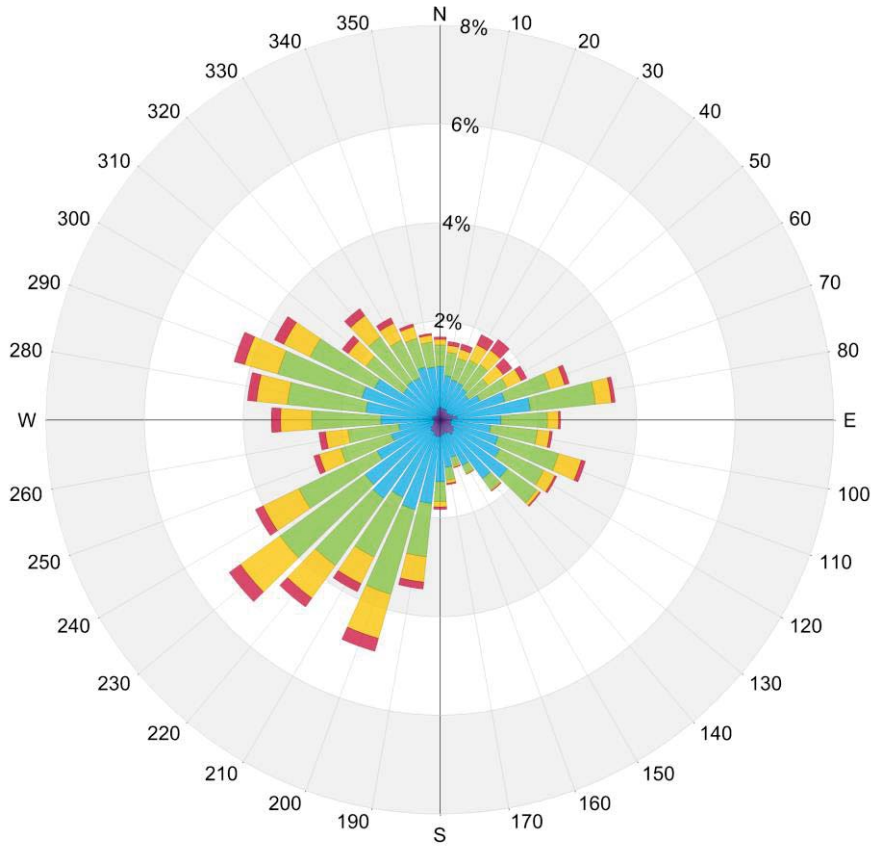
Wind Tunnel Study Model
Proposed

Education First III – Cambridge, MA

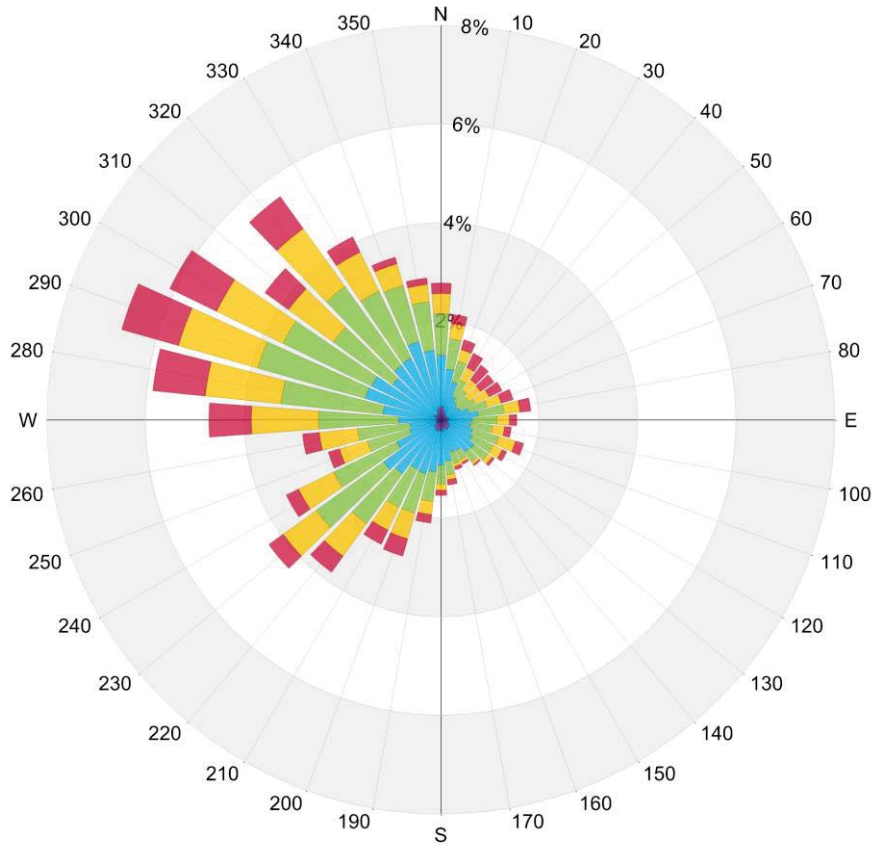
Project #1700598

Figure No. 1b

Date: February 28, 2017



Summer
(May - October)



Winter
(November - April)

Wind Speed (mph)	Probability (%) Summer	Winter
Calm	2.8	2.4
1-5	8.5	6.3
6-10	36.2	28.0
11-15	34.2	31.5
16-20	13.9	19.9
>20	4.4	11.9

Directional Distribution (%) of Winds (Blowing From)

