

# Tobin Montessori School + Vassal Lane Upper School

Cambridge, Massachusetts

PREPARED FOR

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City of Cambridge Public School Department  
795 Massachusetts Avenue  
Cambridge, MA 02139

PREPARED BY



99 High Street  
Boston, MA 02110  
617.728.7777

January 13, 2021

UNDER THE DIRECTION OF

A handwritten signature in black ink, appearing to read "Sean Manning".

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Sean Manning, P.E.

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# Introduction & Project Overview

On behalf of the City of Cambridge Public Schools (CPS) Department, Vanasse Hangen Brustlin, Inc. (VHB) has conducted a Traffic Assessment for the proposed construction of the Tobin Montessori and Vassal Lane Upper Schools Project, which is intended to replace the existing school and be rebuilt at the school's current location at 197 Vassal Lane in Cambridge, Massachusetts.

The Traffic Assessment scope was developed in close coordination with City of Cambridge Traffic, Parking and Transportation (TP&T) Department in response to VHB's Request for Scoping dated June 4, 2020 and Existing Traffic Volumes Evaluation and Proposal memorandum dated May 18, 2020. A copy of these items are included in the Appendix for reference.

This document is comprised of three components, as follows:

1. Introduction and Project Overview, describing the framework in which the transportation component of this Project was evaluated;
2. Traffic Study, presenting the technical information and analysis results as required under the Guidelines; and,
3. Planning Board Special Permit Criteria, summarizing the evaluation of the proposed Project as defined under the Guidelines.

The Traffic Study Summary Sheets and Planning Board Criteria Performance Summary are included in this document. Supplementary data and analysis worksheets are provided in a supporting Technical Appendix. Electronic files for Turning Movement Counts (TMC) and Synchro and SimTraffic analyses are included on an accompanying compact disk (CD).

## Project Description & Overview

The Tobin Montessori and Vassal Lane Upper Schools are public schools in the City of Cambridge housed at the existing building location at 197 Vassal Lane that serve approximately 620 students (320 at the Tobin and 300 at the Vassal) in Grades Pre-K through 8 and employ approximately 123 staff (70 at the Tobin and 53 at the Vassal), some of whom are part-time employees. The existing site includes approximately 120,000 square feet (SF) of school use.

The City of Cambridge proposes to completely reconstruct the school into a new building and implement significant enhancements to the playing fields and community recreation provided at the adjacent Father Callanan Park, which shares the site.

The proposed Project, as currently envisioned, involves the demolition of the existing building and construction of a new building that will include the following redesigned components:

- › Tobin Montessori School (including DHSP Preschool and Special Start)
- › Vassal Lane Upper School
- › Sheltered English Immersion (SEI) Program
- › Autism Spectrum Disorder (ASD) Program
- › Underground parking garage with parking spaces for 150 vehicles (including approximately 100 for faculty and staff and 50 short-term drop-off parking spaces)
- › 18 long-term and 102 short-term bicycle parking spaces

The Proposed Project, when complete, will accommodate a total of 979 students as follows:

(i) 336 students in the Tobin School (JK to 5<sup>th</sup> grade);(ii) 450 students in the Vassal Lane Upper School (6<sup>th</sup> to 8<sup>th</sup> grade, including 75 SEI students); (iii) 68 students in the (ASD) Program (including the two schools); (iv) 45 students in Special Start and (v) 80 students in the Department of Human Services Programs (DHSP) Preschool.

- › **Figure A** presents a regional site location map
- › **Figure B** presents the project site
- › **Figure C** presents the Existing Site Plan
- › **Figure D** presents the Proposed Site Plan
- › **Figure E** presents the study area intersections

As shown in **Figure B**, the Project Site (including the existing school building and the Father Callanan Park) is bounded by Concord Avenue to the north, existing buildings followed by Fresh Pond Parkway to the west, Alpine Street residents to the east and Vassal Lane to the south. The existing Project Site has registered for 60 vehicle parking spaces (although up to 80 cars have been observed to regularly park in the off-site parking lot). The existing site provides

short-term bicycle parking racks at the schools’ entrance, along the drop-off area in front of the school off Vassal Lane. No long-term bicycle parking is provided at the existing school.

Existing student activity, including school bus drop-off/pick-up, parent drop-off/pick-up and bicycle parking, is accommodated and administered from Vassal Street, with parent pick-up and drop-off activity also occurring along the neighborhood roadways where resident parking is provided. The proposed Project will include the expansion of existing school enrollment and supporting services and staff to serve existing and proposed student populations. The school’s total population in staffing and student enrollment are expected to increase with the new school implemented and fully occupied. **Table 1** summarizes those anticipated changes, which are broken out by school program/components

**TABLE 1: PROPOSED SITE USE EXPANSION: STUDENT ENROLLMENTS + STAFFING**

School Program/Component	Existing Condition	Proposed Condition	Incremental Change
Tobin Montessori <sup>1</sup>	312	336	+24
Vassal Lane Upper School <sup>1</sup>	283	450	+167
Special Programs <sup>1</sup>	23 (approx. ½ at Tobin and ½ at Vassal)	109 (approx. 43 at Tobin and 66 at Vassal)	+90
Community School <sup>1</sup>	0	80	+80
<b>Total Student Enrollment</b>	<b>618</b>	<b>975</b>	<b>+361</b>
<b>Total Staffing</b>	<b>212</b>	<b>284</b>	<b>+72</b>

<sup>1</sup> Each school program measured in the number of student enrollments

The proposed vehicular parking spaces and long-term bicycle spaces will be accommodated in a single-level, underground garage. Short-term bicycle parking spaces will be located at building entrances. The bicycle parking will comply with the City’s Bicycle Parking Guidelines.

Details of the proposed parking program (bicycle + vehicle) and transportation elements are presented in **Table 2**.

**TABLE 2: PROPOSED PARKING + TRANSPORTATION PROJECT ELEMENTS**

<b>Transportation Element</b>	<b>Existing Conditions</b>	<b>Proposed Conditions</b>	<b>Incremental Change</b>
<b>Staff Parking Spaces</b>	60 Parking Spaces (observed occupancy of 80 vehicles) <sup>1</sup>	100 Parking Spaces	+20 Parking Spaces (from the observed existing occupancy)
<b>Parent Drop-off/Pick-up Activity</b>	No designated parking location – parents occupy on-street residential parking	On-site accommodations provided in underground short-term drop-off/pick-up and queueing area: 50 spaces	+ 50 spaces (for short-term drop-off/pick-up)
<b>Buses and Vans</b>	Drop-off loop provided off Vassal (two curb-cuts)	Drop-off loop provided off Vassal (single curb-cut)	n/a
<b>Long-term Bicycle Parking Spaces (for Staff)<sup>2</sup></b>	0 long-term bike parking spaces	0.30 per classroom OR 0.015 per auditorium seat <i>(whichever is greater)</i>  18 long-term bike parking spaces	+ 18 spaces
<b>Short-term Bicycle Parking Spaces (for Parents, Students and Visitors)<sup>2</sup></b>	~40 short-term bike parking spaces	1.70 per classroom OR 0.085 per auditorium seat <i>(whichever is greater)</i>  102 short-term bike parking spaces	+62 spaces

<sup>2</sup> City of Cambridge Zoning Ordinance Article 6.000 – based on # of classrooms (60 classrooms per Feasibility Study) which yields a greater (auditorium will seat approx. 625 people)

<sup>1</sup> As indicated on March 2019 VHB observations

## Transportation Improvements and Mitigation

The conduct of this Traffic Assessment, including the assessment of Existing and Future Conditions, collaborative interaction with the City of Cambridge Public Schools, parents, neighbors, and the design team were conducted to clearly understand existing school operations, identify access challenges and opportunities, and to provide detailed input into the design of the new school regarding the framework of future school transportation conditions and operations. This included an in-depth analysis of parent drop-off/pick-up needs, school bus operations, pedestrian amenities, parking demand, and loading and service operations., and strengthened transportation demand management (TDM) actions. The outcome of this study identified measures that should be strongly considered and incorporated into the Project. As a result, the Project will implement the following important infrastructure provisions:



- The parent drop-off/pick-up area will be designed to accommodate all future demand needs on-site. That facility will be located in the basement level of the new school to eliminate drop-off activities on-street as well as conflicts with important school bus drop-off/pick-up operations.
- The drop-off/pick-up facility will be designed to take into account the need to accommodate short-term drop-off activity that is generally associated with older students, as well as short-term parking for younger students that are required to be walked into the school classroom by their parent or guardian.
- The facility has been designed to absorb queuing internally and keep queues from backing outside of the building and onto Vassal Lane.
- Staff parking will be increased from 80 spaces to 100 spaces to support future increases in employment that are expected.
- The staff parking and parent drop-off/pick-up facility are being provisioned in the basement level of the new school to maximize contiguous playing field and open space opportunities.
- The basement level transportation improvements will be accessed via a ramp connection at the intersection of Vassal Lane and Standish Street. This will allow for traffic dispersion opportunity among multiple connecting streets.
- This intersection will be carefully designed to account for the importance of strong pedestrian connectivity and safety measures to limit pedestrian/vehicle conflicts. A crossing officer will be stationed at this location (and many others) during school arrival and dismissal times.
- The school will be supported by a dedicated school bus loop on the western side of the site. This loop will be dedicated to bus use only during school arrival and dismissal and can accommodate up to 8 buses.
- The bus loop will also serve as the access point to loading and service activity – which will be scheduled to occur at times that do not overlap with bus operations.
- The site will have two primary pedestrian access paths through the school property – both connecting Vassal Lane to Concord Avenue on the east and west with access to the school and adjacent playing fields and open space.
- These pedestrian connections are complemented by a significant investment in the recent construction of new sidewalks, ADA ramps and crosswalks along both Vassal Lane and Concord Avenue, as well as many of the other adjacent neighborhood and cross streets to these two corridors by the City of Cambridge.
- The school will have ample long- and short-term bicycle parking spaces to comply with Article 6.100 of the City of Cambridge Zoning Ordinance
- A Bluebikes station will also be accommodated on site near the school entrance.
- As the design advances, consideration will be given to implementing the following traffic and pedestrian safety improvements in connection with the Project;
  - Radar embedded school zone flashers along Vassal Lane adjacent to the Project.
  - Advanced intersection warnings prior to/at the intersections of Vassal Lane/Standish Street and Concord Avenue/Fern Street.

The results of the transportation assessment indicate that traffic operations with the Project will not result in significant changes to delay in traffic at surrounding intersections. The planned improvements

described above will result in substantially improved transportation operations at the School and along adjacent streets.

# Planning Board Criteria Summary

Based on the Traffic Assessment 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 Traffic Assessment, and the Planning Board Criteria Performance Summary is presented below.



**Planning Board Permit**

**Number:** \_\_\_\_\_

**PROJECT**

Project Name: Tobin Montessori School + Vassal Lane Upper School  
 Project Address: 197 Vassal Lane  
 Cambridge, MA 02138  
 Owner/Developer Name: City of Cambridge Public School Department  
 Contact Person: Brendan Roy, Construction Program Manager  
 Contact Address: 795 Massachusetts Avenue Cambridge, MA 02139  
 Contact Phone Number: (857) 998-7312

**SIZE**

Sq. Ft. : 330,000 sf (net-increase of +361 students and +72 staff)  
 Land Use Type: School

**PARKING**

Existing Parking Spaces*:	60 parking spaces	Use: School – Staff Parking
Existing Parking Occupancy:	80 vehicles (parked during the day)	Use: School – Staff Parking
New Staff Parking Spaces**:	100	Use: School – Staff Parking
Net New Parking Spaces***:	+20	Use: School – Staff Parking

\*Existing registered parking spaces for project site  
 \*\*Proposed underground parking garage  
 \*\*\*New parking spaces beyond the existing parking occupancy

**TRIP GENERATION:**

	Daily	AM (Commuter) Peak Hour / AM Peak Student Arrival Hour	Afternoon Peak Student + Staff Departure Hour	PM (Commuter) Peak Hour
Net-New Vehicle Trips	n/a	129	21	72

**MODE SPLIT**

	TMVLUS Staff
Auto	71% SOV / 4% HOV
Transit	9%
Walk	8%
Bicycle	6%
Other	2%



**TRANSPORATION**  
**CONSULTANT**

Company Name: VHB, Inc.  
 Contact Name: Sean M. Manning, PE, PTOE  
 Contact Phone Number: (617) 607-2971

Date of Building Permit  
 Approval: \_\_\_\_\_

**Total Data Entries = 275    Total Number of Criteria Exceedances = 25 (9.0%)**

**Criteria A –Project Vehicle Trip Generation**

Time Period	Criteria (trips)	Build (Net-New)	Exceeds Criteria?
Weekday Daily	2,000	n/a	No
Morning Peak Hour <sup>1</sup>	240	129	No
Afternoon Peak Hour <sup>2</sup>	n/a	21	n/a
Evening Peak Hour <sup>3</sup>	240	72	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

**Criteria B – Vehicular Level of Service**

Intersection	Morning Peak Hour <sup>1</sup>				Afternoon Peak Hour <sup>2</sup>				Evening Peak Hour <sup>3</sup>			
	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?
1. Concord Avenue at Birch Street	D	D	1%	No	C	C	1%	No	D	D	1%	No
2. Concord Avenue at Fern Street	A	A	1%	No	A	A	1%	No	A	A	1%	No
3. Concord Avenue at Corporal Burns Road	C	C	1%	No	C	C	1%	No	D	D	1%	No
4. Concord Avenue at Alpine Street	B	B	1%	No	B	B	1%	No	B	B	1%	No



Intersection	Morning Peak Hour <sup>1</sup>				Afternoon Peak Hour <sup>2</sup>				Evening Peak Hour <sup>3</sup>			
	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?
5. Concord Avenue at Chilton Street	D	D	1%	No	C	C	1%	No	F	F	1%	No
6. Concord Avenue at Fayerweather	F	F	1%	No	D	D	1%	No	F	F	1%	No
7. Fresh Pond Parkway at Vassal Lane	D	D	1%	No	B	B	0%	No	C	C	1%	No
8. Vassal Lane at Lakeview Avenue	A	A	23%	No	A	A	3%	No	A	A	11%	No
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	A	B	39%	No	A	A	-13%	No	A	A	2%	No
10. Vassal Lane at TMVLUS Bus Loop (Exit) (Eliminated in the Build + Future)	A	-	-	No	A	-	-	No	A	-	-	No
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	A	A	48%	No	A	A	35%	No	A	A	40%	No
12. Vassal Lane at Alpine Street	B	B	21%	No	A	A	10%	No	A	B	18%	No
13. Vassal Lane at Chilton Street	B	C	15%	No	B	B	7%	No	B	B	10%	No
14. Vassal Lane at Fayerweather Street	B	B	10%	No	A	A	6%	No	B	B	7%	No
15. Fresh Pond Parkway at Lexington Avenue	E	F	1%	No	C	C	0%	No	C	C	1%	No
16. Lexington Avenue at Worthington Street	A	A	10%	No	A	A	2%	No	A	A	4%	No



Intersection	Morning Peak Hour <sup>1</sup>				Afternoon Peak Hour <sup>2</sup>				Evening Peak Hour <sup>3</sup>			
	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?
17. Lakeview Avenue at Worthington Street	A	B	21%	No	A	A	4%	No	A	A	10%	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

### Criteria C – Traffic on Residential Streets

Roadway	Reviewed Segment	Amount of Residential	Morning Peak Hour			Afternoon Peak Hour			Evening Peak Hour		
			2020 Existing *	Project Trips	Exceeds Criteria?	2020 Existing *	Project Trips	Exceeds Criteria?	2020 Existing *	Project Trips	Exceeds Criteria?
Concord Avenue	West of Birch St										
	Birch St to Fern St	1/3 or less	1,160	12	No	944	5	No	1,246	7	No
	Fern St to Corporal Burns St	1/2 or more	1,181	12	No	915	5	No	1,273	7	No
	Corporal Burns St to Alpine St	1/3 or less	1,164	12	No	898	5	No	1,179	7	No
	Alpine St to Chilton Street	>1/3 but <1/2	1,167	12	No	904	5	No	1,194	7	No
	Chilton St to Fayerweather St	1/2 or more	1,143	12	No	927	5	No	1,211	7	No
	East of Fayerweather St	1/2 or more	1,120	12	No	919	5	No	1,198	7	No
Vassal Lane	Fresh Pond Parkway to Lakeview Ave	1/2 or more	1,023	0	No	853	0	No	1,122	0	No
	Lakeview Ave to Standish St	1/3 or less	96	16	No	89	2	No	109	7	No
	Standish Street to Alpine St	1/2 or more	168	7	No	117	-38	No	153	-5	No
	Alpine St to Chilton Street	1/2 or more	230	58	Yes	108	13	No	149	36	Yes
	Chilton St to Fayerweather St	1/2 or more	281	58	Yes	125	13	No	202	36	Yes
Fresh Pond Parkway	East of Fayerweather	1/2 or more	383	58	Yes	189	13	No	370	36	Yes
	North of Vassal Lane	1/3 or less	317	35	Yes	93	6	No	144	22	Yes
	Vassal Lane to Lexington Ave	1/3 or less	2,415	19	No	1,784	2	No	2,089	7	No
Birch Street	South of Lexington Ave	1/3 or less	2,449	35	No	1,801	4	No	2,112	14	No
	North of Concord Ave	1/3 or less	2,368	16	No	1,732	2	No	2,060	7	No
Fern Street	North of Concord Ave	1/3 or less	35	0	No	67	0	No	64	0	No
Corporal Burns Road	North of Concord Ave	1/2 or more	41	0	No	41	0	No	136	0	No
Alpine Street	North of Concord Ave	1/2 or more	20	0	No	20	0	No	21	0	No

	Concord Ave to Vassal Lane	1/2 or more	51	0	No	17	0	No	53	0	No
Chilton Street	North of Concord Ave	1/2 or more	19	0	No	44	0	No	88	0	No
	Concord Ave to Vassal Lane	1/2 or more	71	0	No	24	0	No	68	0	No
	South of Vassal Lane	1/2 or more	31	0	No	39	0	No	100	0	No
Fayerweather Street	North of Concord Ave	1/2 or more	28	0	No	15	0	No	47	0	No
	Concord Ave to Vassal Lane	1/2 or more	236	12	No	89	5	No	271	7	No
	South of Vassal Lane	1/2 or more	235	12	No	125	3	No	188	7	No
Lexington Avenue	Fresh Pond Parkway to Worthington St	1/3 or less	171	19	No	122	2	No	130	7	No
	South of Worthington St	1/2 or more	138	0	No	113	0	No	110	0	No
Worthington Street	Lexington Ave to Lakeview Ave	1/2 or more	58	19	No	18	2	No	65	7	No
Lakeview Avenue	Vassal Lane to Worthington St	1/2 or more	161	33	Yes	110	4	No	150	15	No
	South of Worthington St	1/2 or more	113	14	No	93	2	No	93	8	No
Standish Street	South of Vassal Lane	1/2 or more	171	22	No	37	3	No	42	14	No

\* Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added

### Criteria D – Length of Vehicle Queue at Signalized Intersections

Intersection	Lane	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
4. Concord Avenue at Alpine Street	Concord Avenue Eastbound - Thru/Right	6	6	No	3	3	No	8	8	No
	Concord Avenue Westbound - Left/Thru	3	3	No	3	3	No	2	2	No
	Alpine Street Southbound – Left/Thru/Right	1	1	No	1	1	No	1	1	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

Note: 1 vehicle = 25 feet

### Criteria E – Signalized Intersection PLOS Summary

Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?
4. Concord Avenue at Alpine Street	East	A	A	No	A	A	No	A	A	No
	West	A	A	No	A	A	No	A	A	No
	North	C	C	No	C	C	No	C	C	No
	South	C	C	No	C	C	No	C	C	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour



### Criteria E – Unsignalized Intersection PLOS Summary

Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?
1. Concord Ave at Birch Street	North	A	A	No	A	A	No	A	A	No
2. Concord Ave at Fern Street	North	A	A	No	A	A	No	A	A	No
	East	F	F	<b>Yes</b>	F	F	<b>Yes</b>	F	F	<b>Yes</b>
	West	F	F	<b>Yes</b>	F	F	<b>Yes</b>	F	F	<b>Yes</b>
3. Concord Ave at Corporal Burns Road	North	A	A	No	A	A	No	A	A	No
5. Concord Ave at Chilton Street	North	A	A	No	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
6. Concord Ave at Fayerweather Street	North	A	A	No	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
	East	F	F	<b>Yes</b>	E	E	<b>Yes</b>	F	F	<b>Yes</b>
	West	F	F	<b>Yes</b>	E	E	<b>Yes</b>	F	F	<b>Yes</b>
7. Fresh Pond Parkway at Vassal Lane	East	A	A	No	A	A	No	A	A	No
8. Vassal Lane at Lakeview Avenue	South	A	A	No	A	A	No	A	A	No
	West	A	A	No	A	A	No	A	A	No
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	North	A	A	No	A	A	No	A	A	No
10. Vassal Lane at TMVLUS Bus Loop (Exit) (Eliminated in the Build + Future)	North	A	B	<b>Yes</b>	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
	East	B	B	No	A	A	No	A	A	No
	West	A	A	No	A	A	No	A	A	No
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	North	A	-	No	A	-	No	A	-	No
12. Vassal Lane at Alpine Street	North	A	A	No	A	A	No	A	A	No
13. Vassal Lane at Chilton Street	North	A	A	No	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No



Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?
	East/West	B	C	Yes	A	A	No	B	B	No
14. Vassal Lane at Fayerweather Street	North	A	A	No	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
	East	A	A	No	A	A	No	A	A	No
	West	A	A	No	A	A	No	A	A	No
15. Fresh Pond Parkway at Lexington Avenue	East	A	A	No	A	A	No	A	A	No
16. Lexington Avenue at Worthington Street	South	A	A	No	A	A	No	A	A	No
	East	A	A	No	A	A	No	A	A	No
17. Lakeview Avenue at Worthington Street	West	A	A	No	A	A	No	A	A	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

### Criteria E – Pedestrian and Bicycle Facilities

Adjacent Street	Link (between)	Sidewalk or Walkway Present	Exceeds Criteria?	Bicycle Facilities or Right of Ways Present	Exceeds Criteria?
Concord Avenue	Birch Street to Alpine Street	Yes	No	No	Yes
Vassal Lane	Lakeview Avenue to Alpine Street	Yes	No	No	Yes

# Traffic Assessment

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

## 1.0 Inventory of Existing Conditions

### 1.a Roadways

The Project Site (including the existing school building and the Father Callanan Park) is bounded by Concord Avenue to the north, existing buildings followed by Fresh Pond Parkway to the west, Alpine Street residents to the east and Vassal Lane to the south in the West Cambridge neighborhood. **Figure B**, previously presented, shows the roadway network surrounding the Project site.