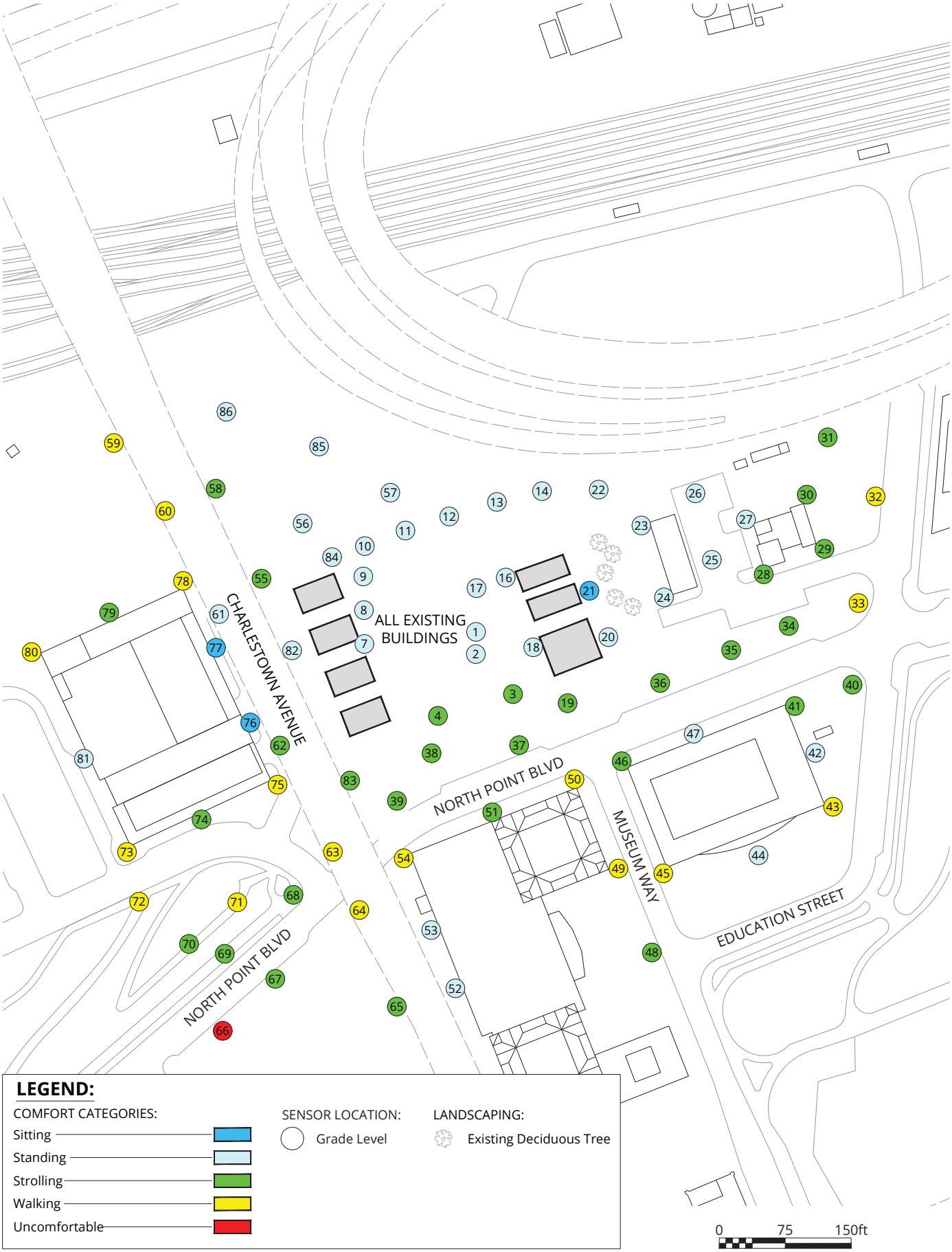
Boston Logan International Airport (1991 - 2016)

Education First III – Cambridge, MA

Project #1700598

Figure No. 2

Date: February 28, 2017



Pedestrian Wind Comfort Conditions

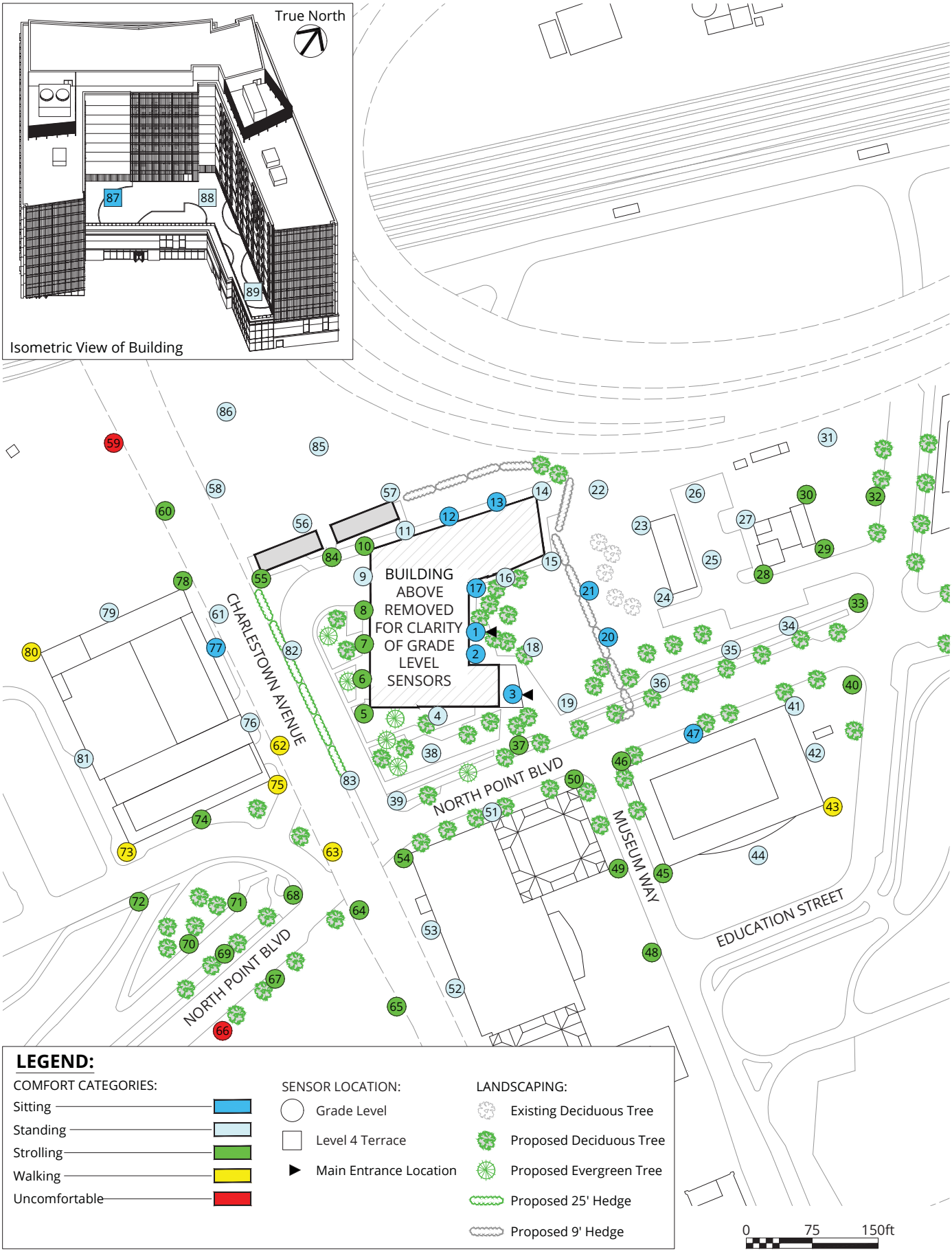
Existing Configuration
Summer (May to October, 6:00 to 23:00)

True North

Drawn by: ESM	Figure: 3a
Approx. Scale:	1"=150'
Date Revised:	Feb. 27, 2017

Education First III - Cambridge, MA

Project #1700598



Pedestrian Wind Comfort Conditions

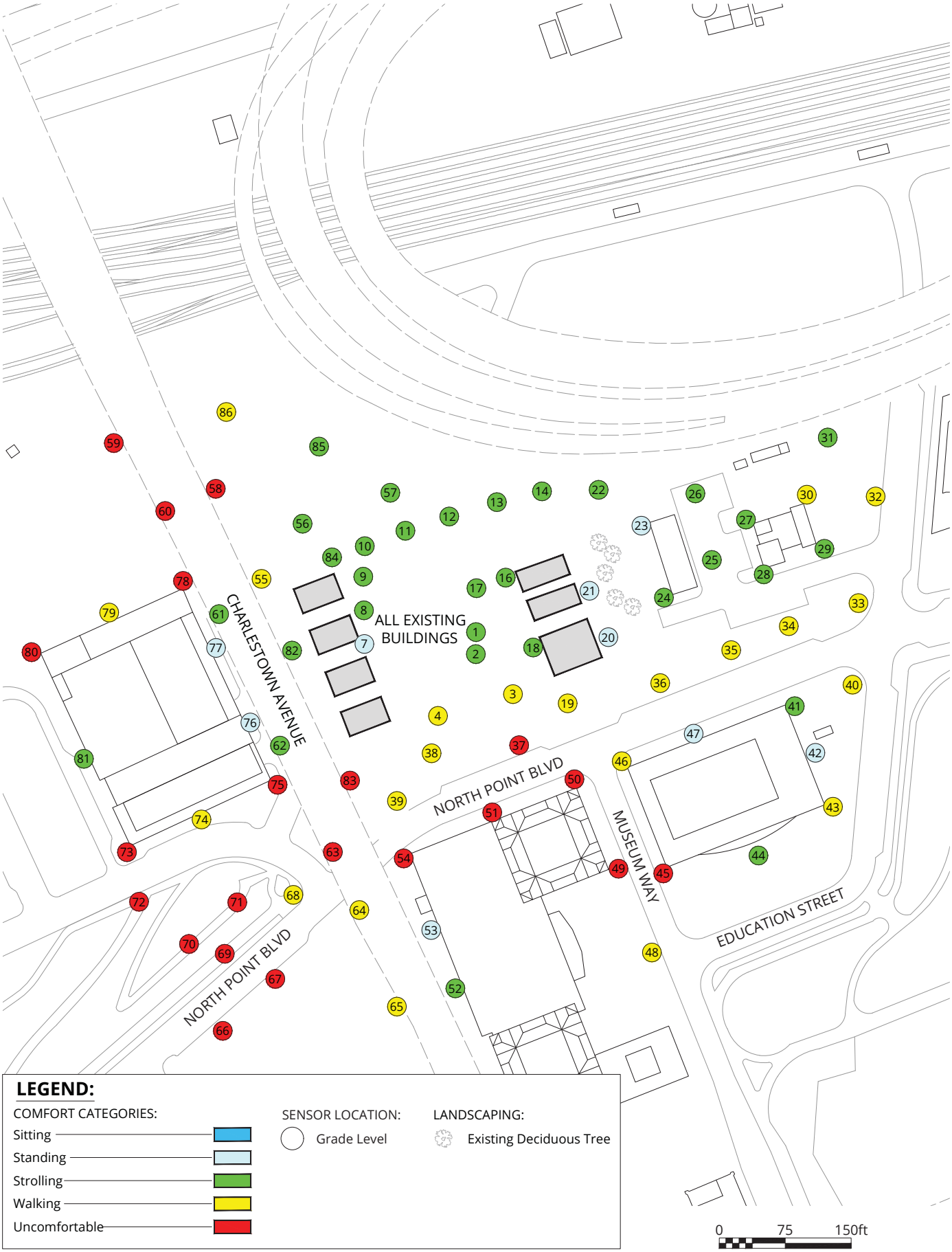
Proposed Configuration
Summer (May to October, 6:00 to 23:00)