Vassal Lane is an east-west one-way eastbound roadway that extends from Fresh Pond Parkway in the west to Huron Avenue in the east. Concord Avenue is an east-west two-way roadway that extends from Fresh Pond Parkway in the west to Garden Street in the east. Alpine Street is a north-south one-way southbound roadway that extends from Concord Avenue in the north to Vassal Lane in the south. Fresh Pond Parkway is a north-south two-way roadway that extends from Concord Avenue in the north to Memorial Drive in the south.

## 1.b Intersections

The Project study area includes the following 15 study intersections which are presented in **Figure E** and illustrated in more detail in **Figure 1.b.1 through Figure 1.b.15**. The study area intersections are listed below:

1. Concord Avenue at Birch Street
2. Concord Avenue at Fern Street
3. Concord Avenue at Corporal Burns Road
4. Concord Avenue at Alpine Street (signalized)
5. Concord Avenue at Chilton Street
6. Concord Avenue at Fayerweather Street
7. Fresh Pond Parkway at Vassal Lane
8. Vassal Lane at Lakeview Avenue
9. Vassal Lane at TMVLUS Parking Driveway
10. Vassal Lane at TMVLUS Bus Loop (Exit)
11. Vassal Lane at Standish Street/TMVLUS Bus Loop (Entrance)
12. Vassal Lane at Alpine Street
13. Vassal Lane at Chilton Street
14. Vassal Lane at Fayerweather Street
15. Fresh Pond Parkway at Lexington Avenue
16. Lexington Avenue at Worthington Street
17. Lakeview Avenue at Worthington Street

## 1.c Parking

### Off-Street Vehicular Parking

The existing site is registered with 60 vehicle parking spaces; (although up to 80 cars have been observed to regularly park in the off-site parking lot).. Vehicle access is provided on Vassal Lane either (1) by the drop-off/pick-up "loop" – a one-way westbound driveway that enters at Vassal Lane at Standish Street and exits approximately 200 feet west on Vassal Lane after passing by the front entrance to the existing school, the existing "drop-off/pick-up loop" or (2) by the staff parking lot driveway – which is located along the most western edge of the site.

Staff Parking - The staff parking lot is provided northwest of the existing building and is accessed by a curb cut on Vassal Lane. The curb cut and driveway to the staff parking lot travels along the southern portion of the west edge of the site.

School Bus Parking - School buses park within the drop-off/pick-up loop off Vassal Lane.

Parent Parking – Parents typically do not park on-site but when they do, they occasionally use space in the drop-off/pick-up loop off Vassal Lane. Otherwise, they were generally observed

occupying on-street spaces along adjacent and other nearby neighborhood roadways where resident parking is provided. Parent parking is mostly short-term parking during morning arrival and afternoon dismissal periods.

**On-Street Vehicular Parking**

**Figure 1.c.1** illustrates the existing on-street parking regulations surrounding the Project Site. The majority of on-street parking surrounding the study area is resident permit parking.

Parent Parking – Parents typically park on-street in available residential parking. Parent drop-off/pick-ups differ between student populations that differ in age from very short dwell times (under 30 seconds) to several minutes for younger age students whose parents walk them into the building, then return to their car to depart.

**Bicycle Parking**

The existing site provides some short-term bicycle parking racks at the schools’ entrance, along the drop-off area in front of the school off Vassal Lane. No long-term bicycle parking is provided at the existing school. Many students bicycle to school, with existing bike racks used beyond their intended capacity (as noted during a VHB site visit on Tuesday, March 5, 2019).

**BlueBikes Services**

Throughout Metro Boston there are more than 3,000 public bikes available as part of the BlueBikes bike share program at more than 300 stations. More specifically, there are two BlueBikes stations within an approximate five-minute walk from the Project site. These BlueBikes stations include Vassal Lane at Tobin/VLUS which is located on the Project Site and nearby at Fresh Pond Reservation. The BlueBikes station locations and their respective dock capacities are summarized in **Table 1.c.1.** and illustrated in **Figure 1.c.2.**

**TABLE 1.c.1 BLUEBIKES STATIONS**

<b>Station Location</b>	<b># of Docks</b>
Vassal Lane at Tobin/VLUS	19
Fresh Pond Reservation	17

Source: Bluebikes.com/system-data – May 8, 2020

## 1.d Public Transit Services (MBTA) and School Buses

### Public Transit Services (MBTA)<sup>1</sup>

The Project area is accessible by several Massachusetts Bay Transportation Authority (MBTA) Bus lines. A graphical illustration of study area transit lines is presented in **Figure 1.d.1** (Existing Public Transportation Services) and summarized in the following sections.

#### MBTA Red Line

Both the Alewife and Porter Square MBTA Stations are located just over a mile away from the project site. The stations each provide access to the MBTA's Red Line providing service to Alewife to the northeast, downtown Boston and Braintree and Ashmont to the south. The Red Line connects with the Green Line at Park Street and the Orange and Silver Lines at Downtown Crossing. Connections to all southern commuter rail lines, the Red Line and Silver Line are made at South Station. In addition, the Fitchburg commuter rail line connects with the Red Line at Porter Square. The Red Line operates from approximately 5:08 AM to 12:30 AM on weekdays with approximately 4.5-minute headways during peak hours. Saturday service is from 5:09 AM to 12:30 AM, and Sunday service is from 6:00 AM to 12:30 AM.

#### MBTA Better Bus Project

In December 2019 the MBTA enacted several changes to bus routes 72, 74, 75, and 78 as part of its Better Bus Project. Service on MBTA Route #72 is reduced, but those resources have been reallocated to MBTA Route #75 to provide a greater combined frequency along Huron Avenue. MBTA Route #74 has been modified to serve two fewer stops in Belmont, but along with Route #78 operates with a greater combined frequency along Concord Avenue.

#### Route 72 – Aberdeen Ave – Harvard Station

MBTA Route #72 connects Aberdeen Avenue and Harvard Square via Concord Avenue and Huron Avenue. The nearest bus stop to the Project Site is located at the corner of Huron Avenue and Lakeview Avenue. Various stops along this route connect with other bus lines and the Red Line. The bus route operates inbound-only to Harvard Square from 6:55 AM to 9:42 AM on weekdays, and outbound-only to Aberdeen Ave. & Mt. Auburn from 2:50 PM to 7:17 PM, with 15-30 minute headways during peak hours. There is no weekend service for this route.

#### Route 74 – Belmont Center – Harvard Station

MBTA Route #74 connects Belmont Center and Harvard Square in Cambridge via Concord Avenue. The nearest bus stop to the Project Site is located at the corner of Concord Avenue



<sup>1</sup> MBTA Rapid Transit and Bus schedules effective August 30, 2020.

and Alpine Street. Various stops along this route connect with other bus lines and the Red Line. The bus route runs on weekdays from 5:10 AM to 1:22 AM with 11 – 20-minute headways during peak hours. On Saturday, service runs from 5:54 AM to 7:19 PM, and there is no service on Sunday.

#### Route 75 – Belmont Center – Harvard Station

MBTA Route #75 connects Belmont Center and Harvard Square in Cambridge via Huron Avenue. The nearest bus stop to the Project Site is located at the corner of Huron Avenue and Lakeview Avenue. Various stops along this route connect with other bus lines and the Red Line. The bus route runs on weekdays from 5:20 AM to 11:19 PM with 11 – 20-minute headways during peak hours. On Saturday, service runs from 5:20 AM to 1:35 AM, and Sunday service is from 6:20 AM to 10:15 PM.

#### Route 78 Arlmont Village – Harvard Station

MBTA Route #78 connects Arlmont Village and Harvard Station via Concord Avenue and the Concord Turnpike in Cambridge. The nearest bus stop to the Project Site is located at the corner of Concord Avenue and Alpine Street. Various stops along this route connect with other bus lines and the Red Line. The bus route runs on weekdays from 5:35 AM to 12:54 AM with 20 – 40-minute headways. On Saturday, service runs from 6:25 AM to 12:57 AM, and Sunday service runs from 6:10 AM to 1:01 AM.

### **School Bus Stops**

The school bus activity occurs along Vassal Lane. The drop-off/pick-up loop off Vassal Lane is used as a pick-up/drop-off location for school buses that serve the schools. Up to 8 buses serve the Tobin and Vassal School students.

Students that are transported in specialty vans or buses, also access the site via the drop-off/pick-up loop off Vassal Lane, and load/unload students at building's entrance.

## **1.e Land Use**

**Figure 1.e.1** illustrates land uses in the area surrounding the Site. Outside of the education use of the school, the immediate neighborhood is largely characterized by residential uses, while the surrounding area along Fresh Pond Parkway and north of Concord Avenue incorporates some commercial spaces.

## **2.0 Data Collection**

In order to perform and submit a traffic assessment, a 2020 Existing Conditions traffic volume network had to be established and agreed upon amongst the City's Traffic, Parking and Transportation Department and VHB that would serve as a baseline for a vehicular capacity analysis and to properly evaluate planning board criteria. As a result of the COVID-19

pandemic, traffic patterns are atypical; thus, conducting new traffic counts would not capture representative typical traffic patterns and volumes. However, VHB has explored the use of available counts and an alternative way to generate volumes to represent the area's traffic.

After consultation with the City's Traffic, Parking and Transportation Department, a combination of recent area peak period traffic counts and supplemental StreetLight Data was deemed as the best fit source to arrive at the 2020 Existing Conditions. A memo detailing the use of StreetLight data and the arrival at this source as the best fit for this project is provided in the **Appendix**.

Street Light Data uses smartphone applications with geolocation to measure activity on the transportation network and provide transportation metrics. The specific data used for the data collection in the following sections was collected over the course of Tuesdays, Wednesdays, and Thursdays in September 2019 through February 2020 (typical travel conditions pre-Pandemic).

## **2.a ATR Counts**

As a result of the limitations of StreetLight Data, 48-hour Automatic Traffic Recorder (ATR) counts were not conducted to capture existing daily vehicle volumes within the Project study area.



## 2.b Intersection Turning Movement Counts

### Vehicle Volumes

VHB developed peak period Turning Movement Counts (TMCs) for vehicles at the study area intersections. The study area intersections are listed below and were presented previously graphically in **Figure E**:

1. Concord Avenue at Birch Street
2. Concord Avenue at Fern Street
3. Concord Avenue at Corporal Burns Road
4. Concord Avenue at Alpine Street (signalized)
5. Concord Avenue at Chilton Street
6. Concord Avenue at Fayerweather Street
7. Fresh Pond Parkway at Vassal Lane
8. Vassal Lane at Lakeview Avenue
9. Vassal Lane at TMVLUS Parking Driveway
10. Vassal Lane at TMVLUS Bus Loop (Exit)
11. Vassal Lane at Standish Street/TMVLUS Bus Loop (Entrance)
12. Vassal Lane at Alpine Street
13. Vassal Lane at Chilton Street
14. Vassal Lane at Fayerweather Street
15. Fresh Pond Parkway at Lexington Avenue
16. Lexington Avenue at Worthington Street
17. Lakeview Avenue at Worthington Street

The results of these counts indicate that the overall weekday traffic peak hour in the study area occur between 7:00 AM - 8:00 AM and 5:00 PM – 6:00 PM. However, for the purposes of capturing all peak school and commuter activity the following peak hours are studied in this traffic assessment:

- › Morning (Commuter) Peak / Morning Peak Student Arrival Hour: **7:00 - 8:00 AM**
- › Afternoon Peak Student + Staff Departure Hour: **2:00 - 3:00 PM**
- › Evening (Commuter) Peak Hour: **5:00 - 6:00 PM**

The morning (commuter) peak hour occurs before school starts due to the gradual and continuous arrival of parent drop-offs and staff arrival. The afternoon student + staff departure peak hour does not coincide with the commuter peak hours, but represents the period in the afternoon where the highest traffic condition is generated by the school. The evening (commuter) peak hour does not coincide with the school's peak activity though some parent pick-up occurs during this time. This period of time has lower school traffic conditions, but area traffic is higher.

Existing condition vehicular volumes at study intersections are summarized in **Figures 2.b.1 through 2.b.3** for the morning, afternoon and evening peak hours, respectively.

Detailed count sheets are included in the **Appendix**.

### **Queueing Observations**

Though the current City of Cambridge Guidelines for Traffic Impact Studies, requires queue observations be conducted at signalized intersections, preferably during the time turning movement counts are conducted, this was not feasible at this time. Queue observations during the time of the COVID-19 pandemic would lead to a misrepresentation of typical existing conditions, therefore queueing observations were not conducted. A detailed queueing analysis is provided in **Section 7**.

### **Pedestrian + Bicycle Volumes**

Since StreetLight data was used to support the development of Existing 2020 vehicle volumes, rather than standard traffic counts which provide TMC's for vehicles, pedestrians, and bicycles, VHB made assumptions about typical bicycle and pedestrian volumes at the study area intersections that would represent a conservatively typical weekday based on other limited, traditional count information that was available.

These assumptions were based in part on traffic counts at the Sozio Rotary as presented in the 55 Wheeler Certified TIS paired with March 2019 VHB observations of existing school conditions.

Pedestrian and bicycle volumes at study intersections are summarized in **Figure 2.b.4** for the morning, afternoon and evening peak hours.

## **2.c Crash Analysis**

Study area data were obtained from both MassDOT records and the City of Cambridge Police Department for the most recent three-year period of available data, January 2015 through December 2017. Analysis of the crash data is summarized in **Table 2.c.1** and includes the calculated crash rates (number of reported crashes per million entering vehicles) based on the evening peak traffic volumes. A detailed summary by crash type is presented in the **Appendix**.

**TABLE 2.C.1 CRASH ANALYSIS SUMMARY (JANUARY 2015 – DECEMBER 2017)**

<b>Location</b>	<b>Total Crashes (3-year period)</b>	<b>Crashes Involving Pedestrians</b>	<b>Crashes Involving Bicycles</b>	<b>MassDOT Average Crash Rate</b>	<b>Calculated Crash Rate</b>	<b>Exceeds?</b>
<b>1.</b> Concord Avenue at Birch Street	5	1	0	0.52	0.32	N
<b>2.</b> Concord Avenue at Fern Street	2	0	0	0.52	0.12	N
<b>3.</b> Concord Avenue at Corporal Burns Road	1	0	0	0.52	0.07	N
<b>4.</b> Concord Avenue at Alpine Street (signalized)	2	1	0	0.71	0.13	N
<b>5.</b> Concord Avenue at Chilton Street	1	0	0	0.52	0.06	N
<b>6.</b> Concord Avenue at Fayerweather Street	4	0	0	0.52	0.25	N
<b>7.</b> Fresh Pond Parkway at Vassal Lane	0	0	0	0.52	0.00	N
<b>8.</b> Vassal Lane at Lakeview Avenue	1	0	0	0.52	0.40	N
<b>9.</b> Vassal Lane at TMVLUS Parking Driveway	0	0	0	0.52	0.00	N
<b>10.</b> Vassal Lane at TMVLUS Bus Loop (Exit)	0	0	0	0.52	0.00	N
<b>11.</b> Vassal Lane at Standish Street/TMVLUS Bus Loop (Entrance)	0	0	0	0.52	0.00	N
<b>12.</b> Vassal Lane at Alpine Street	1	0	0	0.52	0.41	N
<b>13.</b> Vassal Lane at Chilton Street	2	0	0	0.52	0.44	N
<b>14.</b> Vassal Lane at Fayerweather Street	0	0	0	0.52	0.00	N
<b>15.</b> Fresh Pond Parkway at Lexington Avenue	4	0	0	0.52	0.15	N

Location	Total Crashes (3-year period)	Crashes Involving Pedestrians	Crashes Involving Bicycles	MassDOT Average Crash Rate	Calculated Crash Rate	Exceeds?
16. Lexington Avenue at Worthington Street	0	0	0	0.52	0.00	N
17. Lakeview Avenue at Worthington Street	1	0	0	0.52	0.54	Y

Source: Crash history records of MassDOT and Cambridge Police Department

Crash rates in **Table 2.c.1** were calculated based on the number of crashes relative to the volume of traffic traveling through the intersections on a daily basis. These crash rates were then compared to the average MassDOT’s District 6 rates. Rates that exceed MassDOT’s average for crashes could indicate safety or geometric deficiencies at a particular intersection. The latest published average crash rates by MassDOT in District 6, are 0.71 for signalized intersections and 0.52 for unsignalized intersections.

The intersection of Lakeview Avenue at Worthington Street was found to exceed the average crash rates for District 6. Detailed crash data by location is provided in the Appendix.