Education First III - Cambridge, MA

True North

Project #1700598

Drawn by: ESM	Figure: 3b
Approx. Scale:	1"=150'
Date Revised:	Feb. 27, 2017



Pedestrian Wind Comfort Conditions

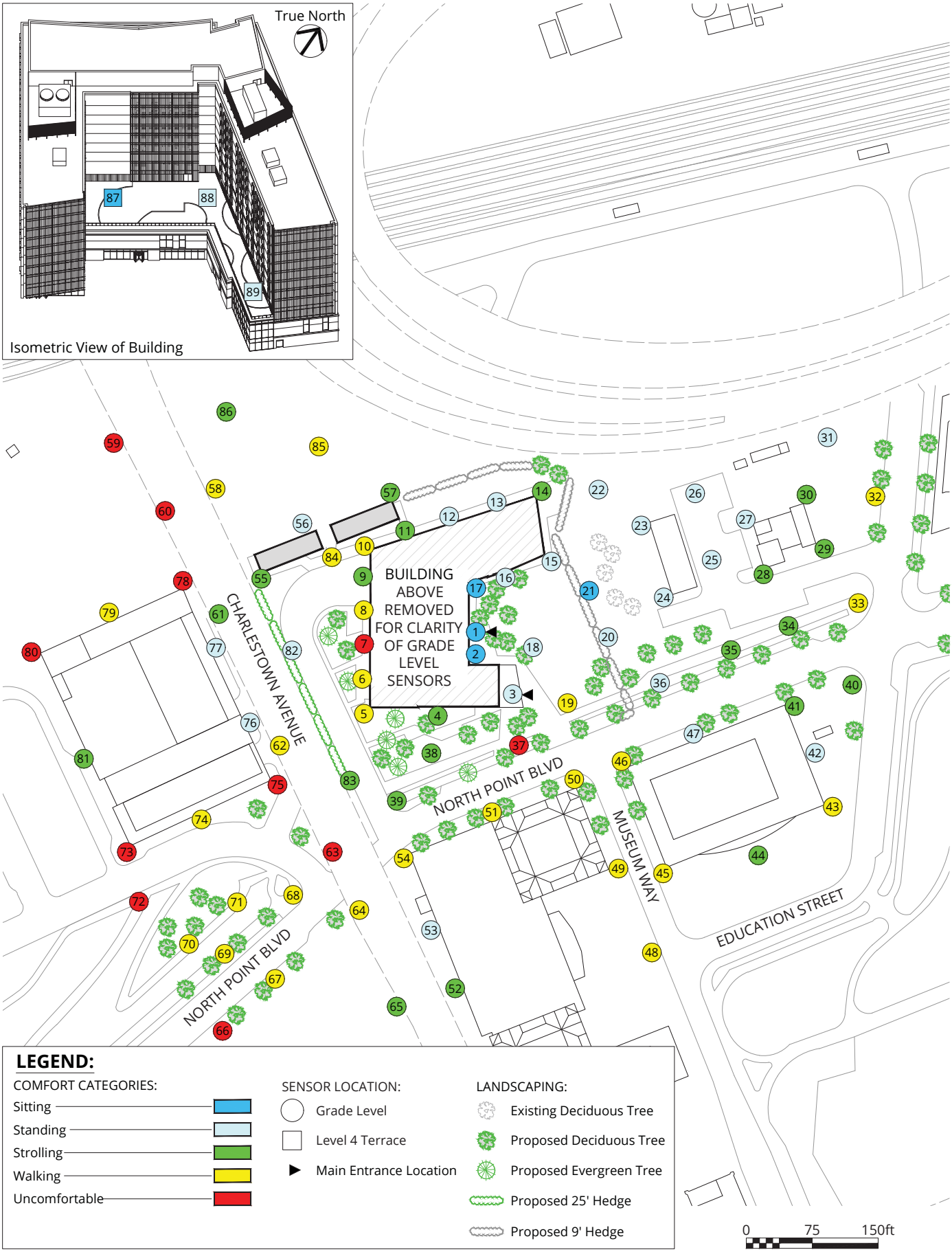
Existing Configuration
Winter (November to April, 6:00 to 23:00)

True North

Drawn by: ESM	Figure: 4a
Approx. Scale:	1"=150'
Date Revised:	Feb. 27, 2017

Education First III - Cambridge, MA

Project #1700598



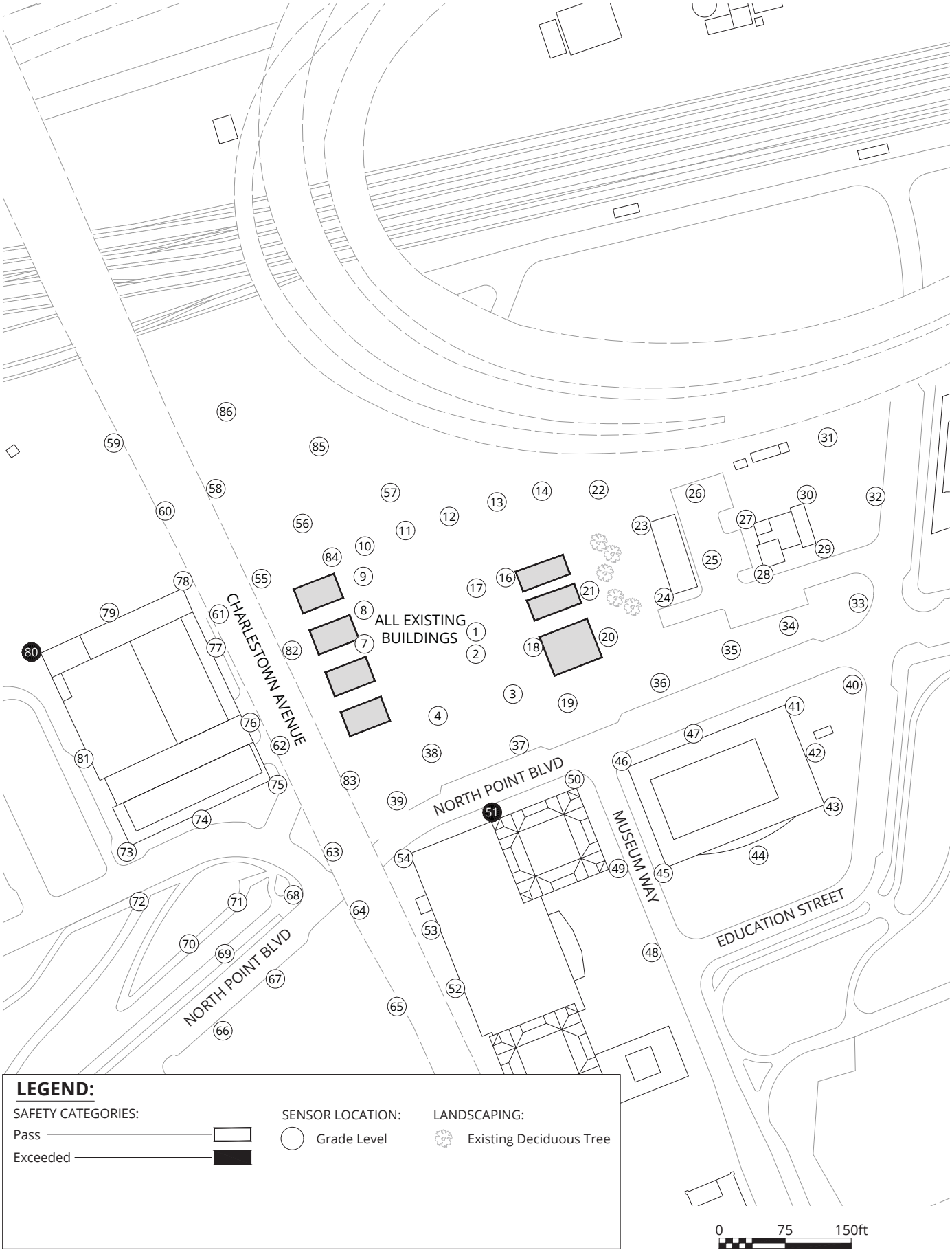
Pedestrian Wind Comfort Conditions
Proposed Configuration
Winter (November to April, 6:00 to 23:00)

True North

Drawn by: ESM	Figure: 4b
Approx. Scale:	1"=150'
Date Revised:	Feb. 27, 2017

Education First III - Cambridge, MA

Project #1700598



Pedestrian Wind Safety Conditions
Existing Configuration
Annual (January to December, 0:00 to 23:00)

Education First III - Cambridge, MA

Project #1700598

True North

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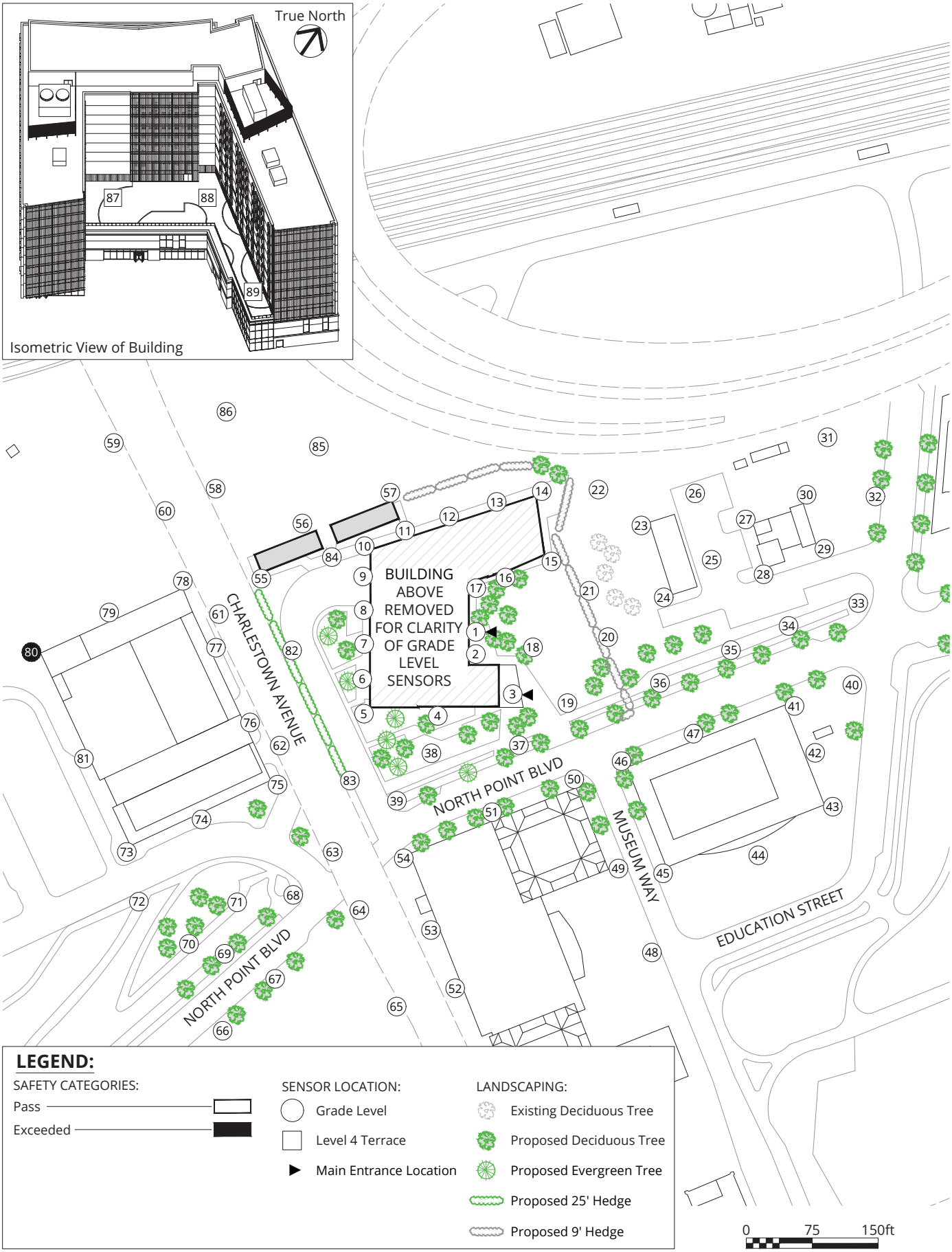
Date Revised:	Feb. 27, 2017



Pedestrian Wind Safety Conditions
Proposed Configuration
Annual (January to December, 0:00 to 23:00)