## 2.d Public Transit

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

**TABLE 2.D.1 EXISTING TRANSIT SERVICE SUMMARY**

Transit Service	Origin – Destination	Weekday Hours of Operation <sup>a</sup>	Peak Hour Headways <sup>a</sup> (Minutes)	Weekday Daily Ridership <sup>b</sup> (Passengers)
<b>Red Line</b>	Alewife – Ashmont/Braintree	5:08 AM – 12:30 AM	4.5 minutes	272,684 <sup>c</sup>
<b>MBTA Bus Route 72</b>	Aberdeen Ave – Harvard Station	In: 6:55 AM – 9:42 AM Out: 2:50 PM – 7:17 PM	15-30 minutes	940
<b>MBTA Bus Route 74</b>	Belmont Center – Harvard Station	5:10 AM – 1:22 AM	11-20 minutes	810
<b>MBTA Bus Route 75</b>	Belmont Center – Harvard Station	5:20 AM – 11:19 PM	11-20 minutes	475
<b>MBTA Bus Route 78</b>	Arlmont Village – Harvard Station	5:35 AM – 12:54 AM	18-30 minutes	1,555

a Source: MBTA Fall 2020 Schedule – effective August 30, 2020

b Daily ridership from MBTA Ridership Load Profile Fall 2018

c Ashmont/Braintree ridership data is combined

## 2.e Parking

On-site parking occupancies were reviewed by VHB staff during a site visit on Tuesday, March 5, 2019 to quantify existing conditions. The observations indicated the staff parking surface lot provides approximately 60 striped parking spaces which are heavily used throughout the school day. Observations indicate that staff would make use of excess space both in the lot and along the staff parking lot driveway and park vehicles exceeding the lot’s striped capacity (up to 80 parked vehicles).

## 2.f School Activity Observations + Data Collection

During March 2019 observations, VHB also conducted observations of existing school activity at the site to assist the design team in understanding school operations, identify access challenges and opportunities, and to provide guidance and input regarding the framework of future transportation conditions and operations at the school. A detailed memorandum summarizing the VHB observations is provided in the **Appendix**.

Prior to observations, the principals outlined the following student and staff profiles:

### Tobin Montessori School: Student + Staff Profile

- › There are approximately 320 students ages 3 – 11 years old in Pre-K – Grade 5.
- › Students begin to arrive at 7:15, when breakfast is provided by the school. The school day begins at 7:55 AM and ends at 1:55 PM.
- › There are approximately 70 staff.

- › Staff begin to arrive before 7:00 AM, but most arrive between 7:10 and 7:30. Most staff leave after the school day ends and their bus duties are finished.
- › Afterschool program (through Cambridge Department of Human Service Programs (DHSP)) runs Monday – Friday from 1:55 PM to 6:00 PM.
- › There are many parents who bring their students to school in cars, park, and walk their students into the school. This is required for students who are 3 years old only, although many parents of students ages 4 and older also park and walk their students in. At dismissal, parents wait for their students in the lobby.

#### Vassal Lane Upper School: Student + Staff Profile

- › There are approximately 300 students ages 11 – 14 years old in Grades 6 – 8.
- › Students begin to arrive at 8:15 AM, when breakfast is provided by the school. The school day begins at 8:55 AM and ends at 2:55 PM.
- › There are approximately 53 staff.
- › Most staff arrive between 8:15 and 8:30. Most staff leave after the school day ends and their bus duties are finished.
- › Afterschool activities take place Tuesday – Thursday from 2:55 PM to 4:30 PM.
- › Students are not typically accompanied by parents into the school; vehicle congestion is therefore much lower compared to the Tobin Montessori School.

#### General Findings

- › Tobin Montessori School arrival and dismissal activity was observed to be heavier and more challenging than that of the Vassal Lane Upper School due to the higher level of parent involvement during these times, which is driven primarily by the younger age profile of those students. Many Tobin Montessori School parents park their cars and walk their students in, creating congested traffic conditions both in the drop-off area as well as along Vassal Lane. Few Vassal Lane Upper School students were walked in by parents, and many students walked by themselves and with other students, resulting in less vehicle traffic attributable to parents.
- › Staggered Tobin Montessori School and Vassal Lane Upper School arrival and dismissal times were highly important to the functionality of traffic operations.

#### Buses + Vans

- › Buses were observed to have limited space within the drop-off/pick-up loop, frequently driving over the curb, maneuvering forwards and backwards to make the turn into the loop or having to wait in Vassal Lane for other vehicles in the loop to clear.
- › Buses were also observed to move very slowly along narrow sections of Vassal Lane where cars were parked on both sides of the street.

- › Bus arrivals were spread out through each respective morning arrival period, which limited long queues of buses in the morning.
- › Up to 8 buses were observed queuing simultaneously at the time of the Tobin dismissal – which is traditionally the first Cambridge School to dismiss in the system.
- › Buses appeared to hold available capacity for increased demand of students and were not fully occupied.

### Walkers

- › The crossing guard was effective helping pedestrians cross at the intersection of Vassal Lane and Standish Street during peak activity levels.

### Bicyclists

- › The majority of bicyclists were observed coming from the neighborhoods to the south and east of the school. Younger students tended to be accompanied by parents, while older students traveled to school alone.
- › The Bluebike station was observed being used for traveling to and leaving the school.

### Parking + Loading

- › The staff parking lot is heavily used; demand exceeds the supply of striped spaces. Cars were observed to be parked in any available space, including along the lot driveway. The number of cars parked in the lot was approximately 80.
- › According to the City of Cambridge, the school is registered for 60 institutional parking spaces (provided by a 1990 parking inventory).
- › Although parking spaces are not striped within the drop-off/pick-up loop at the front entrance, signage indicates there are approximately five accessible parking spaces. As many as 12 cars plus 2 buses were observed to be parked in the loop at one time.
- › The loading dock has space to accommodate one vehicle at a time. Cars were observed to park along the sidewalk along the loading dock driveway.

## **Morning Student Arrival**

The data were broken down into 10 or 15-minute intervals and were categorized by the type of activity (bus, drop off, walking, bicycle, et cetera). One count was treated as one family unit (for example, one drop-off equals one parent car dropping off students, and one walker equals either one family walking together, or one student walking by themselves if not accompanied by an adult). Bus and van arrivals were counted as each vehicle arrived. A summary of the data collection for the morning arrival period is presented in **Tables 2.f.1 and 2.f.2** for each type of activity, shown as a percentage of observations (for example, 90% and 75% of morning student drop-offs for the Tobin Montessori School and Vassal Lane Upper School, respectively, occurred within the drop-off/pick-up loop, followed by drop-offs occurring along Vassal Lane immediately in front of the school).

**TABLE 2.F.1 EXISTING MORNING ARRIVAL ACTIVITY**

	<b>Bus Arrivals (In Loop)</b>	<b>Van Arrivals (In Loop)</b>	<b>Drop-offs</b>	<b>Parent Parks + Walks Student In</b>	<b>Walkers</b>
<b>Tobin Montessori</b>					
<b>7:15 – 7:25 AM</b>	2	0	6	2	4
<b>7:25 – 7:35 AM</b>	2	0	9	4	2
<b>7:35 – 7:45 AM</b>	3	2	11	18	3
<b>7:45 – 7:55 AM</b>	1	0	13	34	3
<b>7:55 – 8:05 AM</b>	0	0	6	10	0
<b>Totals</b>	<b>8</b>	<b>2</b>	<b>45</b>	<b>68</b>	<b>12</b>
			90% Loop 5% Vassal Ln in Front of School 5% Standish St	40% Vassal Ln in Front of School 25% Loop 25% Vassal Ln East of School 10% Standish St	33% Vassal Ln East of School 25% Standish St 25% Pathway 17% Staff Lot or West of School
<b>Vassal Lane Upper School</b>					
<b>8:15 – 8:25 AM</b>	1	0	4	1	7
<b>8:25 – 8:35 AM</b>	2	1	11	2	14
<b>8:35 – 8:45 AM</b>	1	1	15	1	28
<b>8:45 – 8:55 AM</b>	1	1	13	1	17
<b>Totals</b>	<b>5</b>	<b>3</b>	<b>43</b>	<b>5</b>	<b>66</b>
			75% Loop 20% Vassal Ln in Front of School 5% Standish Street	60% Loop 40% On-Street	40% Staff Lot or West of School 30% Pathway 20% Vassal Ln East of School 10% Standish St

Note:

- > Walking students accompanied by parents coming from Vassal Lane east of the school, and from Standish Street, where it was not possible to see if they drove and parked first, were assumed to have driven and parked before walking to the school.



**TABLE 2.F.2 EXISTING MORNING BICYCLE ARRIVAL ACTIVITY**

	Parent with Student <sup>1</sup>	Student Alone	Staff
<b>Tobin Montessori</b>			
<b>7:00 – 7:15 AM</b>	0	0	0
<b>7:15 – 7:30 AM</b>	0	0	1
<b>7:30 – 7:45 AM</b>	3 parents/5 students	1	1
<b>7:35 – 7:45 AM</b>	1 parent/2 students	0	1
<b>7:45 – 8:00 AM</b>	1 parent/1 student	0	0
<b>Totals</b>	<b>5 parents/8 students</b>	<b>1</b>	<b>3</b>
<b>Vassal Lane Upper School</b>			
<b>8:15 – 8:30 AM</b>	0	3	0
<b>8:30 – 8:45 AM</b>	0	6	0
<b>8:45 – 9:00 AM</b>	0	2	0
<b>9:00 – 9:15 AM</b>	0	1	1
<b>Totals</b>	<b>0</b>	<b>12</b>	<b>1</b>

<sup>1</sup> Some parents were observed accompanying multiple students

In order to extrapolate the vehicle trips to arrive at a trip generation estimate for the proposed project, **Figure 2.f.1** depicts the existing conditions school activity during the morning arrival as measured in vehicle trips. This includes a single trip for every arriving staff and two trips (arriving and departing) for every parent dropping off a student(s).

**Afternoon Student Dismissal**

A summary of the data collection for the afternoon dismissal period is presented in **Table 2.f.3**. In the afternoon, there were occasional student drop-offs, likely for after school programs through DHSP. Pick-ups (when the parent waited in the car for the student to come out by themselves) and parents who parked, walked into the school, and walked out of the school with their students to their cars, were grouped together due to the similar vehicle dwelling time associated with each activity.

**TABLE 2.F.3 EXISTING AFTERNOON DISMISSAL ACTIVITY**

	<b>Bus Arrivals</b> (In Loop)	<b>Van Arrivals</b> (In Loop)	<b>Pick-ups</b>	<b>Parent Parks + Walks Student In</b>	<b>Walkers</b>
<b>Tobin Montessori</b>					
<b>1:25 – 1:35 PM</b>	0	1	0	13	0
<b>1:35 – 1:45 PM</b>	1	0	0	13	0
<b>1:45 – 1:55 PM</b>	3	1	0	14	0
<b>1:55 – 2:05 PM</b>	2	1	0	2	1
<b>2:05 – 2:15 PM</b>	2	0	1	1	0
<b>Totals</b>	<b>8</b>	<b>3</b>	<b>1</b>	<b>43</b>	<b>1</b>
			<i>Vassal Lane in Front of School</i>	<i>45% Vassal Ln in Front of School 35% Vassal Lane East of School 15% Standish St 5% Loop</i>	<i>Vassal Ln East of School</i>
<b>Vassal Lane Upper School</b>					
<b>2:35 – 2:45 PM</b>	0	0	0	6	1
<b>2:45 – 2:55 PM</b>	3	1	2	11	0
<b>2:55 – 3:05 PM</b>	2	0	1	2	31
<b>3:05 – 3:15 PM</b>	0	0	0	1	4
<b>Totals</b>	<b>5</b>	<b>1</b>	<b>3</b>	<b>20</b>	<b>36</b>
			<i>67% Vassal Ln in Front of School 33% Loop</i>	<i>65% Vassal Ln in Front of School 30% Loop 5% Standish St</i>	<i>35% Standish St 30% Vassal Ln East of School 20% Staff Lot or West of School 15% Pathway</i>

Note:

- Walking students accompanied by parents coming from Vassal Lane east of the school, and from Standish Street, where it was not possible to see if they drove and parked first, were assumed to have driven and parked before walking to the school.

**Figure 2.f.2** depicts the existing conditions school activity during the afternoon dismissal as measured in vehicle trips. This includes a single trip for every departing staff and two trips (arriving and departing) for every parent picking-up a student(s).

**Employee Survey**

In May 2019 an online survey was created and the link was distributed to existing TMVLUS staff to understand their travel patterns to and from the school. The survey included 9 questions and asked about their commuting patterns during the week of Monday, May 13<sup>th</sup> through Friday, May 17<sup>th</sup>. The survey was closed after reaching a 74% overall response rate. The compiled survey results can be found in the Appendix. **Table 2.f.4.** provides a summary of the modes that were used by the survey participants.

**TABLE 2.F.4 EXISTING STAFF MODE SHARE RESULTS SUMMARY**

<b>Travel Mode Choice</b>	<b>Mode Share</b>
<b>Single Occupancy Vehicle (SOV)</b>	71%
<b>High Occupancy Vehicle (HOV)</b>	4%
<b>Public Transit</b>	9%
<b>Walk</b>	8%
<b>Bicycle</b>	6%
<b>Other</b>	2%
<b>Total</b>	<b>100%</b>

Note: Based on survey conducted of TMVLUS staff in May 2019

The survey results show that 75% of existing TMVLUS staff commute by auto and the remaining 25% take an alternative mode including 9% which arrive by public transit.

### 3.0 Project Traffic

#### 3.a Mode Share and Average Vehicle Occupancy (AVO)

Mode share characteristics for the Project were identified through the May 2019 existing employee survey. It was assumed that staff associated with the increased enrollment would continue to practice similar travel patterns in commuting to and from the school as they do today in order to provide a conservative analysis.

Though some valuable information, was collected through the March 2019 school observations about student + parent commute modes, the specific vehicle arrival and departure volumes were applied to the analysis and specific modal splits are not identified. Again, this assumes that the same populations that currently walk, bike, take the school bus, or are dropped-off/picked-up by a parent will continue to travel this way.

**Table 2.f.1**, shown previously, presents the mode shares used as a basis for estimating Project trip generation for TMVLUS staff.

A local AVO of 1.03 was calculated from the mode shares listed above based on surveys conducted of TMVLUS staff in May 2019.

#### 3.b Trip Generation

The trip generation estimate for the proposed project was calculated by using and projecting the vehicle trip generation that was observed during the March 2019 VHB observations to align with the anticipated program and enrollment changes associated with the proposed project.

**Figures 2.f.1 and 2.f.2.** present the existing vehicle trips over time. **Figures 3.b.1. and 3.b.2.** depict how each of these temporal charts change when the net-increase of vehicle trips are

added to the schools arriving and departing vehicles. Again, it was assumed that each staff vehicle trip was arriving in the morning and departing in the evening and that student and parent pick-up/drop-offs occurred in two vehicle trips within that peak hour.

**Table 3.b.1** below presents the net-new trip generation by mode for the TMVLUS staff trips and **Table 3.b.2.** presents the net-new vehicle trip generation for the proposed project.

**TABLE 3.B.1 PROJECT NET-NEW TRIP GENERATION BY MODE – TMVLUS STAFF ONLY**

	Person Trips	SOV	HOV	Public Transit	Walk/Bike	Other
Morning In	17	12	1	2	2	0
Morning Out	0	0	0	0	0	0
<b>Total Morning</b>	<b>17</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>0</b>
Afternoon In	0	0	0	0	0	0
Afternoon Out	7	5	0	1	1	0
<b>Total Afternoon</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>

**TABLE 3.B.2 PROJECT NET-NEW VEHICULAR TRIP GENERATION**

	Existing			Proposed			Net-New		
	Staff Vehicle Trips	Student/Parent Vehicle Trips	Total Vehicle Trips	Staff Vehicle Trips	Student/Parent Vehicle Trips	Total Vehicle Trips	Staff Vehicle Trips	Student/Parent Vehicle Trips	Total Vehicle Trips
Morning In	38	120	158	51	178	229	+13	+58	+71
Morning Out	0	120	120	0	178	178	0	+58	+58
<b>Total Morning</b>	<b>38</b>	<b>240</b>	<b>278</b>	<b>51</b>	<b>356</b>	<b>407</b>	<b>+13</b>	<b>+116</b>	<b>+129</b>
Afternoon In	0	55	55	0	63	63	+0	+8	+8
Afternoon Out	46	55	101	51	63	114	+5	+8	+13
<b>Total Afternoon</b>	<b>46</b>	<b>110</b>	<b>156</b>	<b>51</b>	<b>126</b>	<b>177</b>	<b>+5</b>	<b>+16</b>	<b>+21</b>
Evening In	n/a <sup>1</sup>	n/a <sup>1</sup>	n/a <sup>1</sup>	0	36	36	+0	+36	+36
Evening Out	n/a <sup>1</sup>	n/a <sup>1</sup>	n/a <sup>1</sup>	0	36	36	+0	+36	+36
<b>Total Evening</b>							<b>+0</b>	<b>+72</b>	<b>+72</b>

1 Note that evening observations were not conducted by VHB.

As shown in **Table 3.b.2**, the Project is expected to generate 129 net-new vehicle trips during the morning peak hour, 21 net-new vehicle trips during the afternoon peak hour, and 72 during the evening peak hour.

### 3.c Site Access

#### **Parking Garage Access – TMVLUS Staff + Parent/Students**

As shown in **Figure D**, Proposed Site Plan, access to the new underground garage and parent drop-off area will be provided from Vassal Lane at its intersection with Standish Street. The garage will provide the following key transportation elements:

- 100 traditional, long-term parking spaces dedicated to serving the school staff and faculty
- 50 short-term spaces that are designed to support drop-off and pick-up activities for the parents of younger students,
- A defined drop-off lane for quick drop-off activity by parent of older students. This lane can accommodate up to 8 vehicles.
- An internal queuing area for up to 25 additional cars awaiting to use the defined drop-off lane

The goal of this amenity is to accommodate all parent drop-off activity on site and away from adjacent neighborhood streets. Additionally, the drop-off and parking area has been accommodated to be completely separate from on-grade bus drop-off activity, which is discussed in greater detail below.

#### **School Bus Access**

School buses will be provided an exclusive driveway during peak arrival and dismissals to safely drop-off and pick-up students, as shown in **Figure D**. Access to the driveway will be provided via Vassal Lane along the south-western portion of the site. The driveway allows ample queuing capacity for up to 8 school buses that are intended to serve the school.

#### **Bicycle Parking Access**

Short-term bicycle parking and a BlueBikes station (along Vassal) are provided in various locations around the site and users can then access the building by one of several pedestrian access points including the front, rear, and west entrance (bus-loop access). Long-term bicycle parking is provided in the basement level of the parking garage where pedestrians can access via the parking ramp off of Vassal Lane.

#### **Pedestrian Access**

Pedestrians can access the site from Vassal Lane or from Concord Avenue by traveling along the multi-use paths that travel along the west and east edges of the site. Access to the building is provided by one of several pedestrian access points including the front, rear, and west entrance (bus-loop access). The existing community path along the east edge will remain, while a new, separated multi-use path will be constructed along the western edge of the site. The path connects Vassal Lane to Concord Avenue and Fern Street while incentivizing active

mobility choices and allowing residents to travel between neighborhoods, a goal of the Cambridge Envision plan.

### **3.d Vehicular Trip Distribution and Assignment to Roadway Network**

Project-generated vehicle trips were distributed and assigned to roadways based on school provided zip code data for students and staff zip codes that were identified in the May 2019 employee survey. The distribution for Parent/Student and Staff Project trips to roadway network, is presented in **Figures 3.d.1 and 3.d.2.**, respectively. Resulting Project generated trip networks are presented in **Figures 3.d.3 through 3.d.5.**

Finally, the existing staff, bus, and parent/student trips were re-assigned to their prospective driveways and parent/student trips that were parking in the neighborhood in the existing conditions were also re-assigned to make use of the drop-off/pick-up loop internal to the underground garage, in the future.

### **3.e Servicing and Deliveries**

#### **Truck Access and Egress**

As shown in **Figure D**, the loading and service for the Project will be accommodated in an off-street loading dock accessed from Vassal Lane, utilizing the same driveway that support bus drop-off activity. The dock will provide a service bay and a dedicated location for a dumpster. The driveway would be shared with that used by the buses during peak arrival and departure periods, but the loading activity would not coincide with student/school bus activity.

**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), Massachusetts Avenue and the Longfellow Bridge while avoiding Memorial Drive (Route 3).

**Daily Deliveries**

The servicing and deliveries are not expected to change with the construction of the new buildings. The new site will allow the servicing to take place inside a loading dock, which will enhance the public realm in and around the Project site. **Table 3.e.1** summarizes existing deliveries accommodated at the school, which are expected to remain in the future.

**TABLE 3.E.1 EXISTING DELIVERIES**

Use	Type of Delivery	Size of Truck	Frequency of Delivery	Timing of Delivery	Daily Trip Rate
Tobin + Vassal	Milk	16' - 24' truck	3 per week	Early AM	0.6
	FNS	n/a	Daily (every weekday)	Morning	1.0
	FNS	n/a	Daily (every weekday)	Afternoon	1.0
	Produce	16' truck	Daily (every weekday)	Early AM	1.0
	Paper	20' - 26' truck	1 per week	Late AM/Early	0.2
	Grocery	20' - 26' truck	1 per week	Late AM/Early	0.2
	Fresh Bread	n/a	2 per week	Morning	0.3
	Fresh Pizza	n/a	1 per week	Morning	0.2
	Extended Day	Food Vendor	Large box truck	1 per month	Morning
Vendors		Small and large	2-3 per month	Daytime	0.15
Preschool	Food Vendor	Large box truck	1 per month	Morning	0.05
	Vendors	Small and large	2-3 per month	Daytime	0.15

As can be seen from the **Table 3.e.1**, most of the existing servicing and deliveries are completed with small to medium sized trucks. The new building is expected to have the same number of deliveries, however the School will likely have a delivery manager that will help schedule and reduce the number of trucks being generated by the project.

## 4.0 Background Traffic

A background growth of 0.5 percent per year, for five years, has been applied to the existing traffic volumes, as specified in the Traffic Study Scoping Letter. Furthermore, as requested in the Traffic Study Scoping Letter, the following background projects have been separately added and included within the Traffic Assessment:

1. 101 Smith Place
2. 87-95 Fawcett Street
3. 55 Wheeler Street
4. 605 Concord Avenue
5. 50 Cambridgepark Drive
6. 101 Cambridgepark Drive
7. 75 New Street

As noted in the Scoping request, the proposed 40 Wilson Project and 600 KSF Quad mixed-use project on Mooney Street should be included if a TIS is submitted before this TIS submission. When this TIS was submitted, TISs for these projects had not yet been certified.

## 5.0 Traffic Analysis

Traffic networks were developed for the following scenarios:

### 5.a 2020 Existing Condition

The 2020 Existing Condition analysis is based on existing vehicle counts at the study area intersections (see Section 2 –Data Collection). The Existing Condition traffic networks are shown in **Figures 2.b.1 through 2.b.3.**

### 5.b 2020 Build Condition

The 2020 Build Condition analysis assumes full occupancy of the Project. Project generated traffic (see Section 3 – Project Traffic) was added to the study area to create the 2020 Build Condition networks shown in **Figures 5.b.1 through 5.b.3.**

### 5.c 2025 Future Condition

The 2025 Future Condition builds upon the 2020 Build Condition volumes to include general background growth and other specific development projects as previously described (see Section 4 – Background Traffic).

The number of school population trips is not expected to change by much in the future, and therefore this analysis assumes no changes to the distribution of existing parent pickup or drop off trips. The Future Condition traffic networks are shown in **Figures 5.c.1 through 5.c.3.**



## 6.0 Vehicle Capacity Analysis

Synchro 9 software was used to determine the vehicle level of service (LOS) for signalized and unsignalized study intersections. Synchro software is based on the 2000 Highway Capacity Manual. Results for the 2020 Existing, 2020 Build, and 2025 Future conditions are presented in **Table 6.a.1** through **Table 6.a.3** for signalized intersections and **Table 6.a.4** through **Table 6.a.6** for unsignalized intersections. **Figures 6.a.1** through **6.a.3** illustrate the overall VLOS, and **Figures 6.a.4** through **6.a.6** illustrate the Vehicular Delay for each intersection for the morning, afternoon and the evening peak hours, respectively. A summary of the analysis results follows.

**TABLE 6.A.1 SIGNALIZED INTERSECTION LOS RESULTS – MORNING PEAK HOUR<sup>1</sup>**

Intersection	Approach	2020 Existing			2020 Build			2025 Future		
		v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
4. Concord Avenue at Alpine Street	Concord Avenue Eastbound - Thru/Right	0.71	13.2	B	0.71	13.2	B	0.77	15.1	B
	Concord Avenue Westbound - Left/Thru	0.45	8.5	A	0.46	8.6	A	0.49	8.9	A
	Alpine Street Southbound – Left/Thru/Right	0.36	29.4	C	0.36	29.4	C	0.36	29.5	C
	<b>OVERALL</b>	<b>0.61</b>	<b>12.5</b>	<b>B</b>	<b>0.61</b>	<b>12.5</b>	<b>B</b>	<b>0.66</b>	<b>13.7</b>	<b>B</b>

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

**TABLE 6.A.2 SIGNALIZED INTERSECTION LOS RESULTS – AFTERNOON PEAK HOUR<sup>1</sup>**

Intersection	Approach	2020 Existing			2020 Build			2025 Future		
		v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
4. Concord Avenue at Alpine Street	Concord Avenue Eastbound - Thru/Right	0.50	9.3	A	0.50	9.3	A	0.51	9.5	A
	Concord Avenue Westbound - Left/Thru	0.49	9.1	A	0.49	9.2	A	0.51	9.4	A
	Alpine Street Southbound – Left/Thru/Right	0.42	32.1	C	0.42	32.1	C	0.43	32.6	C
	<b>OVERALL</b>	<b>0.46</b>	<b>11.1</b>	<b>B</b>	<b>0.46</b>	<b>11.1</b>	<b>B</b>	<b>0.47</b>	<b>11.3</b>	<b>B</b>

<sup>1</sup> Afternoon Peak Student + Staff Departure Hour

**TABLE 6.A.3 SIGNALIZED INTERSECTION LOS RESULTS – EVENING PEAK HOUR<sup>1</sup>**

Intersection	Approach	2020 Existing			2020 Build			2025 Future		
		v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
4. Concord Avenue at Alpine Street	Concord Avenue Eastbound - Thru/Right	0.86	20.4	C	0.86	20.4	C	0.94	31.0	C
	Concord Avenue Westbound - Left/Thru	0.34	7.4	A	0.35	7.5	A	0.40	9.1	A
	Alpine Street Southbound – Left/Thru/Right	0.42	31.0	C	0.42	31.0	C	0.46	33.6	C
	<b>OVERALL</b>	<b>0.74</b>	<b>17.6</b>	<b>B</b>	<b>0.74</b>	<b>17.6</b>	<b>B</b>	<b>0.77</b>	<b>24.9</b>	<b>C</b>

<sup>1</sup> Evening Commuter Peak Hour

**TABLE 6.A.4 UNSIGNALIZED INTERSECTION LOS RESULTS – MORNING PEAK HOUR<sup>1</sup>**

Intersection	Approach	2020 Existing			2020 Build			2025 Future		
		v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
1. Concord Avenue at Birch Street	SB L/R	0.21	29.8	D	0.21	30.6	D	0.27	37.3	E
2. Concord Avenue at Fern Street	EB T/L	0.03	0.9	A	0.03	0.9	A	0.04	0.9	A
3. Concord Avenue at Corporal Burns Road	SB L/R	0.10	23.6	C	0.10	24.1	C	0.12	27.5	D
5. Concord Avenue at Chilton Street	SB L/R	0.04	31.6	D	0.04	32.4	D	0.06	41.1	E
6. Concord Avenue at Fayerweather	NB L/R	0.64	103.0	F	0.80	134.1	F	1.11	259.0	F
7. Fresh Pond Parkway at Vassal Lane	WB L	0.33	32.5	D	0.34	33.5	D	0.39	39.2	E
8. Vassal Lane at Lakeview Avenue	NB L/R	0.20	9.6	A	0.24	10.0	A	0.24	10.0	B
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	SB L	0.00	0.0	A	0.02	10.6	B	0.02	10.6	B
10. Vassal Lane at TMVLUS Bus Loop (Exit) (Eliminated in the Build + Future)	SB L	0.06	9.6	A	-	-	-	-	-	-
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	SB L	-	-	-	-	9.1	A	-	9.1	A
12. Vassal Lane at Alpine Street	SB L	0.08	10.7	B	0.09	11.3	B	0.09	11.4	B
13. Vassal Lane at Chilton Street	SB L	0.17	14.6	B	0.19	15.8	C	0.20	16.1	C
14. Vassal Lane at Fayerweather Street	EB L/T/R	0.53	10.7	B	0.61	14.4	B	0.62	14.9	B
15. Fresh Pond Parkway at Lexington Avenue	WB L/R	0.62	42.9	E	0.67	50.2	F	0.76	66.3	F
16. Lexington Avenue at Worthington Street	NB T/R	0.16	7.7	A	0.17	7.8	A	0.17	7.8	A
17. Lakeview Avenue at Worthington Street	EB L	0.06	9.9	A	0.09	10.1	B	0.09	10.1	B

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

**TABLE 6.A.5 UNSIGNALIZED INTERSECTION LOS RESULTS – AFTERNOON PEAK HOUR<sup>1</sup>**

Intersection	Approach	2020 Existing			2020 Build			2025 Future		
		v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
1. Concord Avenue at Birch Street	SB L/R	0.17	15.3	C	0.17	15.4	C	0.18	15.7	C
2. Concord Avenue at Fern Street	EB T/L	0.03	0.9	A	0.03	0.9	A	0.03	1.0	A
3. Concord Avenue at Corporal Burns Road	SB L/R	0.07	17.0	C	0.07	17.1	C	0.07	17.6	C
5. Concord Avenue at Chilton Street	SB L/R	0.01	16.6	C	0.01	16.7	C	0.01	17.2	C
6. Concord Avenue at Fayerweather	NB L/R	0.19	28.5	D	0.22	29.9	D	0.24	31.6	D
7. Fresh Pond Parkway at Vassal Lane	WB L	0.14	14.9	B	0.14	14.9	B	0.15	15.2	C
8. Vassal Lane at Lakeview Avenue	NB L/R	0.13	9.4	A	0.13	9.4	A	0.14	9.4	A
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	SB L	0.04	9.6	A	0.02	9.6	A	0.02	9.6	A
10. Vassal Lane at TMVLUS Bus Loop (Exit) (Eliminated in the Build + Future)	SB L	0.01	9.4	A	-	-	-	-	-	-
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	SB L	-	-	-	-	7.9	A	-	7.9	A
12. Vassal Lane at Alpine Street	SB L	0.02	9.5	A	0.02	9.6	A	0.02	9.6	A
13. Vassal Lane at Chilton Street	SB L	0.04	10.3	B	0.04	10.4	B	0.04	10.5	B
14. Vassal Lane at Fayerweather Street	EB L/T/R	0.22	7.9	A	0.24	8.1	A	0.24	8.1	A
15. Fresh Pond Parkway at Lexington Avenue	WB L/R	0.28	17.2	C	0.28	17.3	C	0.29	17.8	C
16. Lexington Avenue at Worthington Street	NB T/R	0.13	7.6	A	0.13	7.6	A	0.14	7.6	A
17. Lakeview Avenue at Worthington Street	EB L	0.02	9.4	A	0.02	9.4	A	0.02	9.5	A

<sup>1</sup> Afternoon Peak Student + Staff Departure Hour

**TABLE 6.A.6 UNSIGNALIZED INTERSECTION LOS RESULTS – EVENING PEAK HOUR<sup>1</sup>**

Intersection	Approach	2020 Existing			2020 Build			2025 Future		
		v/c	Delay	VLOS	v/c	Delay	VLOS	v/c	Delay	VLOS
1. Concord Avenue at Birch Street	SB L/R	0.35	32.2	D	0.35	32.8	D	0.43	42.0	E
2. Concord Avenue at Fern Street	EB T/L	0.11	2.8	A	0.11	2.9	A	0.12	3.1	A
3. Concord Avenue at Corporal Burns Road	SB L/R	0.13	27.9	D	0.13	28.3	D	0.15	33.4	D
5. Concord Avenue at Chilton Street	SB L/R	0.13	55.1	F	0.14	56.3	F	0.21	93.5	F
6. Concord Avenue at Fayerweather	NB L/R	0.79	98.0	F	0.92	131.7	F	1.50	381.8	F
7. Fresh Pond Parkway at Vassal Lane	WB L	0.15	15.6	C	0.16	15.7	C	0.17	17.0	C
8. Vassal Lane at Lakeview Avenue	NB L/R	0.18	9.7	A	0.19	9.8	A	0.20	9.8	A
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	SB L	0.03	9.9	A	0.00	0.0	A	0.00	0.0	A
10. Vassal Lane at TMVLUS Bus Loop (Exit) (Eliminated in the Build + Future)	SB L	0.01	9.6	A	-	-	-	-	-	-
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	SB L	-	-	-	-	8.0	A	-	8.0	A
12. Vassal Lane at Alpine Street	SB L	0.07	9.8	A	0.08	10.1	B	0.08	10.1	B
13. Vassal Lane at Chilton Street	SB L	0.15	13.3	B	0.16	14.0	B	0.16	14.3	B
14. Vassal Lane at Fayerweather Street	EB L/T/R	0.48	11.2	B	0.53	12.0	B	0.54	12.2	B
15. Fresh Pond Parkway at Lexington Avenue	WB L/R	0.30	19.2	C	0.30	19.6	C	0.34	22.2	C
16. Lexington Avenue at Worthington Street	NB T/R	0.13	7.5	A	0.13	7.5	A	0.13	7.5	A
17. Lakeview Avenue at Worthington Street	EB L	0.08	9.7	A	0.09	9.8	A	0.09	9.9	A

<sup>1</sup> Evening Commuter Peak Hour

Under 2020 Existing, 2020 Build, and 2025 Future Conditions, the signalized intersection of Concord Avenue at Alpine Street operates at an overall VLOS B during the morning, afternoon and evening peak hours. With the addition of the proposed project trips traveling through the intersection (12 morning trips, 5 afternoon trips and 7 evening trips), the intersection maintains an overall VLOS B during the morning, afternoon and evening peak hours.

The unsignalized intersections experience only minor operational changes from the 2020 Existing to 2020 Build Conditions for the morning, afternoon and evening peak hours. During the morning peak hour:

- › (9) Vassal Lane at TMVLUS Parking Driveway southbound approach declines from an VLOS A to a VLOS B

- › (13) Vassal Lane at Chilton Street southbound approach declines from an VLOS B to a VLOS C
- › (15) Fresh Pond Parkway at Lexington Avenue westbound approach declines from an VLOS E to a VLOS F
- › (17) Lakeview Avenue at Worthington Street eastbound approach declines from an VLOS A to a VLOS B

During the evening peak hour:

- › (12) Vassal Lane at Alpine Street southbound approach declines from an VLOS A to a VLOS B

## 7.0 Queue Analysis

### 7.a Intersection Queueing Analysis

Queue analysis was performed in conjunction with the VLOS analysis. **Tables 7.a.1 through 7.a.3** present results for modeled average queues modeled in Synchro for each of the following scenario:

- › Morning (commuter) Peak / Morning Peak Student Arrival Hour;
- › Afternoon Peak Student and Staff Departure Hour;
- › Evening (Commuter) Peak Hour, respectively.

As indicted previously in **Section 2b**, though the current City of Cambridge Guidelines for Traffic Impact Studies, requires queue observations be conducted at signalized intersections, preferably during the time turning movement counts are conducted, this was not feasible. Queue observations during the time of the COVID-19 pandemic would lead to a misrepresentation of typical existing conditions, therefore queueing observations were not conducted.

**TABLE 7.A.1 SIGNALIZED INTERSECTION QUEUE ANALYSIS – MORNING PEAK HOUR<sup>1</sup>**

Intersection	Lane	Average Modeled Queue in Vehicles		
		2020 Existing Conditions	2020 Build Conditions	2025 Future Conditions
4. Concord Avenue at Alpine Street	Concord Avenue Eastbound - Thru/Right	6	6	7
	Concord Avenue Westbound - Left/Thru	3	3	3
	Alpine Street Southbound – Left/Thru/Right	1	1	1

Note: 1 vehicle = 25 feet

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

**TABLE 7.A.2 SIGNALIZED INTERSECTION QUEUE ANALYSIS – AFTERNOON PEAK HOUR<sup>1</sup>**

Intersection	Lane	Average Modeled Queue in Vehicles		
		2020 Existing Conditions	2020 Build Conditions	2025 Future Conditions
4. Concord Avenue at Alpine Street	Concord Avenue Eastbound - Thru/Right	3	3	3
	Concord Avenue Westbound - Left/Thru	3	3	3
	Alpine Street Southbound – Left/Thru/Right	1	1	1

Note: 1 vehicle = 25 feet

<sup>1</sup> Afternoon Peak Student + Staff Departure Hour

**TABLE 7.A.3 SIGNALIZED INTERSECTION QUEUE ANALYSIS – EVENING PEAK HOUR<sup>1</sup>**

Intersection	Lane	Average Modeled Queue in Vehicles		
		2020 Existing Conditions	2020 Build Conditions	2025 Future Conditions
4. Concord Avenue at Alpine Street	Concord Avenue Eastbound - Thru/Right	8	8	9
	Concord Avenue Westbound - Left/Thru	2	2	3
	Alpine Street Southbound – Left/Thru/Right	1	1	1

Note: 1 vehicle = 25 feet

<sup>1</sup> Evening Commuter Peak Hour

### 7.b Garage Queueing Analysis

In addition to the queue analysis conducted at each of the study area intersections, an evaluation of queueing impacts to Vassal Lane and other neighborhood roadways was conducted in order to provide queueing storage within the parking garage so that queueing does not spill into the neighborhood. This was done by evaluating peak hour drop-off and pick-up activity and understanding the instance when queueing would be the most impactful and the number of vehicles that would (a) be parked in staff parking spaces, (b) parking in short-term parking spaces to pick-up or drop-off young students, or (c) queueing to quickly pick-up or drop-off a student. The peak hour instances of peak queueing for this evaluation are shown graphically in **Figures 7.b.1 and 7.b.2**, respectively for the morning and afternoon peak hours.

Most critically for this underground parking system to function successfully, management of vehicle flow will be a priority during peak vehicle activity. The management would ensure brief curbside activity and that idling parent vehicles are directed to a vacant parking space to wait for their student to be dismissed.