True North

Drawn by: ESM	Figure: 5b
Approx. Scale:	1"=150'
Date Revised:	Feb. 27, 2017

Education First III - Cambridge, MA

Project #1700598

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
1	Existing	8	Standing	10	Strolling	39	Pass
	Proposed	6	Sitting	6	Sitting	32	Pass
2	Existing	8	Standing	10	Strolling	40	Pass
	Proposed	5	Sitting	5	Sitting	35	Pass
3	Existing	9	Strolling	12	Walking	44	Pass
	Proposed	6	Sitting	7	Standing	32	Pass
4	Existing	9	Strolling	12	Walking	43	Pass
	Proposed	7	Standing	10	Strolling	40	Pass
5	Existing	N/A	N/A	N/A	N/A	N/A	N/A
	Proposed	9	Strolling	12	Walking	43	Pass
6	Existing	N/A	N/A	N/A	N/A	N/A	N/A
	Proposed	9	Strolling	12	Walking	46	Pass
7	Existing	7	Standing	8	Standing	34	Pass
	Proposed	10	Strolling	13	Uncomfortable	52	Pass
8	Existing	8	Standing	10	Strolling	38	Pass
	Proposed	9	Strolling	12	Walking	51	Pass
9	Existing	8	Standing	10	Strolling	36	Pass
	Proposed	8	Standing	10	Strolling	45	Pass
10	Existing	7	Standing	9	Strolling	36	Pass
	Proposed	10	Strolling	12	Walking	52	Pass
11	Existing	8	Standing	10	Strolling	38	Pass
	Proposed	7	Standing	9	Strolling	36	Pass
12	Existing	8	Standing	10	Strolling	39	Pass
	Proposed	6	Sitting	8	Standing	33	Pass
13	Existing	8	Standing	10	Strolling	38	Pass
	Proposed	6	Sitting	8	Standing	35	Pass
14	Existing	8	Standing	10	Strolling	37	Pass
	Proposed	8	Standing	10	Strolling	46	Pass
15	Existing	N/A	N/A	N/A	N/A	N/A	N/A
	Proposed	7	Standing	8	Standing	40	Pass
16	Existing	7	Standing	9	Strolling	38	Pass
	Proposed	7	Standing	7	Standing	36	Pass
17	Existing	8	Standing	10	Strolling	40	Pass
	Proposed	6	Sitting	6	Sitting	27	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
18	Existing	8	Standing	10	Strolling	39	Pass
	Proposed	7	Standing	8	Standing	32	Pass
19	Existing	10	Strolling	12	Walking	48	Pass
	Proposed	8	Standing	11	Walking	43	Pass
20	Existing	7	Standing	8	Standing	34	Pass
	Proposed	6	Sitting	7	Standing	32	Pass
21	Existing	6	Sitting	7	Standing	26	Pass
	Proposed	6	Sitting	6	Sitting	39	Pass
22	Existing	8	Standing	10	Strolling	37	Pass
	Proposed	7	Standing	7	Standing	32	Pass
23	Existing	7	Standing	8	Standing	34	Pass
	Proposed	7	Standing	8	Standing	34	Pass
24	Existing	8	Standing	10	Strolling	43	Pass
	Proposed	7	Standing	8	Standing	42	Pass
25	Existing	8	Standing	9	Strolling	38	Pass
	Proposed	8	Standing	8	Standing	36	Pass
26	Existing	8	Standing	9	Strolling	38	Pass
	Proposed	7	Standing	8	Standing	37	Pass
27	Existing	8	Standing	9	Strolling	37	Pass
	Proposed	8	Standing	8	Standing	37	Pass
28	Existing	10	Strolling	10	Strolling	46	Pass
	Proposed	9	Strolling	10	Strolling	44	Pass
29	Existing	9	Strolling	10	Strolling	45	Pass
	Proposed	9	Strolling	10	Strolling	44	Pass
30	Existing	10	Strolling	11	Walking	54	Pass
	Proposed	10	Strolling	10	Strolling	51	Pass
31	Existing	9	Strolling	10	Strolling	42	Pass
	Proposed	8	Standing	8	Standing	39	Pass
32	Existing	11	Walking	12	Walking	49	Pass
	Proposed	10	Strolling	12	Walking	48	Pass
33	Existing	11	Walking	12	Walking	49	Pass
	Proposed	10	Strolling	12	Walking	48	Pass
34	Existing	10	Strolling	11	Walking	45	Pass
	Proposed	8	Standing	10	Strolling	40	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
35	Existing	10	Strolling	11	Walking	48	Pass
	Proposed	8	Standing	9	Strolling	39	Pass
36	Existing	9	Strolling	11	Walking	46	Pass
	Proposed	7	Standing	8	Standing	42	Pass
37	Existing	10	Strolling	13	Uncomfortable	50	Pass
	Proposed	10	Strolling	14	Uncomfortable	50	Pass
38	Existing	10	Strolling	12	Walking	43	Pass
	Proposed	8	Standing	10	Strolling	41	Pass
39	Existing	9	Strolling	11	Walking	43	Pass
	Proposed	8	Standing	10	Strolling	40	Pass
40	Existing	10	Strolling	12	Walking	53	Pass
	Proposed	9	Strolling	10	Strolling	44	Pass
41	Existing	9	Strolling	10	Strolling	53	Pass
	Proposed	8	Standing	10	Strolling	50	Pass
42	Existing	8	Standing	8	Standing	42	Pass
	Proposed	8	Standing	8	Standing	40	Pass
43	Existing	11	Walking	12	Walking	52	Pass
	Proposed	11	Walking	12	Walking	51	Pass
44	Existing	8	Standing	10	Strolling	40	Pass
	Proposed	8	Standing	9	Strolling	37	Pass
45	Existing	12	Walking	13	Uncomfortable	52	Pass
	Proposed	10	Strolling	12	Walking	50	Pass
46	Existing	10	Strolling	12	Walking	45	Pass
	Proposed	10	Strolling	11	Walking	44	Pass
47	Existing	7	Standing	8	Standing	35	Pass
	Proposed	6	Sitting	8	Standing	32	Pass
48	Existing	10	Strolling	12	Walking	45	Pass
	Proposed	10	Strolling	12	Walking	44	Pass
49	Existing	12	Walking	13	Uncomfortable	53	Pass
	Proposed	10	Strolling	11	Walking	47	Pass
50	Existing	11	Walking	13	Uncomfortable	49	Pass
	Proposed	10	Strolling	12	Walking	45	Pass
51	Existing	10	Strolling	14	Uncomfortable	58	Exceeded
	Proposed	8	Standing	11	Walking	43	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
52	Existing	8	Standing	10	Strolling	40	Pass
	Proposed	8	Standing	10	Strolling	40	Pass
53	Existing	7	Standing	8	Standing	37	Pass
	Proposed	7	Standing	8	Standing	37	Pass
54	Existing	12	Walking	14	Uncomfortable	50	Pass
	Proposed	9	Strolling	11	Walking	40	Pass
55	Existing	7	Standing	10	Strolling	37	Pass
	Proposed	9	Strolling	10	Strolling	41	Pass
56	Existing	8	Standing	10	Strolling	40	Pass
	Proposed	7	Standing	8	Standing	32	Pass
57	Existing	8	Standing	10	Strolling	37	Pass
	Proposed	8	Standing	10	Strolling	46	Pass
58	Existing	9	Strolling	13	Uncomfortable	51	Pass
	Proposed	8	Standing	12	Walking	50	Pass
59	Existing	12	Walking	14	Uncomfortable	35	Pass
	Proposed	13	Uncomfortable	15	Uncomfortable	37	Pass
60	Existing	11	Walking	15	Uncomfortable	56	Pass
	Proposed	10	Strolling	14	Uncomfortable	55	Pass
61	Existing	8	Standing	9	Strolling	47	Pass
	Proposed	8	Standing	10	Strolling	47	Pass
62	Existing	10	Strolling	10	Strolling	46	Pass
	Proposed	11	Walking	12	Walking	49	Pass
63	Existing	12	Walking	14	Uncomfortable	52	Pass
	Proposed	11	Walking	13	Uncomfortable	49	Pass
64	Existing	11	Walking	12	Walking	49	Pass
	Proposed	10	Strolling	11	Walking	48	Pass
65	Existing	9	Strolling	11	Walking	44	Pass
	Proposed	9	Strolling	10	Strolling	45	Pass
66	Existing	16	Uncomfortable	19	Uncomfortable	55	Pass
	Proposed	16	Uncomfortable	19	Uncomfortable	53	Pass
67	Existing	10	Strolling	13	Uncomfortable	47	Pass
	Proposed	10	Strolling	12	Walking	43	Pass
68	Existing	10	Strolling	12	Walking	46	Pass
	Proposed	9	Strolling	11	Walking	42	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
69	Existing	10	Strolling	13	Uncomfortable	46	Pass
	Proposed	9	Strolling	12	Walking	42	Pass
70	Existing	10	Strolling	13	Uncomfortable	47	Pass
	Proposed	10	Strolling	12	Walking	44	Pass
71	Existing	11	Walking	14	Uncomfortable	50	Pass
	Proposed	10	Strolling	12	Walking	43	Pass
72	Existing	11	Walking	14	Uncomfortable	52	Pass
	Proposed	10	Strolling	14	Uncomfortable	52	Pass
73	Existing	12	Walking	16	Uncomfortable	55	Pass
	Proposed	12	Walking	15	Uncomfortable	55	Pass
74	Existing	9	Strolling	12	Walking	46	Pass
	Proposed	9	Strolling	12	Walking	43	Pass
75	Existing	12	Walking	14	Uncomfortable	47	Pass
	Proposed	12	Walking	14	Uncomfortable	48	Pass
76	Existing	6	Sitting	7	Standing	30	Pass
	Proposed	7	Standing	8	Standing	29	Pass
77	Existing	6	Sitting	7	Standing	29	Pass
	Proposed	6	Sitting	7	Standing	28	Pass
78	Existing	11	Walking	15	Uncomfortable	53	Pass
	Proposed	10	Strolling	14	Uncomfortable	51	Pass
79	Existing	9	Strolling	11	Walking	43	Pass
	Proposed	8	Standing	11	Walking	43	Pass
80	Existing	12	Walking	16	Uncomfortable	58	Exceeded
	Proposed	12	Walking	15	Uncomfortable	57	Exceeded
81	Existing	8	Standing	9	Strolling	38	Pass
	Proposed	8	Standing	9	Strolling	38	Pass
82	Existing	7	Standing	9	Strolling	37	Pass
	Proposed	7	Standing	8	Standing	34	Pass
83	Existing	10	Strolling	13	Uncomfortable	45	Pass
	Proposed	8	Standing	10	Strolling	42	Pass
84	Existing	7	Standing	10	Strolling	36	Pass
	Proposed	10	Strolling	12	Walking	47	Pass
85	Existing	8	Standing	10	Strolling	39	Pass
	Proposed	8	Standing	11	Walking	43	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
86	Existing	8	Standing	12	Walking	43	Pass
	Proposed	7	Standing	10	Strolling	42	Pass
87	Existing	N/A	N/A	N/A	N/A	N/A	N/A
	Proposed	6	Sitting	6	Sitting	35	Pass
88	Existing	N/A	N/A	N/A	N/A	N/A	N/A
	Proposed	7	Standing	7	Standing	34	Pass
89	Existing	N/A	N/A	N/A	N/A	N/A	N/A
	Proposed	7	Standing	8	Standing	35	Pass

Configurations	
Existing	Without the proposed development
Proposed	With the proposed development and landscaping

Seasons	Hours
Summer = May - October	6:00 - 23:00 for comfort
Winter = November - April	0:00 - 23:00 for safety

Comfort Speed (mph)	
(20% Seasonal Exceedance)	
≤ 6	Sitting
7 - 8	Standing
9 - 10	Strolling
11 - 12	Walking
> 12	Uncomfortable

Safety Speed (mph)	
(0.1% Annual Exceedance)	
≤ 56	Pass
>56	Exceeded

APPENDIX A

Drawing List for Model Construction

The drawings and information listed below were received from Wilson Architects and were used to construct the scale model of the proposed Education First III Development. Should there be any design changes that deviate from this list of drawings, the results may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received (dd/mm/yyyy)
20170221.skp	SketchUp	22/2/17
2017-02-23 ZEN Tree height diagram and sketch.pdf	PDF	24/2/17

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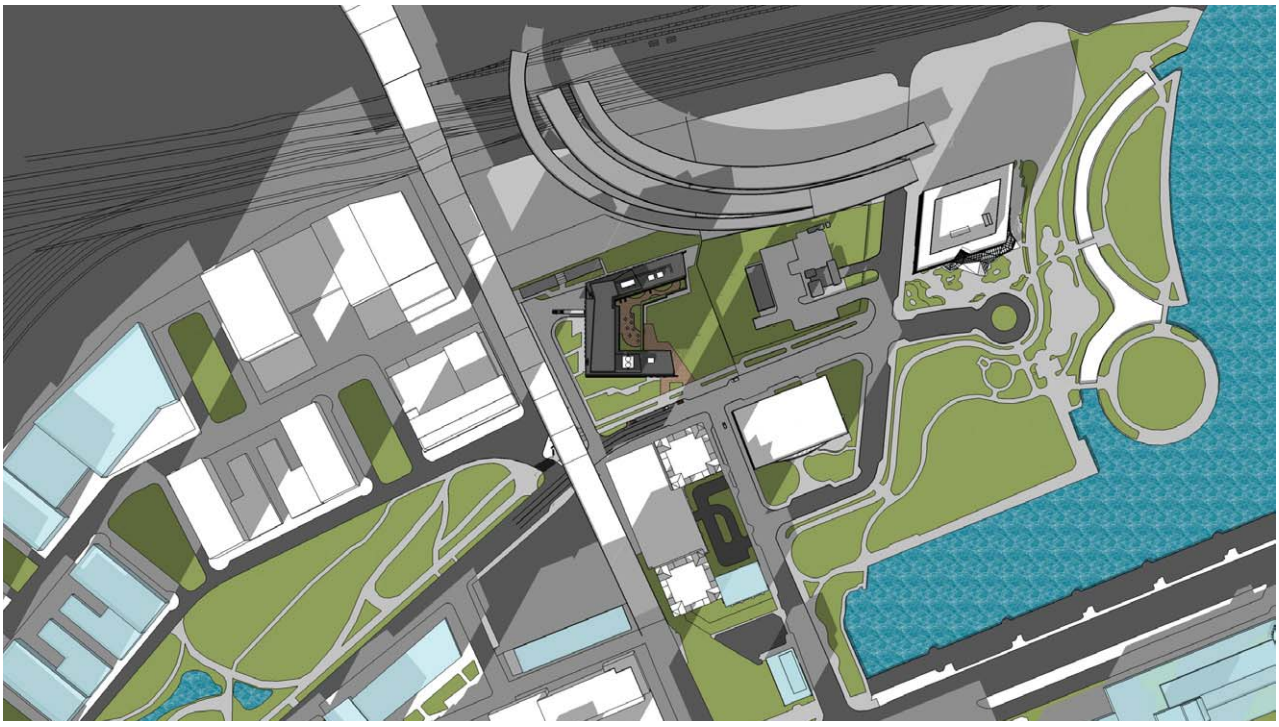
Aerial view of proposed site