## 8.0 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 through 8.a.3** for the morning, afternoon and the evening peak hours, respectively. **Figures 8.a.1 through 8.a.3** graphically present the traffic increase along critical roadway segments during the morning, afternoon, and evening peak hours, respectively. For analyzed segments that are between study area intersections, the average volumes at these intersections were taken as the volume traveling along the segment. 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 of the roadway segments in the study area, a total of 24 of the 33 segments identified are streets which have more than 1/3 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 ROADWAY – MORNING PEAK HOUR<sup>3</sup>**

Roadway	Reviewed Segment	Amount of Residential	2020 Existing <sup>1</sup>	2020 Build	Increase	Percent Increase	2025 Future <sup>2</sup>	Increase	Percent Increase
Concord Avenue	West of Birch St	1/3 or less	1,160	1,172	12	1.0%	1,256	96	8.3%
	Birch St to Fern St	1/2 or more	1,181	1,193	12	1.0%	1,278	97	8.2%
	Fern St to Corporal Burns St	1/3 or less	1,164	1,176	12	1.0%	1,260	96	8.2%
	Corporal Burns St to Alpine St	>1/3 but <1/2	1,167	1,179	12	1.0%	1,264	97	8.3%
	Alpine St to Chilton Street	1/2 or more	1,143	1,155	12	1.0%	1,239	96	8.4%
	Chilton St to Fayerweather St	1/2 or more	1,120	1,132	12	1.1%	1,216	96	8.6%
	East of Fayerweather St	1/2 or more	1,023	1,023	0	0%	1,105	82	8.0%
Vassal Lane	Fresh Pond Parkway to Lakeview Ave	1/3 or less	96	112	16	16.7%	114	18	18.8%
	Lakeview Ave to Standish St	1/2 or more	168	175	7	4.2%	179	11	6.5%
	Standish Street to Alpine St	1/2 or more	230	288	58	25.2%	294	64	27.8%
	Alpine St to Chilton Street	1/2 or more	281	339	58	20.6%	346	65	23.1%
	Chilton St to Fayerweather St	1/2 or more	383	441	58	15.1%	452	69	18.0%
	East of Fayerweather	1/2 or more	317	352	35	11.0%	360	43	13.6%
Fresh Pond Parkway	North of Vassal Lane	1/3 or less	2,415	2,434	19	0.8%	2,593	178	7.4%
	Vassal Lane to Lexington Ave	1/3 or less	2,449	2,484	35	1.4%	2,644	195	8.0%
	South of Lexington Ave	1/3 or less	2,368	2,384	16	0.7%	2,541	173	7.3%
Birch Street	North of Concord Ave	1/3 or less	35	35	0	0%	36	1	2.9%
Fern Street	North of Concord Ave	1/3 or less	41	41	0	0%	42	1	2.4%
Corporal Burns Road	North of Concord Ave	1/2 or more	20	20	0	0%	20	0	0%
Alpine Street	North of Concord Ave	1/2 or more	80	80	0	0%	82	2	2.5%
	Concord Ave to Vassal Lane	1/2 or more	51	51	0	0%	52	1	2.0%
Chilton Street	North of Concord Ave	1/2 or more	19	19	0	0%	20	1	5.3%
	Concord Ave to Vassal Lane	1/2 or more	71	71	0	0%	73	2	2.8%
	South of Vassal Lane	1/2 or more	31	31	0	0%	32	1	3.2%
Fayerweather Street	North of Concord Ave	1/2 or more	28	28	0	0%	28	0	0%
	Concord Ave to Vassal Lane	1/2 or more	236	248	12	5.1%	255	19	8.1%
	South of Vassal Lane	1/2 or more	235	247	12	5.1%	253	18	7.7%
Lexington Avenue	Fresh Pond Parkway to Worthington St	1/3 or less	171	190	19	11.1%	194	23	13.5%
	South of Worthington St	1/2 or more	138	138	0	0%	141	3	2.2%
Worthington Street	Lexington Ave to Lakeview Ave	1/2 or more	58	77	19	32.8%	78	20	34.5%
Lakeview Avenue	Vassal Lane to Worthington St	1/2 or more	161	194	33	20.5%	198	37	23.0%
	South of Worthington St	1/2 or more	113	127	14	12.4%	130	17	15.0%
Standish Street	South of Vassal Lane	1/2 or more	171	193	22	12.9%	197	26	15.2%

<sup>1</sup> Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added

<sup>2</sup> Future accounts for area background project volumes, project generated volumes, and a background growth rate of 0.5%

<sup>3</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

**TABLE 8.A.2 TRAFFIC ON STUDY AREA ROADWAY – AFTERNOON PEAK HOUR<sup>3</sup>**

Roadway	Reviewed Segment	Amount of Residential	2020 Existing <sup>1</sup>	2020 Build	Increase	Percent Increase	2025 Future <sup>2</sup>	Increase	Percent Increase
Concord Avenue	West of Birch St	1/3 or less	944	949	5	0.5%	974	30	3.2%
	Birch St to Fern St	1/2 or more	915	920	5	0.5%	944	29	3.2%
	Fern St to Corporal Burns St	1/3 or less	898	903	5	0.6%	925	27	3.0%
	Corporal Burns St to Alpine St	>1/3 but <1/2	904	909	5	0.6%	931	27	3.0%
	Alpine St to Chilton Street	1/2 or more	927	932	5	0.5%	955	28	3.0%
	Chilton St to Fayerweather St	1/2 or more	919	924	5	0.5%	947	28	3.0%
	East of Fayerweather St	1/2 or more	853	853	0	0.0%	873	20	2.3%
Vassal Lane	Fresh Pond Parkway to Lakeview Ave	1/3 or less	89	91	2	2.2%	93	4	4.5%
	Lakeview Ave to Standish St	1/2 or more	117	79	-38	-32.5%	82	-35	-29.9%
	Standish Street to Alpine St	1/2 or more	108	121	13	12.0%	124	16	14.8%
	Alpine St to Chilton Street	1/2 or more	125	138	13	10.4%	141	16	12.8%
	Chilton St to Fayerweather St	1/2 or more	189	202	13	6.9%	207	18	9.5%
Fresh Pond Parkway	East of Fayerweather	1/2 or more	93	99	6	6.5%	101	8	8.6%
	North of Vassal Lane	1/3 or less	1,784	1,786	2	0.1%	1,831	47	2.6%
	Vassal Lane to Lexington Ave	1/3 or less	1,801	1,805	4	0.2%	1,850	49	2.7%
Birch Street	South of Lexington Ave	1/3 or less	1,732	1,734	2	0.1%	1,777	45	2.6%
	North of Concord Ave	1/3 or less	67	67	0	0%	69	2	3.0%
Fern Street	North of Concord Ave	1/3 or less	41	41	0	0%	42	1	2.4%
Corporal Burns Road	North of Concord Ave	1/2 or more	20	20	0	0%	20	0	0%
Alpine Street	North of Concord Ave	1/2 or more	77	77	0	0%	78	1	1.3%
	Concord Ave to Vassal Lane	1/2 or more	17	17	0	0%	17	0	0%
Chilton Street	North of Concord Ave	1/2 or more	44	44	0	0%	46	2	4.5%
	Concord Ave to Vassal Lane	1/2 or more	24	24	0	0%	25	1	4.2%
	South of Vassal Lane	1/2 or more	39	39	0	0%	40	1	2.6%
Fayerweather Street	North of Concord Ave	1/2 or more	15	15	0	0%	15	0	0%
	Concord Ave to Vassal Lane	1/2 or more	89	94	5	5.6%	96	7	7.9%
	South of Vassal Lane	1/2 or more	125	128	3	2.4%	132	7	5.6%
Lexington Avenue	Fresh Pond Parkway to Worthington St	1/3 or less	122	124	2	1.6%	126	4	3.3%
	South of Worthington St	1/2 or more	113	113	0	0%	115	2	1.8%
Worthington Street	Lexington Ave to Lakeview Ave	1/2 or more	18	20	2	11.1%	20	2	11.1%
Lakeview Avenue	Vassal Lane to Worthington St	1/2 or more	110	114	4	3.6%	116	6	5.5%
	South of Worthington St	1/2 or more	93	95	2	2.2%	97	4	4.3%
Standish Street	South of Vassal Lane	1/2 or more	37	40	3	8.1%	41	4	10.8%

<sup>1</sup> Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added

<sup>2</sup> Future accounts for area background project volumes, project generated volumes, and a background growth rate of 0.5%

<sup>3</sup> Afternoon Peak Student + Staff Departure Hour

**TABLE 8.A.3 TRAFFIC ON STUDY AREA ROADWAY – EVENING PEAK HOUR<sup>3</sup>**

Roadway	Reviewed Segment	Amount of Residential	2020 Existing <sup>1</sup>	2020 Build	Increase	Percent Increase	2025 Future <sup>2</sup>	Increase	Percent Increase
Concord Avenue	West of Birch St	1/3 or less	1,246	1,253	7	0.6%	1,342	96	7.7%
	Birch St to Fern St	1/2 or more	1,273	1,280	7	0.5%	1,370	97	7.6%
	Fern St to Corporal Burns St	1/3 or less	1,179	1,186	7	0.6%	1,274	95	8.1%
	Corporal Burns St to Alpine St	>1/3 but <1/2	1,194	1,201	7	0.6%	1,289	95	8.0%
	Alpine St to Chilton Street	1/2 or more	1,211	1,218	7	0.6%	1,307	96	7.9%
	Chilton St to Fayerweather St	1/2 or more	1,198	1,205	7	0.6%	1,293	95	7.9%
	East of Fayerweather St	1/2 or more	1,122	1,122	0	0%	1,207	85	7.6%
Vassal Lane	Fresh Pond Parkway to Lakeview Ave	1/3 or less	109	116	7	6.4%	118	9	8.3%
	Lakeview Ave to Standish St	1/2 or more	153	148	-5	-3.3%	152	-1	-0.7%
	Standish Street to Alpine St	1/2 or more	149	185	36	24.2%	189	40	26.8%
	Alpine St to Chilton Street	1/2 or more	202	238	36	17.8%	243	41	20.3%
	Chilton St to Fayerweather St	1/2 or more	370	406	36	9.7%	416	46	12.4%
Fresh Pond Parkway	East of Fayerweather	1/2 or more	144	166	22	15.3%	170	26	18.1%
	North of Vassal Lane	1/3 or less	2,089	2,096	7	0.3%	2,254	165	7.9%
	Vassal Lane to Lexington Ave	1/3 or less	2,112	2,126	14	0.7%	2,284	172	8.1%
Birch Street	South of Lexington Ave	1/3 or less	2,060	2,067	7	0.3%	2,224	164	8.0%
	North of Concord Ave	1/3 or less	64	64	0	0%	65	1	1.6%
Fern Street	North of Concord Ave	1/3 or less	136	136	0	0%	139	3	2.2%
Corporal Burns Road	North of Concord Ave	1/2 or more	21	21	0	0%	21	0	0%
Alpine Street	North of Concord Ave	1/2 or more	95	95	0	0%	98	3	3.2%
	Concord Ave to Vassal Lane	1/2 or more	53	53	0	0%	54	1	1.9%
Chilton Street	North of Concord Ave	1/2 or more	88	88	0	0%	90	2	2.3%
	Concord Ave to Vassal Lane	1/2 or more	68	68	0	0%	70	2	2.9%
	South of Vassal Lane	1/2 or more	100	100	0	0%	103	3	3.0%
Fayerweather Street	North of Concord Ave	1/2 or more	47	47	0	0%	48	1	2.1%
	Concord Ave to Vassal Lane	1/2 or more	271	278	7	2.6%	285	14	5.2%
	South of Vassal Lane	1/2 or more	188	195	7	3.7%	200	12	6.4%
Lexington Avenue	Fresh Pond Parkway to Worthington St	1/3 or less	130	137	7	5.4%	140	10	7.7%
	South of Worthington St	1/2 or more	110	110	0	0%	112	2	1.8%
Worthington Street	Lexington Ave to Lakeview Ave	1/2 or more	65	72	7	10.8%	74	9	13.8%
Lakeview Avenue	Vassal Lane to Worthington St	1/2 or more	150	165	15	10.0%	169	19	12.7%
	South of Worthington St	1/2 or more	93	101	8	8.6%	103	10	10.8%
Standish Street	South of Vassal Lane	1/2 or more	42	56	14	33.3%	57	15	35.7%

<sup>1</sup> Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added

<sup>2</sup> Future accounts for area background project volumes, project generated volumes, and a background growth rate of 0.5%

<sup>3</sup> Evening Commuter Peak Hour

## 9.0 Parking Analysis

To better understand the parking needs of the Project, a vehicle parking analysis has been conducted and is described in the following sections.

### 9.a Vehicle Parking Analysis

#### Parking Supply Per Zoning

The school is governed by City of Cambridge’s Article 6.0 for parking requirements. To develop parking supply requirements per zoning, a review of Article 6.0 parking ratios was conducted, as documented in **Tables 9.a.1 and 9.a.2**, and later supplemented with Article 5.54 applicability provisions for the school components of the Project only.

**TABLE 9.A.1 PROJECT PARKING RATIOS, ZONING (PER ARTICLE 6.0)**

Land Use	Minimum Parking Ratio <sup>1</sup>	Maximum Parking Ratio <sup>1</sup>
School	3 spaces / 2 instructional rooms	1 space / 5 seats in the main auditorium

Parking ratios are calculated based on GFA

<sup>1</sup> City of Cambridge Zoning Ordinance Article 6.000

In order to estimate the Project parking supply per zoning, the parking ratios for the school land use were applied to the relevant parameter (auditorium seats + instructional classrooms) for the school. **Table 9.a.2** presents the resulting number of parking spaces calculated.

**TABLE 9.A.2 PROJECT PARKING SUPPLY, ZONING (PER ARTICLE 6.0)**

Land Use	GFA (SF)	Program Component	Minimum Parking Supply	Maximum Parking Supply
School	330,000*	1. 625 auditorium seats 2. 60 instructional classrooms	90 spaces	125 spaces

City of Cambridge Zoning Ordinance Article 6.000 – based on # of classrooms which yields a greater (auditorium will seat approx. 625 people)

\*SF per Feasibility Study

Per Article 6.0 Zoning, a maximum of 125 parking spaces and a minimum of 90 parking spaces are to be provided for the proposed site. However, since Article 5.54 governs the school uses on the site, the applicable definition for parking supply for those components states that “The minimum required number of off-street motor vehicle parking spaces shall be the number of legally existing off-street parking spaces on the lot or the minimum number of off-street parking spaces required by Article 6.000, whichever is fewer.” Because the minimum number of legal spaces for the existing surface lot is 60, and minimum number of parking spaces per Article 6.000 is 90, the site is required to provide a minimum of 60 parking spaces for school uses only.

The final parking supply numbers are summarized in **Table 9.a.3**.

**TABLE 9.A.3 PROJECT PARKING SUPPLY, ZONING (PER ARTICLE 5.54)**

Land Use	Minimum Parking Supply	Maximum Parking Supply
School	60 <sup>(a)</sup>	125 <sup>(b)</sup>

a- Per Article 5.54, City of Cambridge Zoning Ordinance

b- Per Article 6.00, City of Cambridge Zoning Ordinance

As indicated in **Table 9.a.3**, the total minimum required parking supply by the project is 60 spaces and maximum parking supply is 125 spaces.

**Parking Provided by Project**

The project is providing an underground garage accessed and egressed from Vassal Lane. The proposed parking supply includes 100 parking spaces for use by TMVLUS staff as well as 50 spaces for short-term drop-off/pick-up activity that is expected to occur during younger student arrival and departures so that they may be escorted to their classroom by parents who are able to park their vehicle.

**9.b Bicycle Parking Analysis**

The proposed Project will provide short-term and long-term bicycle parking per the City of Cambridge Bicycle Parking Guidelines, as calculated in **Table 9.b.1**. Short-term bicycle parking will be located close to building entrances, and long-term bicycle parking will be provided in the parking garage. An elevator sized to accommodate bicycles will be provided on-site.

**TABLE 9.B.1: PROPOSED BICYCLE PARKING**

Land Use	Size	Number of Classrooms*	Long-Term Parking Ratio <sup>1</sup>	Long-Term Spaces	Short-Term Parking Ratio <sup>1</sup>	Short-Term Spaces
Tobin Montessori, Vassal Lane Upper, and Community schools	330,000 GFA	60	0.30 per classroom OR 0.015 per auditorium seat <i>(whichever is greater)</i>	18	1.70 per classroom OR 0.085 per auditorium seat <i>(whichever is greater)</i>	102
<b>Total</b>	<b>330,000 GFA</b>	<b>60</b>	-	<b>18</b>	-	<b>102</b>

<sup>1</sup> City of Cambridge Zoning Ordinance Article 6.000 – based on # of classrooms which yields a greater (auditorium will seat approx. 625 people)

\*Number of instructional classrooms and square footage per Feasibility Study

Per zoning, the project is required to provide a minimum of 18 long-term bicycle parking spaces and 102 short-term.

## 10.0 Transit Analysis

The existing transit data for the MBTA Bus Routes 72, 74, 75, and 78 have been reviewed. As previously mentioned, these routes had undergone significant changes in December 2019 which affected the routes and/or schedules as part of the MBTA’s Better Bus Project. The most recent ridership data available is from Spring 2018. Therefore, a full analysis, applying the background and project transit trips, would not be representative of the current conditions. Ridership from Spring 2018 was grown using local bus annual growth rates from CTPS’s *Destination 2040: Long-Range Transportation Plan of the Boston Region Metropolitan Planning Organization*. The existing bus ridership and corresponding V/C ratios for the morning and afternoon peak hours are presented in **Table 10.a.1** below.

**TABLE 10.A.1 TRANSIT CAPACITY ANALYSIS – PEAK LOAD/PEAK DIRECTION**

MBTA Bus Route	AM Peak Hour			Afternoon Peak Hour		
	Capacity (MBTA)	Existing Ridership	Existing V/C	Capacity (MBTA)	Existing Ridership	Existing V/C
72 Inbound	270	68	0.25	108	6	0.05
72 Outbound	216	4	0.02	108	16	0.14
74 Inbound	108	53	0.49	54	26	0.48
74 Outbound	54	17	0.31	54	11	0.21
75 Inbound	54	30	0.56	54	10	0.19
75 Outbound	54	8	0.15	54	13	0.25
78 Inbound	162	67	0.41	54	13	0.23
78 Outbound	108	48	0.45	108	48	0.44

Source: MBTA Ridership Data Spring 2018

The data shows there is available capacity on all routes and during both peak hours, with all V/C ratios under 0.60. Therefore, the limited expected transit trips generated by the Project are not expected to adversely impact these bus routes.

## 11.0 Pedestrian Analysis

Pedestrian crossing volumes at study intersections are presented in **Figure 2.b.4**.

The results of pedestrian level-of-service (PLOS) analysis at intersection crosswalks are presented in **Table 11.a.1** for signalized intersections and **Table 11.a.2** for unsignalized intersections. **Figures 11.a.1 through 11.a.3** depict the Pedestrian LOS at each of the study area intersections graphically.

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. It is assumed that the walk time and cycle length at this intersection will not change from existing conditions and therefore PLOS will remain consistent.

For unsignalized intersections, the PLOS is calculated using the crosswalk length and the conflicting vehicle flow rates for morning, afternoon, and evening peak hours.

All intersections show no change in PLOS with the addition of project trips with the exception of the morning peak hour PLOS at crosswalk at the proposed sub-grade parking entrance/exit (PLOS A to B) and the East/West crosswalk of Vassal Lane at Chilton Street (PLOS B to C).

**TABLE 11.A.1 SIGNALIZED INTERSECTION - PEDESTRIAN LEVEL OF SERVICE (LOS) SUMMARY**

Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	2025 Future	2020 Existing	2020 Build	2025 Future	2020 Existing	2020 Build	2025 Future
4. Concord Avenue at Alpine Street	North	C	C	C	C	C	C	C	C	C
	South	C	C	C	C	C	C	C	C	C
	East	A	A	A	A	A	A	A	A	A
	West	A	A	A	A	A	A	A	A	A

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

**TABLE 11.A.2 UNSIGNALIZED INTERSECTIONS – PEDESTRIAN LEVEL OF SERVICE (LOS) SUMMARY**

Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	2025 Future	2020 Existing	2020 Build	2025 Future	2020 Existing	2020 Build	2025 Future
1. Concord Ave at Birch Street	North	A	A	A	A	A	A	A	A	A
2. Concord Ave at Fern Street	North	A	A	A	A	A	A	A	A	A
	East	F	F	F	F	F	F	F	F	F
	West	F	F	F	F	F	F	F	F	F





Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	2025 Future	2020 Existing	2020 Build	2025 Future	2020 Existing	2020 Build	2025 Future
3. Concord Ave at Corporal Burns Road	North	A	A	A	A	A	A	A	A	A
5. Concord Ave at Chilton Street	North	A	A	A	A	A	A	A	A	A
	South	A	A	A	A	A	A	A	A	A
6. Concord Ave at Fayerweather Street	North	A	A	A	A	A	A	A	A	A
	South	A	A	A	A	A	A	A	A	A
	East	F	F	F	E	E	E	F	F	F
	West	F	F	F	E	E	E	F	F	F
7. Fresh Pond Parkway at Vassal Lane	East	A	A	A	A	A	A	A	A	A
8. Vassal Lane at Lakeview Avenue	South	A	A	A	A	A	A	A	A	A
	West	A	A	A	A	A	A	A	A	A
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	North	A	A	A	A	A	A	A	A	A
10. Vassal Lane at TMVLUS Bus Loop (Exit) (Eliminated in the Build + Future))	North	A	-	-	A	-	-	A	-	-
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	North	A	B	B	A	A	A	A	A	A
	South	A	A	A	A	A	A	A	A	A
	East	B	B	B	A	A	A	A	A	A
	West	A	A	A	A	A	A	A	A	A
12. Vassal Lane at Alpine Street	North	A	A	A	A	A	A	A	A	A
13. Vassal Lane at Chilton Street	North	A	A	A	A	A	A	A	A	A
	South	A	A	A	A	A	A	A	A	A
	East/West	B	C	C	A	A	A	B	B	B
14. Vassal Lane at Fayerweather Street	North	A	A	A	A	A	A	A	A	A
	South	A	A	A	A	A	A	A	A	A
	East	A	A	A	A	A	A	A	A	A
	West	A	A	A	A	A	A	A	A	A



Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	2025 Future	2020 Existing	2020 Build	2025 Future	2020 Existing	2020 Build	2025 Future
15. Fresh Pond Parkway at Lexington Avenue	East	A	A	A	A	A	A	A	A	A
16. Lexington Avenue at Worthington Street	South	A	A	A	A	A	A	A	A	A
	East	A	A	A	A	A	A	A	A	A
17. Lakeview Avenue at Worthington Street	West	A	A	A	A	A	A	A	A	A

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

## 12.0 Bicycle Analysis

### 12.a Conflicting Movements

Conflicting vehicle turning movements at the study area intersections are presented in **Figure 2.b.4.** and summarized in **Table 12.a.1** for Existing 2020, Build 2020, and Future 2025 conditions.

**TABLE 12.A.1 CONFLICTING BICYCLE/VEHICLE MOVEMENTS AT STUDY INTERSECTIONS**

Intersection	Time Period	Bicycle Direction	Existing Peak Hour Bicycle Volume	Conflicting Vehicle Movements					
				Existing 2020		Build 2020		Future 2025	
				Right Turn <sup>a</sup>	Left Turn <sup>b</sup>	Right Turn <sup>a</sup>	Left Turn <sup>b</sup>	Right Turn <sup>a</sup>	Left Turn <sup>b</sup>
1. Concord Ave at Birch Street	Morning	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	NA	NA	NA	NA	NA	NA
		SB	0	7	NA	7	NA	7	NA
	Afternoon	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	NA	NA	NA	NA	NA	NA
		SB	0	48	NA	48	NA	48	NA
	Evening	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	NA	NA	NA	NA	NA	NA
		SB	0	19	NA	19	NA	19	NA
2. Concord Ave at Fern Street	Morning	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	12	29	12	29	12	29
	Afternoon	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	12	29	12	29	12	29



3. Concord Ave at Corporal Burns Road	Evening	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	21	115	21	115	21	115
	Morning	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	NA	NA	NA	NA	NA	NA
		SB	0	9	NA	8	NA	8	NA
	Afternoon	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	NA	NA	NA	NA	NA	NA
		SB	0	7	NA	7	NA	7	NA
	Evening	EB	15	NA	NA	NA	NA	NA	NA
		WB	15	NA	NA	NA	NA	NA	NA
SB		0	3	NA	3	NA	3	NA	
4. Concord Ave at Alpine Street	Morning	EB	15	10	5	10	5	10	5
		WB	15	NA	NA	NA	NA	NA	NA
		SB	0	31	NA	31	NA	32	NA
	Afternoon	EB	15	5	3	5	3	5	3
		WB	15	NA	NA	NA	NA	NA	NA
		SB	0	21	NA	21	NA	22	NA
	Evening	EB	15	23	3	23	3	24	3
		WB	15	NA	NA	NA	NA	NA	NA
		SB	0	15	NA	15	NA	16	NA
	5. Concord Ave at Chilton Street	Morning	EB	15	54	17	54	17	55
WB			15	13	1	13	1	13	1
SB			0	2	NA	2	NA	2	NA
Afternoon		EB	15	19	5	19	5	19	5
		WB	15	24	17	24	17	25	18
		SB	0	2	NA	2	NA	2	NA
Evening		EB	15	52	11	52	11	53	11
		WB	15	52	25	52	25	53	26
		SB	0	2	NA	2	NA	2	NA
6. Concord Ave at Fayerweather Street		Morning	EB	15	75	32	75	32	77
	WB		15	NA	NA	NA	NA	NA	NA
	NB		0	3	2	3	2	3	2
	SB		0	10	48	10	60	10	62
	Afternoon	EB	15	50	7	50	7	51	7
		WB	15	NA	NA	NA	NA	NA	NA
		NB	0	5	5	5	5	5	5
		SB	0	5	28	5	33	5	34
	Evening	EB	15	107	4	107	4	110	4
		WB	15	NA	NA	NA	NA	NA	NA
		NB	0	56	12	56	12	57	12
		SB	0	6	35	6	42	6	43



8. Vassal Lane at Lakeview Avenue	Morning	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	115	NA	148	NA	151	NA
	Afternoon	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	60	NA	63	NA	64	NA
	Evening	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	115	NA	110	NA	112	NA
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	Morning	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
	Afternoon	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
	Evening	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
10. Vassal Lane at TMVLUS Bus Loop (Exit) (Eliminated in the Build + Future)	Morning	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
	Afternoon	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
	Evening	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	Morning	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	80	NA	63	134	65	134
		SB	0	NA	NA	NA	NA	NA	NA
	Afternoon	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	21	NA	6	84	7	84
		SB	0	NA	NA	NA	NA	NA	NA
	Evening	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	27	NA	27	63	28	63
		SB	0	NA	NA	NA	NA	NA	NA
12. Vassal Lane at Alpine Street	Morning	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
	Afternoon	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
	Evening	EB	10	NA	NA	NA	NA	NA	NA
		SB	0	NA	NA	NA	NA	NA	NA
13. Vassal Lane at Chilton Street	Morning	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	31	71	31	71	32	73
		SB	0	NA	NA	NA	NA	NA	NA
	Afternoon	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	39	24	39	24	40	25
		SB	0	NA	NA	NA	NA	NA	NA
	Evening	EB	10	NA	NA	NA	NA	NA	NA
		NB	0	100	68	100	68	103	70

14. Vassal Lane at Fayerweather Street	Morning	SB	0	NA	NA	NA	NA	NA	NA
		EB	10	70	NA	82	NA	84	NA
	Afternoon	SB	0	NA	NA	NA	NA	NA	NA
		EB	10	70	NA	83	NA	85	NA
	Evening	SB	0	NA	NA	NA	NA	NA	NA
		EB	10	77	NA	84	NA	86	NA
		SB	0	NA	NA	NA	NA	NA	

a Advancing volume  
 b Opposing volume  
 NA Movement not available

\*Bike LOS not studied at intersections with no bike volumes (intersections 7, 15, 16, and 17).

### 13.0 Transportation Demand Management

The Proposed Site will support a program of transportation demand management (TDM) actions to reduce automobile trips generated by the Project. 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.

Furthermore, the Project will become subject to the City’s PTDM Ordinance (Parking, Transportation Demand Management) and require a large project PTDM Plan submission, as indicated in the City’s Traffic Study Scoping Letter. The PTDM Ordinance is applicable because the existing site is only registered for 60 parking spaces and the project proposes to build 100 staff vehicle parking spaces, any addition of 20 or more new parking spaces triggers a Large Project PTDM Plan.

The Cambridge Public School Department will work with the City’s PTDM Officer to develop and put in place an appropriate set of TDM measures for this Site.

### 14.0 Transportation Mitigation

The proposed Project exceeds 25 out of 275 possible data entries, resulting in an 9.0% exceedance rate. **Table 14.a.1** provides a listing of all Planning Board Special Permit Exceedances and indicates how transportation mitigation measures will or cannot mitigate the Project Exceedances.

**TABLE 14.A.1 EXCEEDANCE MITIGATION SUMMARY**

#	Location		Reason for Exceedance	Mitigation
<b>Criteria C – Traffic on Residential Streets</b>				
1	Vassal Lane	Standish Street to Alpine Street – Morning Peak Hour	Increase of greater than 30 VPH	This increased volume on residential roadway segments will be mitigated by the underground parking garage to minimize neighborhood parking and idling and possible neighborhood calming measures.
2	Vassal Lane	Standish Street to Alpine Street – Evening Peak Hour	Increase of greater than 30 VPH	
3	Vassal Lane	Alpine Street to Chilton Street – Morning Peak Hour	Increase of greater than 30 VPH	
4	Vassal Lane	Alpine Street to Chilton Street – Evening Peak Hour	Increase of greater than 30 VPH	
5	Vassal Lane	Chilton Street to Fayerweather Street – Morning Peak Hour	Increase of greater than 30 VPH	
6	Vassal Lane	Chilton Street to Fayerweather Street – Evening Peak Hour	Increase of greater than 30 VPH	
7	Vassal Lane	East of Fayerweather Street – Morning Peak Hour	Increase of greater than 30 VPH	
8	Vassal Lane	East of Fayerweather Street – Evening Peak Hour	Increase of greater than 30 VPH	
9	Lakeview Avenue	Vassal Lane to Worthington Street – Morning Peak Hour	Increase of greater than 30 VPH	
<b>Criteria E-3 – Pedestrian LOS</b>				
10	Concord Avenue at Fern Street – East Crosswalk	PLOS F during Morning Peak Hour	Increase in traffic volumes	Existing PLOS conditions are maintained under Build conditions - neighborhood calming measures are under consideration to protect pedestrians throughout the neighborhood.
11	Concord Avenue at Fern Street – East Crosswalk	PLOS F during Afternoon Peak Hour	Increase in traffic volumes	
12	Concord Avenue at Fern Street – East Crosswalk	PLOS F during Evening Peak Hour	Increase in traffic volumes	
13	Concord Avenue at Fern Street – West Crosswalk	PLOS F during Morning Peak Hour	Increase in traffic volumes	
14	Concord Avenue at Fern Street – West Crosswalk	PLOS F during Afternoon Peak Hour	Increase in traffic volumes	
15	Concord Avenue at Fern Street – West Crosswalk	PLOS F during Evening Peak Hour	Increase in traffic volumes	
16	Concord Avenue at Fayerweather	PLOS F during Morning Peak Hour	Increase in traffic volumes	

#	Location		Reason for Exceedance	Mitigation
	Street – East Crosswalk			
17	Concord Avenue at Fayerweather Street – East Crosswalk	PLOS E during Afternoon Peak Hour	Increase in traffic volumes	
18	Concord Avenue at Fayerweather Street – East Crosswalk	PLOS F during Evening Peak Hour	Increase in traffic volumes	
19	Concord Avenue at Fayerweather Street – West Crosswalk	PLOS F during Morning Peak Hour	Increase in traffic volumes	
20	Concord Avenue at Fayerweather Street – West Crosswalk	PLOS E during Afternoon Peak Hour	Increase in traffic volumes	
21	Concord Avenue at Fayerweather Street – West Crosswalk	PLOS F during Evening Peak Hour	Increase in traffic volumes	
22	Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future) – North Crosswalk	PLOS B during Evening Peak Hour	Increase in traffic volumes	
23	Vassal Lane at Chilton Street – East/West	PLOS C during Evening Peak Hour	Increase in traffic volumes	
<b>Criteria E-4 – Pedestrian + Bicycle Facilities</b>				
24	Concord Avenue	Birch Street to Alpine Street	No bicycle facilities/rights-of-way present	Multiple multi-use paths proposed within the footprint of the project site.
25	Vassal Lane	Lakeview Avenue to Alpine Street	No bicycle facilities/rights-of-way present	

# Planning Board Special Permit Criteria

## Criterion A – Project Vehicle Trip Generation

**Table A-1** presents the Project vehicle trip generation criterion. Project vehicle trip generation 188is based on existing school vehicle observations, as discussed previously.

**TABLE A-1 PROJECT VEHICLE TRIP GENERATION**

Time Period	Criteria (trips)	Build (Net-New)	Exceeds Criteria?
Weekday Daily	2,000	n/a	No
Morning Peak Hour <sup>1</sup>	240	129	No
Afternoon Peak Hour <sup>2</sup>	n/a	21	n/a
Evening Peak Hour <sup>3</sup>	240	72	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

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

## Criterion B – Vehicle 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



Existing	With Project
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**

Intersection	Morning Peak Hour <sup>1</sup>				Afternoon Peak Hour <sup>2</sup>				Evening Peak Hour <sup>3</sup>			
	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?
1. Concord Avenue at Birch Street	D	D	1%	No	C	C	1%	No	D	D	1%	No
2. Concord Avenue at Fern Street	A	A	1%	No	A	A	1%	No	A	A	1%	No
3. Concord Avenue at Corporal Burns Road	C	C	1%	No	C	C	1%	No	D	D	1%	No
4. Concord Avenue at Alpine Street	B	B	1%	No	B	B	1%	No	B	B	1%	No
5. Concord Avenue at Chilton Street	D	D	1%	No	C	C	1%	No	F	F	1%	No
6. Concord Avenue at Fayerweather	F	F	1%	No	D	D	1%	No	F	F	1%	No
7. Fresh Pond Parkway at Vassal Lane	D	D	1%	No	B	B	0%	No	C	C	1%	No
8. Vassal Lane at Lakeview Avenue	A	A	23%	No	A	A	3%	No	A	A	11%	No
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	A	B	39%	No	A	A	-13%	No	A	A	2%	No
10. Vassal Lane at TMVLUS Bus Loop	A	-	-	No	A	-	-	No	A	-	-	No

Intersection	Morning Peak Hour <sup>1</sup>				Afternoon Peak Hour <sup>2</sup>				Evening Peak Hour <sup>3</sup>			
	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?	2020 Existing	2020 Build	Traffic Increase	Exceeds Criterion?
(Exit) (Eliminated in the Build + Future)												
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	A	A	48%	No	A	A	35%	No	A	A	40%	No
12. Vassal Lane at Alpine Street	B	B	21%	No	A	A	10%	No	A	B	18%	No
13. Vassal Lane at Chilton Street	B	C	15%	No	B	B	7%	No	B	B	10%	No
14. Vassal Lane at Fayerweather Street	B	B	10%	No	A	A	6%	No	B	B	7%	No
15. Fresh Pond Parkway at Lexington Avenue	E	F	1%	No	C	C	0%	No	C	C	1%	No
16. Lexington Avenue at Worthington Street	A	A	10%	No	A	A	2%	No	A	A	4%	No
17. Lakeview Avenue at Worthington Street	A	B	21%	No	A	A	4%	No	A	A	10%	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

## 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**.

**TABLE C-1 CRITERION – TRAFFIC ON RESIDENTIAL STREETS**

Parameter 1: Amount of Residential <sup>1</sup>	Parameter 2: Current Peak Hour Street Volume (two-way vehicles)		
	< 150 VPH	150-400 VPH	> 400 VPH
1/2 or more	20 VPH <sup>2</sup>	30 VPH <sup>2</sup>	40 VPH <sup>2</sup>
> 1/3 but < 1/2	30 VPH <sup>2</sup>	45 VPH <sup>2</sup>	60 VPH <sup>2</sup>
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

24 of the 33 roadway segments in the study area identified as street segments which have more than 1/3 of residential frontage and are therefore evaluated against the traffic volume criteria. The results are presented in **Table C-2**.

**TABLE C-2 TRAFFIC ON RESIDENTIAL STREETS**

Roadway	Reviewed Segment	Amount of Residential	Morning Peak Hour			Afternoon Peak Hour			Evening Peak Hour		
			2020 Existing *	Project Trips	Exceeds Criteria?	2020 Existing *	Project Trips	Exceeds Criteria?	2020 Existing *	Project Trips	Exceeds Criteria?
Concord Avenue	West of Birch St	1/3 or less	1,160	12	No	944	5	No	1,246	7	No
	Birch St to Fern St	1/2 or more	1,181	12	No	915	5	No	1,273	7	No
	Fern St to Corporal Burns St	1/3 or less	1,164	12	No	898	5	No	1,179	7	No
	Corporal Burns St to Alpine St	>1/3 but <1/2	1,167	12	No	904	5	No	1,194	7	No
	Alpine St to Chilton Street	1/2 or more	1,143	12	No	927	5	No	1,211	7	No
	Chilton St to Fayerweather St	1/2 or more	1,120	12	No	919	5	No	1,198	7	No
	East of Fayerweather St	1/2 or more	1,023	0	No	853	0	No	1,122	0	No
	Vassal Lane	Fresh Pond Parkway to Lakeview Ave	1/3 or less	96	16	No	89	2	No	109	7
Lakeview Ave to Standish St		1/2 or more	168	7	No	117	-38	No	153	-5	No
Standish Street to Alpine St		1/2 or more	230	58	<b>Yes</b>	108	13	No	149	36	<b>Yes</b>
Alpine St to Chilton Street		1/2 or more	281	58	<b>Yes</b>	125	13	No	202	36	<b>Yes</b>
Chilton St to Fayerweather St		1/2 or more	383	58	<b>Yes</b>	189	13	No	370	36	<b>Yes</b>
East of Fayerweather		1/2 or more	317	35	<b>Yes</b>	93	6	No	144	22	<b>Yes</b>
Fresh Pond Parkway	North of Vassal Lane	1/3 or less	2,415	19	No	1,784	2	No	2,089	7	No
	Vassal Lane to Lexington Ave	1/3 or less	2,449	35	No	1,801	4	No	2,112	14	No
	South of Lexington Ave	1/3 or less	2,368	16	No	1,732	2	No	2,060	7	No
Birch Street	North of Concord Ave	1/3 or less	35	0	No	67	0	No	64	0	No
Fern Street	North of Concord Ave	1/3 or less	41	0	No	41	0	No	136	0	No
Corporal Burns Road	North of Concord Ave	1/2 or more	20	0	No	20	0	No	21	0	No
Alpine Street	North of Concord Ave	1/2 or more	80	0	No	77	0	No	95	0	No
	Concord Ave to Vassal Lane	1/2 or more	51	0	No	17	0	No	53	0	No
Chilton Street	North of Concord Ave	1/2 or more	19	0	No	44	0	No	88	0	No
	Concord Ave to Vassal Lane	1/2 or more	71	0	No	24	0	No	68	0	No
	South of Vassal Lane	1/2 or more	31	0	No	39	0	No	100	0	No
Fayerweather Street	North of Concord Ave	1/2 or more	28	0	No	15	0	No	47	0	No
	Concord Ave to Vassal Lane	1/2 or more	236	12	No	89	5	No	271	7	No
	South of Vassal Lane	1/2 or more	235	12	No	125	3	No	188	7	No
Lexington Avenue	Fresh Pond Parkway to Worthington St	1/3 or less	171	19	No	122	2	No	130	7	No
	South of Worthington St	1/2 or more	138	0	No	113	0	No	110	0	No
Worthington Street	Lexington Ave to Lakeview Ave	1/2 or more	58	19	No	18	2	No	65	7	No
Lakeview Avenue	Vassal Lane to Worthington St	1/2 or more	161	33	<b>Yes</b>	110	4	No	150	15	No
	South of Worthington St	1/2 or more	113	14	No	93	2	No	93	8	No
Standish Street	South of Vassal Lane	1/2 or more	171	22	No	37	3	No	42	14	No

\* Where driveways/on-street parking created a segment inflow/outflow volume imbalance, an average was calculated per direction and added

## 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 VEHICULAR QUEUES AT SIGNALIZED INTERSECTIONS**

Intersection	Lane	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?	Existing	Build	Exceeds Criteria?
4. Concord Avenue at Alpine Street	Concord Avenue Eastbound - Thru/Right	6	6	No	3	3	No	8	8	No
	Concord Avenue Westbound - Left/Thru	3	3	No	3	3	No	2	2	No
	Alpine Street Southbound – Left/Thru/Right	1	1	No	1	1	No	1	1	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

Note: 1 vehicle = 25 feet

## 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 and E-3** present the evaluation of PLOS criteria for each crosswalk at study area intersections under existing and full build conditions.