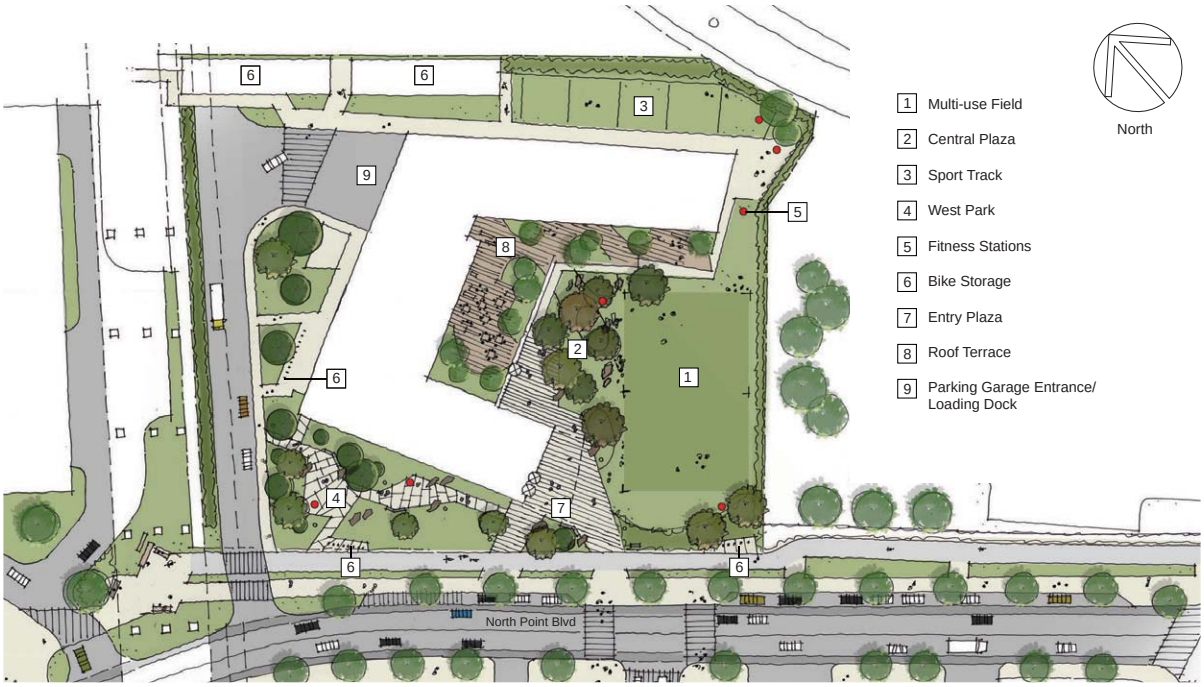


Aerial view of proposed massing on site

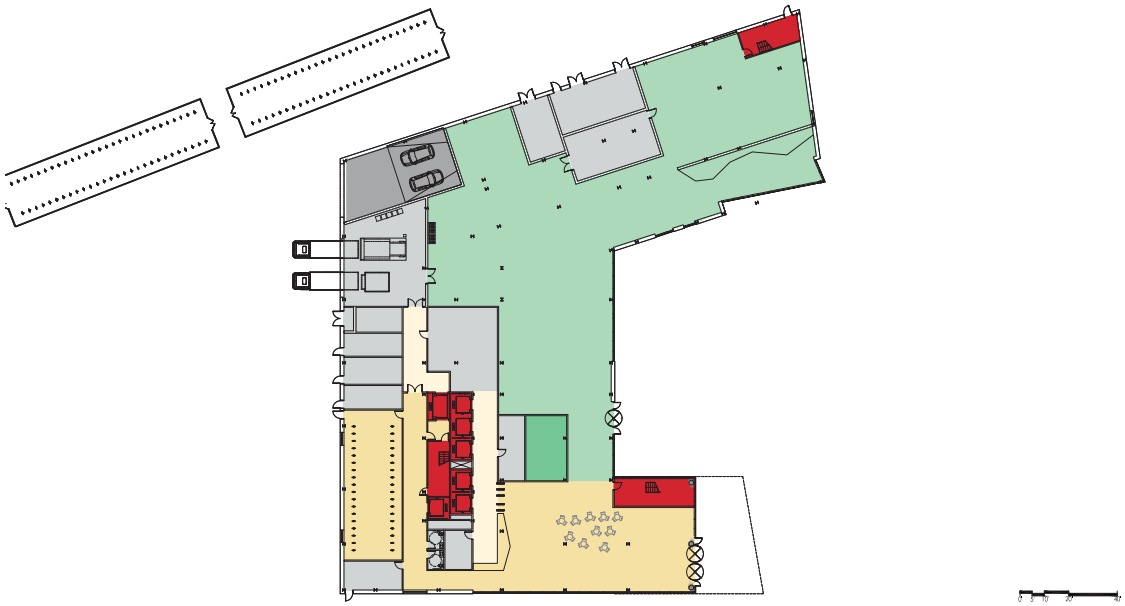
Aerial landscape view

View beneath Gilmore Bridge

View from Museum Way



Landscape Plan Diagram



FEIR Level 1 Plan

View from Museum Way