**TABLE E-1 CRITERION – PLOS 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 PLOS SUMMARY**

Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?
4. Concord Avenue at Alpine Street	East	A	A	No	A	A	No	A	A	No
	West	A	A	No	A	A	No	A	A	No
	North	C	C	No	C	C	No	C	C	No
	South	C	C	No	C	C	No	C	C	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

**TABLE E-3 UNSIGNALIZED INTERSECTION PLOS SUMMARY**

Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?
1. Concord Ave at Birch Street	North	A	A	No	A	A	No	A	A	No
2. Concord Ave at Fern Street	North	A	A	No	A	A	No	A	A	No
	East	F	F	<b>Yes</b>	F	F	<b>Yes</b>	F	F	<b>Yes</b>
	West	F	F	<b>Yes</b>	F	F	<b>Yes</b>	F	F	<b>Yes</b>
3. Concord Ave at Corporal Burns Road	North	A	A	No	A	A	No	A	A	No
5. Concord Ave at Chilton Street	North	A	A	No	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
6. Concord Ave at Fayerweather Street	North	A	A	No	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
	East	F	F	<b>Yes</b>	E	E	<b>Yes</b>	F	F	<b>Yes</b>
	West	F	F	<b>Yes</b>	E	E	<b>Yes</b>	F	F	<b>Yes</b>
7. Fresh Pond Parkway at Vassal Lane	East	A	A	No	A	A	No	A	A	No
8. Vassal Lane at	South	A	A	No	A	A	No	A	A	No



Intersection	Crosswalk	Morning Peak Hour <sup>1</sup>			Afternoon Peak Hour <sup>2</sup>			Evening Peak Hour <sup>3</sup>		
		2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?	2020 Existing	2020 Build	Exceeds Criteria?
Lakeview Avenue	West	A	A	No	A	A	No	A	A	No
9. Vassal Lane at TMVLUS Parking Driveway or Proposed Bus Loop + Loading Access (Build + Future)	North	A	A	No	A	A	No	A	A	No
10. Vassal Lane at TMVLUS Bus Loop (Exit) (Eliminated in the Build + Future)	North	A	-	No	A	-	No	A	-	No
11. Vassal Lane at Standish Street / TMVLUS Bus Loop (Entrance) or Proposed Parking Garage Access (Build + Future)	North	A	B	Yes	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
	East	B	B	No	A	A	No	A	A	No
	West	A	A	No	A	A	No	A	A	No
12. Vassal Lane at Alpine Street	North	A	A	No	A	A	No	A	A	No
13. Vassal Lane at Chilton Street	North	A	A	No	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
	East/West	B	C	Yes	A	A	No	B	B	No
14. Vassal Lane at Fayerweather Street	North	A	A	No	A	A	No	A	A	No
	South	A	A	No	A	A	No	A	A	No
	East	A	A	No	A	A	No	A	A	No
	West	A	A	No	A	A	No	A	A	No
15. Fresh Pond Parkway at Lexington Avenue	East	A	A	No	A	A	No	A	A	No
16. Lexington Avenue at Worthington Street	South	A	A	No	A	A	No	A	A	No
	East	A	A	No	A	A	No	A	A	No
17. Lakeview Avenue at Worthington Street	West	A	A	No	A	A	No	A	A	No

<sup>1</sup> Morning Commuter Peak Hour / Morning Peak Student Arrival Hour

<sup>2</sup> Afternoon Peak Student + Staff Departure Hour

<sup>3</sup> Evening Commuter Peak Hour

**Criteria 2 & 3: Safe Pedestrian and Bicycle Facilities**

Safe pedestrian facilities must exist on any adjacent publicly-accessible street or ROW; and they must connect to site entrances, interior walkways, and adjoining pedestrian facilities.

Safe Bicycle Facilities are on-street bicycle lanes or off-road paths along a publicly-accessible street or right-of-way which meet City design standards.

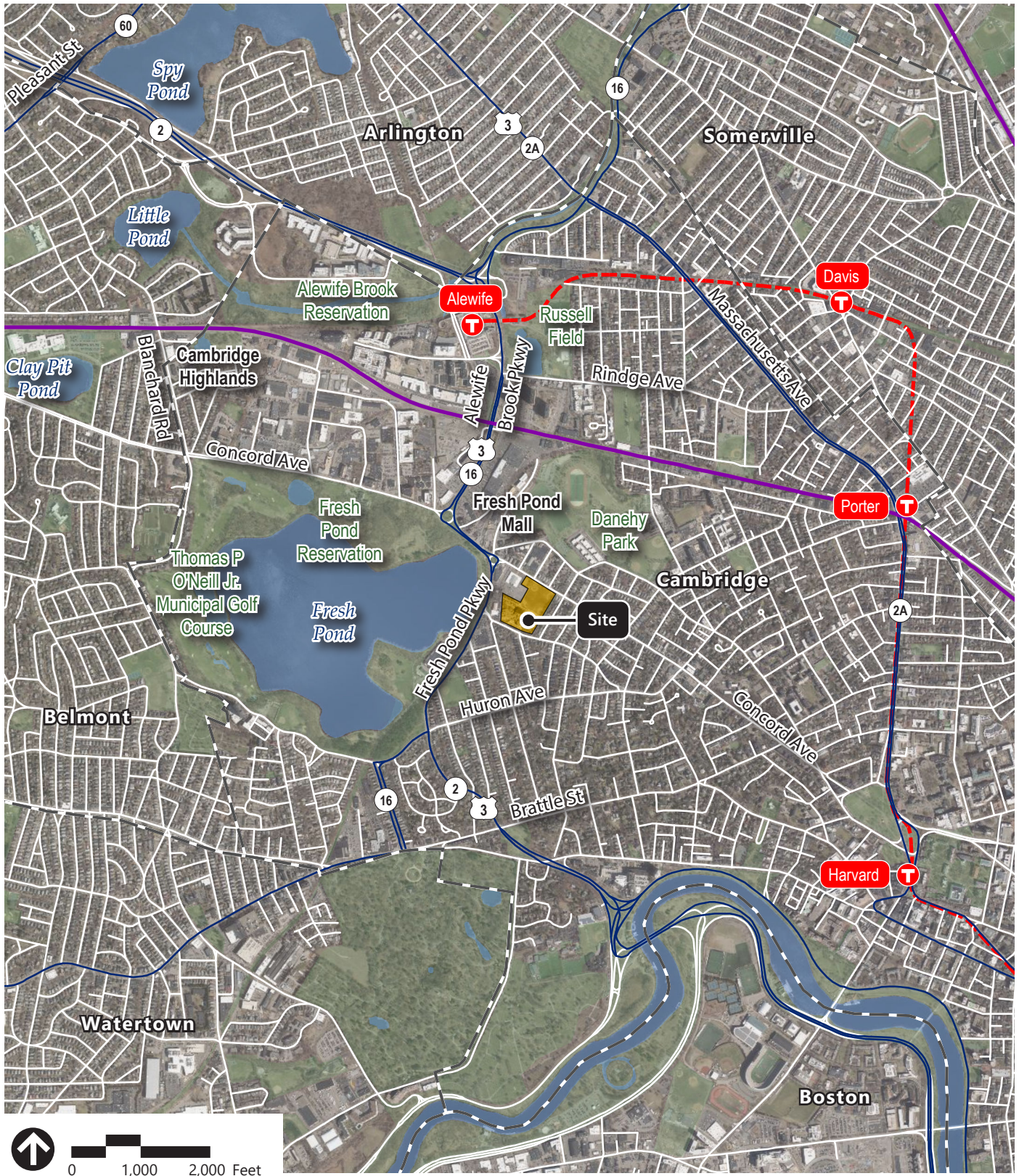
Where sufficient ROW currently exists, safe bicycle facilities must exist or sufficient ROW must be preserved on any adjacent publicly-accessible street or ROW; and they must connect to site entrances, interior pathways, and adjoining bicycle facilities.

**Table E-4** presents the evaluation of the pedestrian and bicycle facilities for the streets adjacent to the Project.

**TABLE E-4 PEDESTRIAN AND BICYCLE FACILITIES**

<b>Adjacent Street</b>	<b>Link (between)</b>	<b>Sidewalk or Walkway Present</b>	<b>Exceeds Criteria?</b>	<b>Bicycle Facilities or Right of Ways Present</b>	<b>Exceeds Criteria?</b>
Concord Avenue	Birch Street to Alpine Street	Yes	No	No	<b>Yes</b>
Vassal Lane	Lakeview Avenue to Alpine Street	Yes	No	No	<b>Yes</b>





Source: MassGIS

- Key Regional Roadways
- - - MBTA Red Line
- MBTA Commuter Rail
- - - Town Line



Figure A  
Regional Context Map

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**



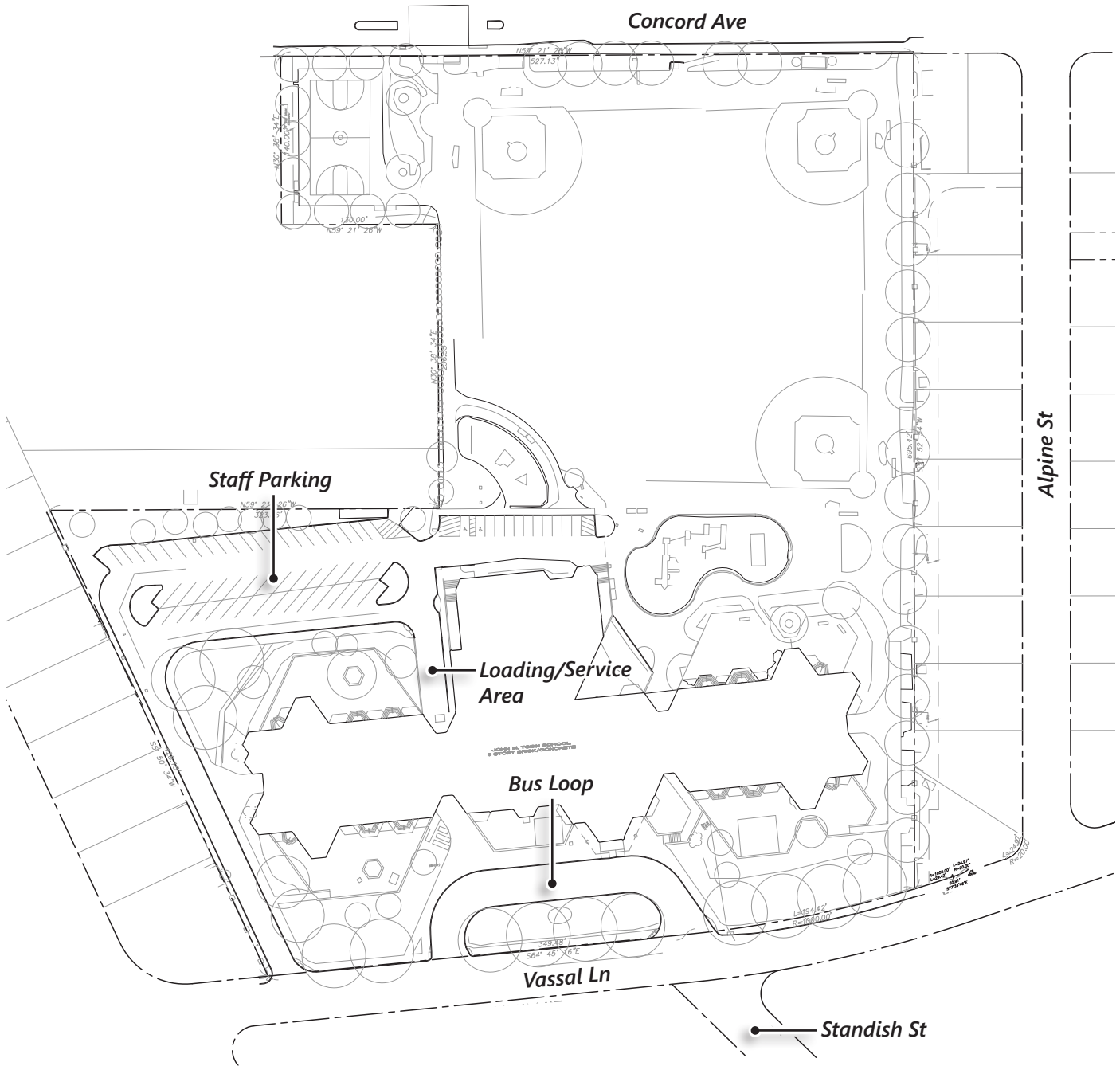


Source: MassGIS



Figure B  
Project Site

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**



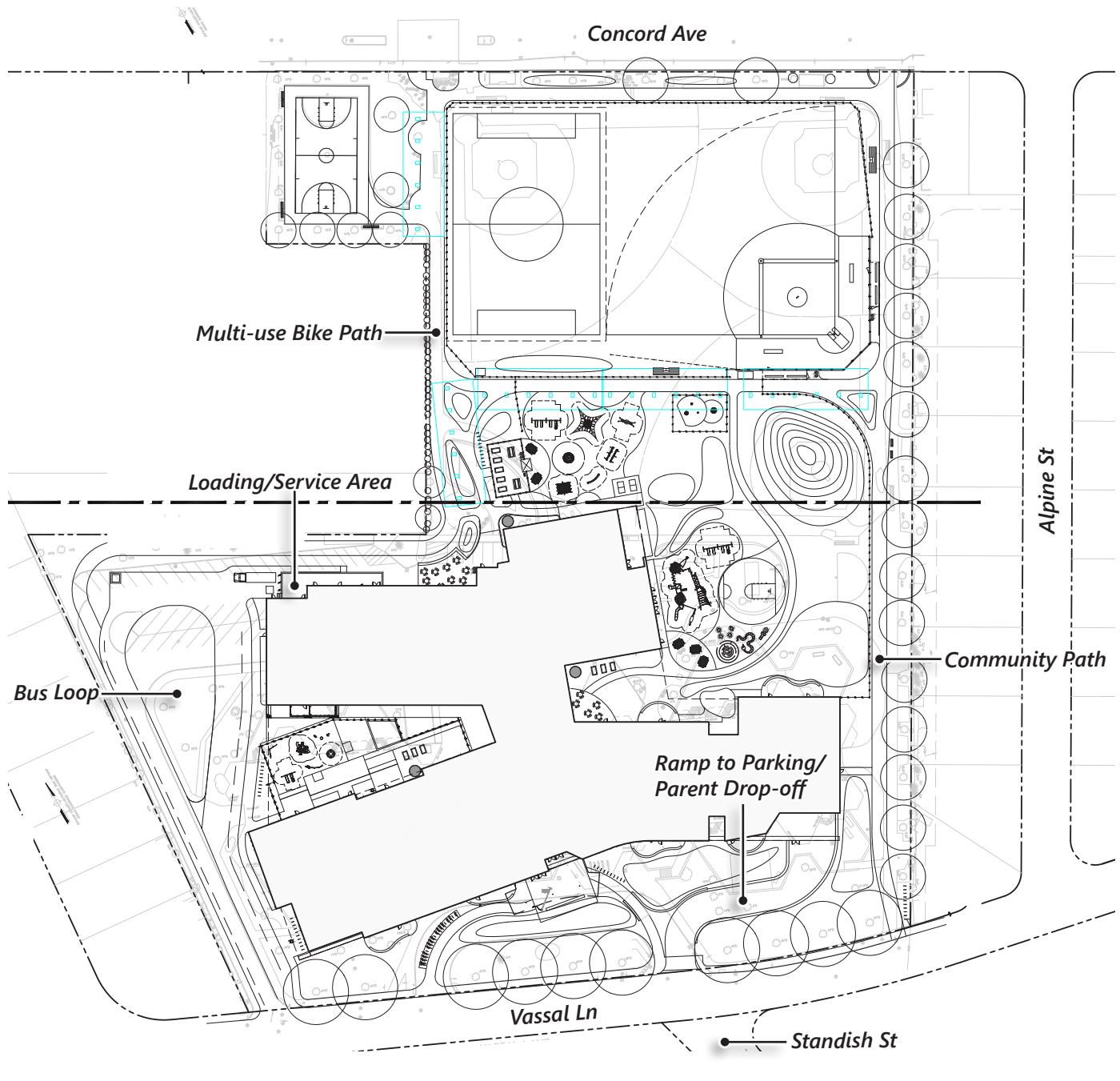
Source: Traverse Landscape Architects



Figure C  
Existing Site Plan

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**





Source: Traverse Landscape Architects



Figure D  
Proposed Site Plan

**Tobin Montessori + Vassal Lane Upper School**  
Cambridge, Massachusetts



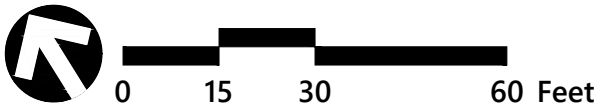
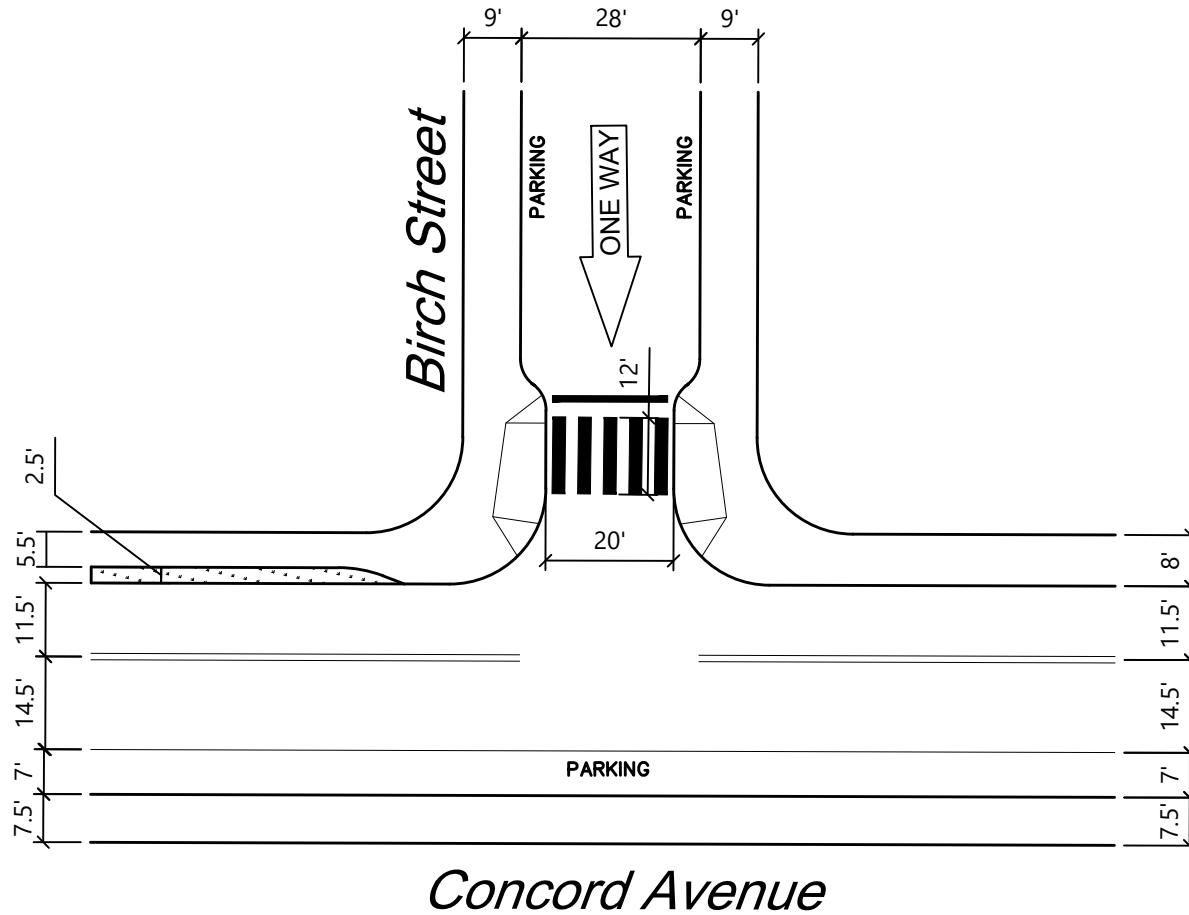
Source: MassGIS

- # Unsignalized Intersection
- # Signalized Intersection



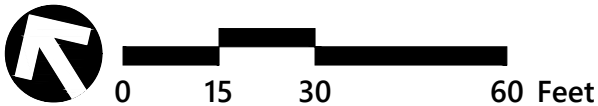
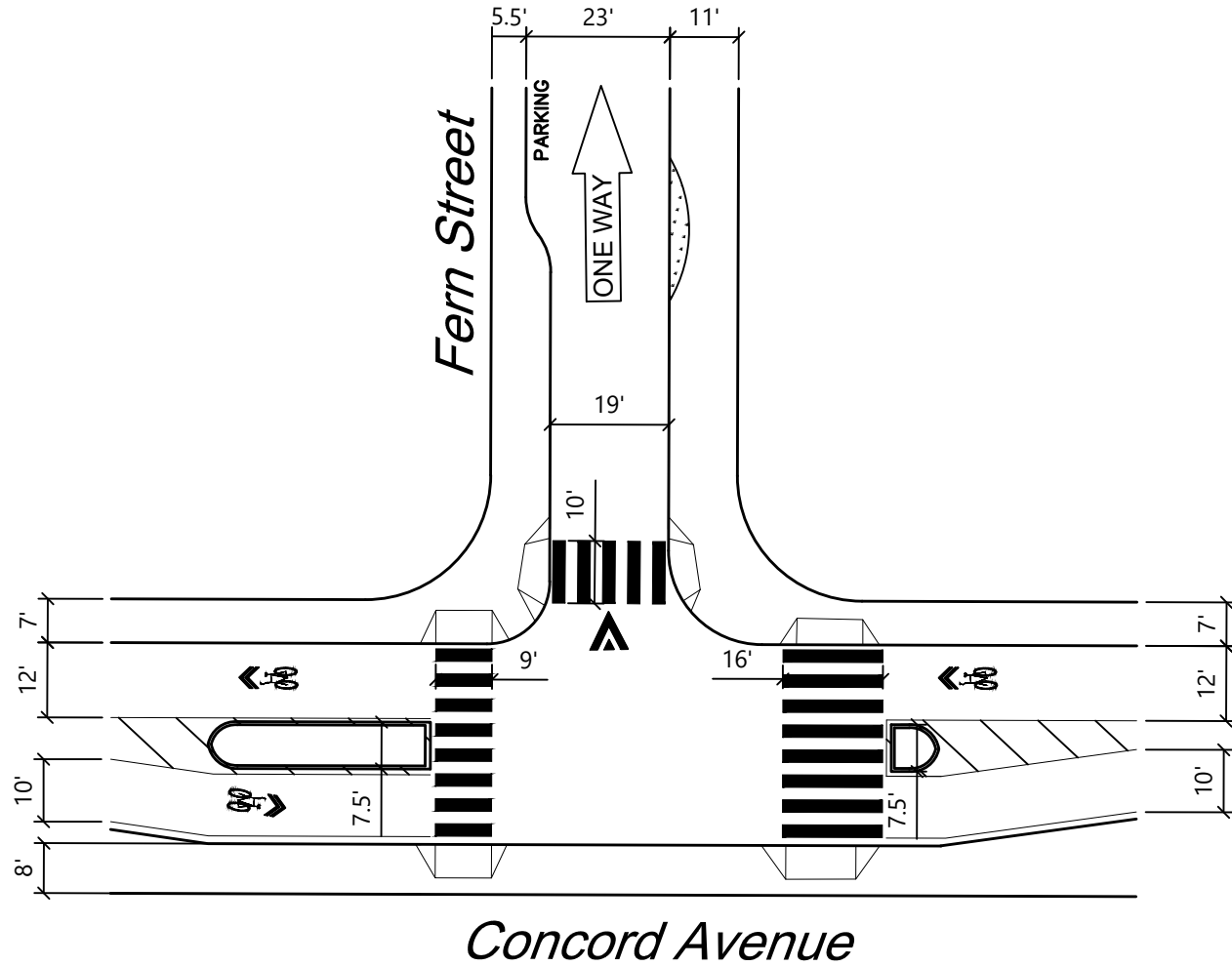
Figure E  
Study Area Intersections

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**



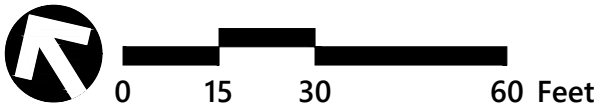
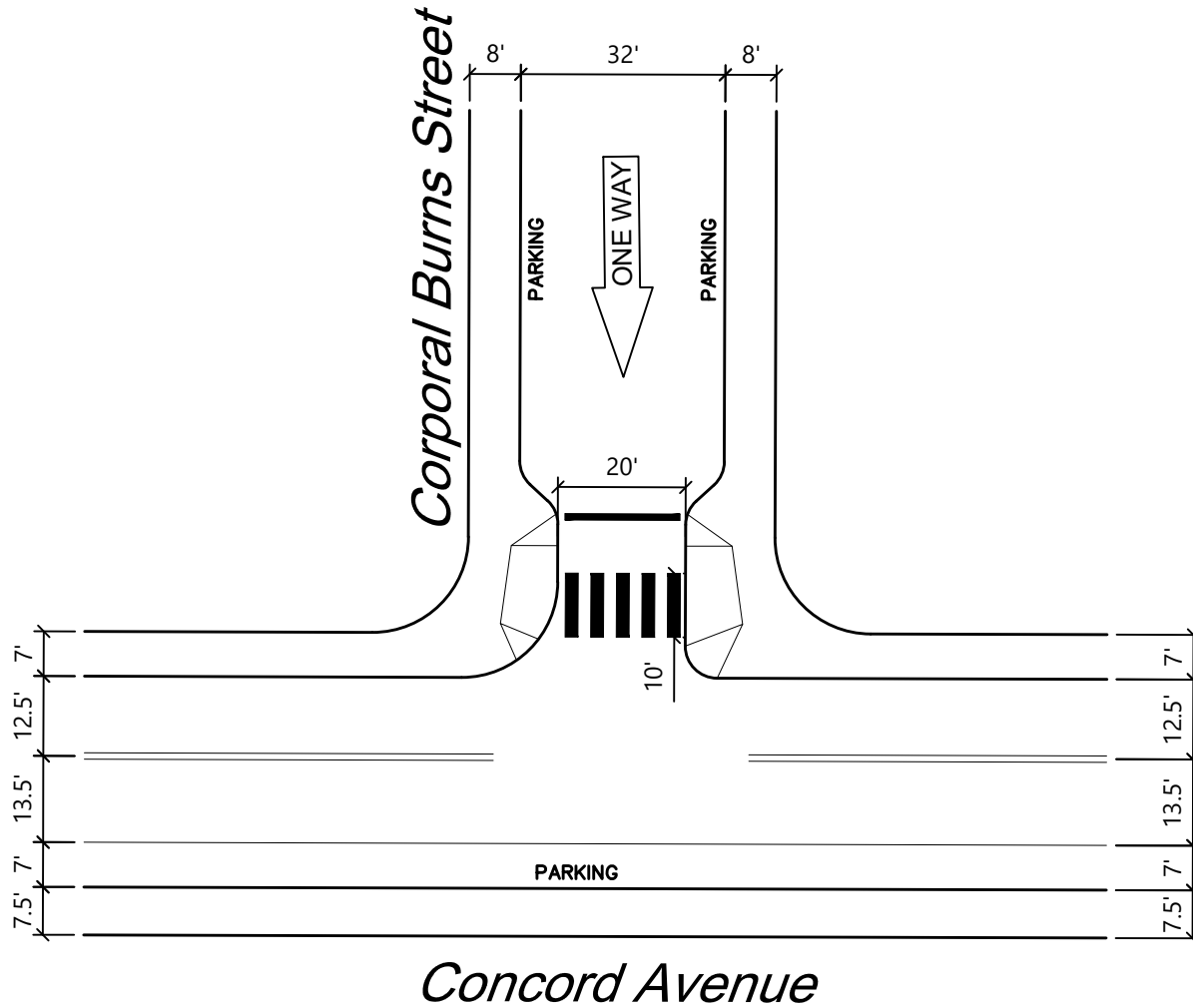
Existing Condition Intersection Sketch **Figure 1.b.1**  
Concord Avenue at Birch Street

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Existing Condition Intersection Sketch **Figure 1.b.2**  
Concord Avenue at Fern Street

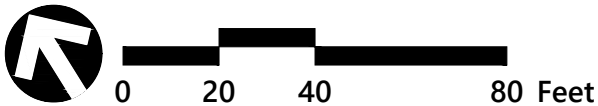
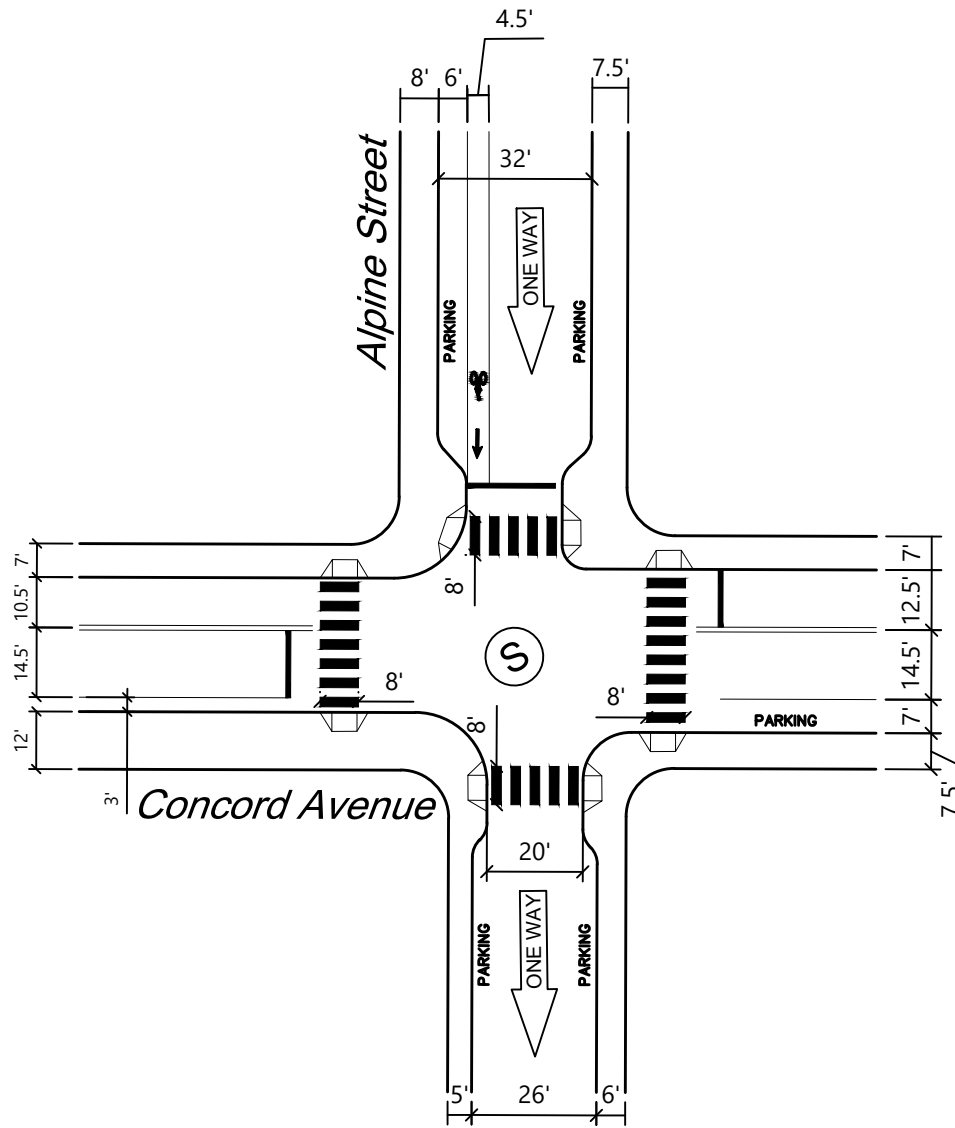
**Tobin Montessori + Vassal Lane Upper School**  
**Cambridge, Massachusetts**



Existing Condition Intersection Sketch **Figure 1.b.3**  
Concord Avenue at Corporal Burns Street

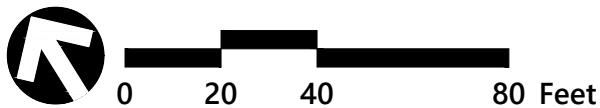
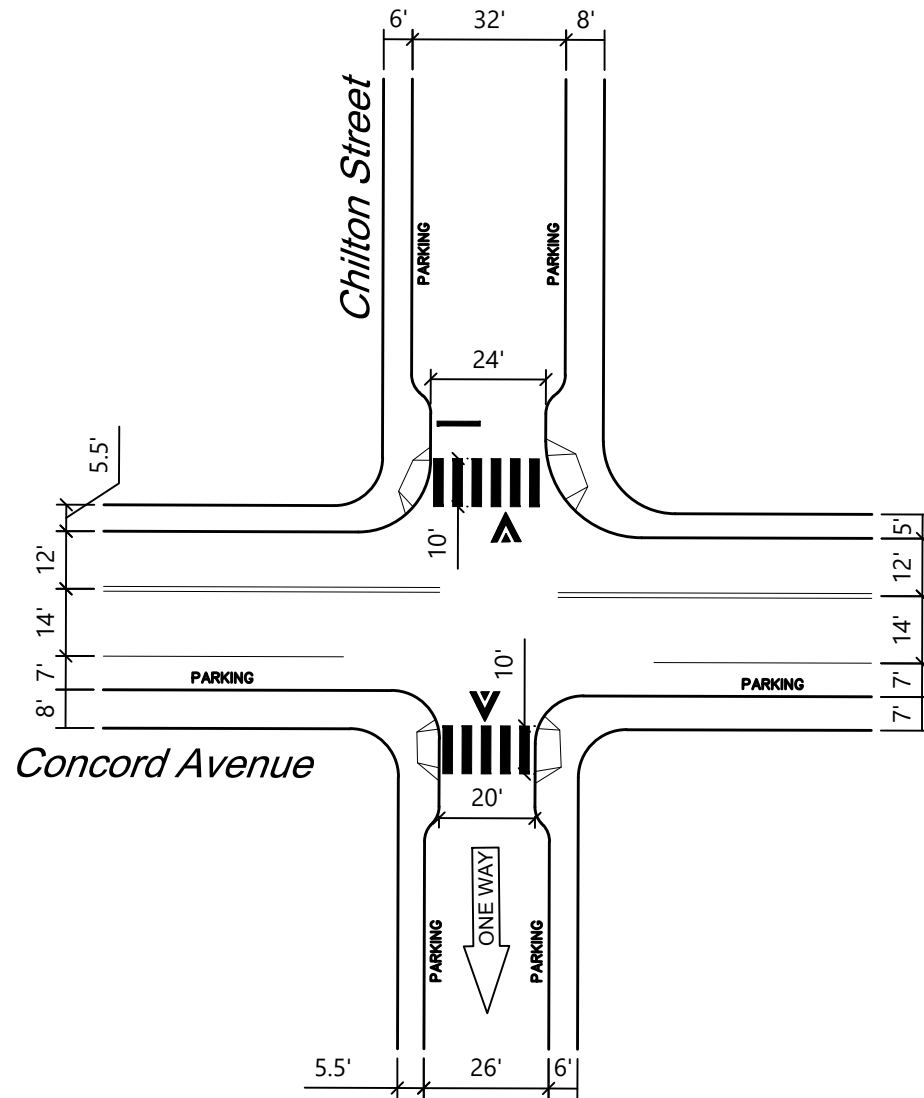
**Tobin Montessori + Vassal Lane Upper School**  
**Cambridge, Massachusetts**





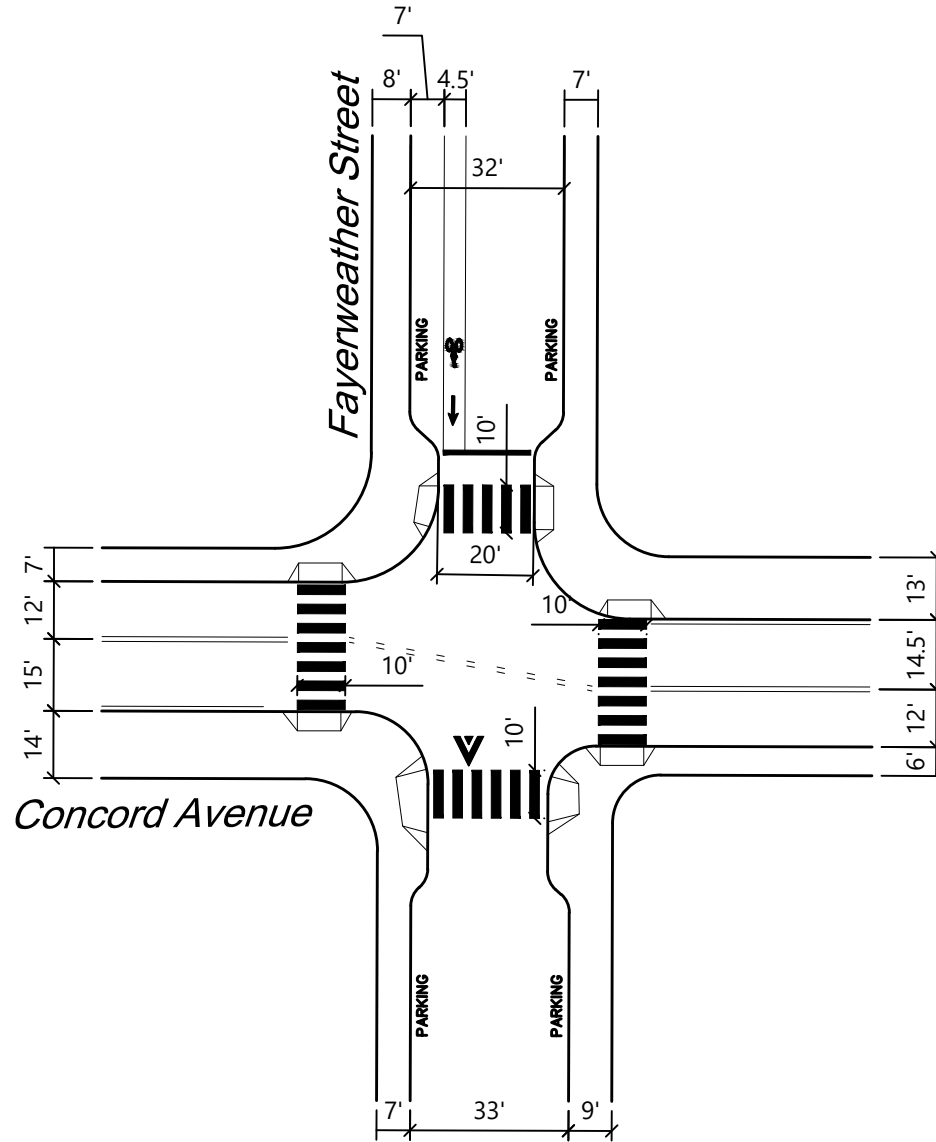
Existing Condition Intersection Sketch **Figure 1.b.4**  
Concord Avenue at Alpine Street

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**Cambridge, Massachusetts**



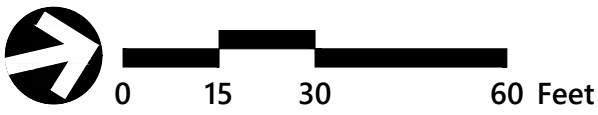
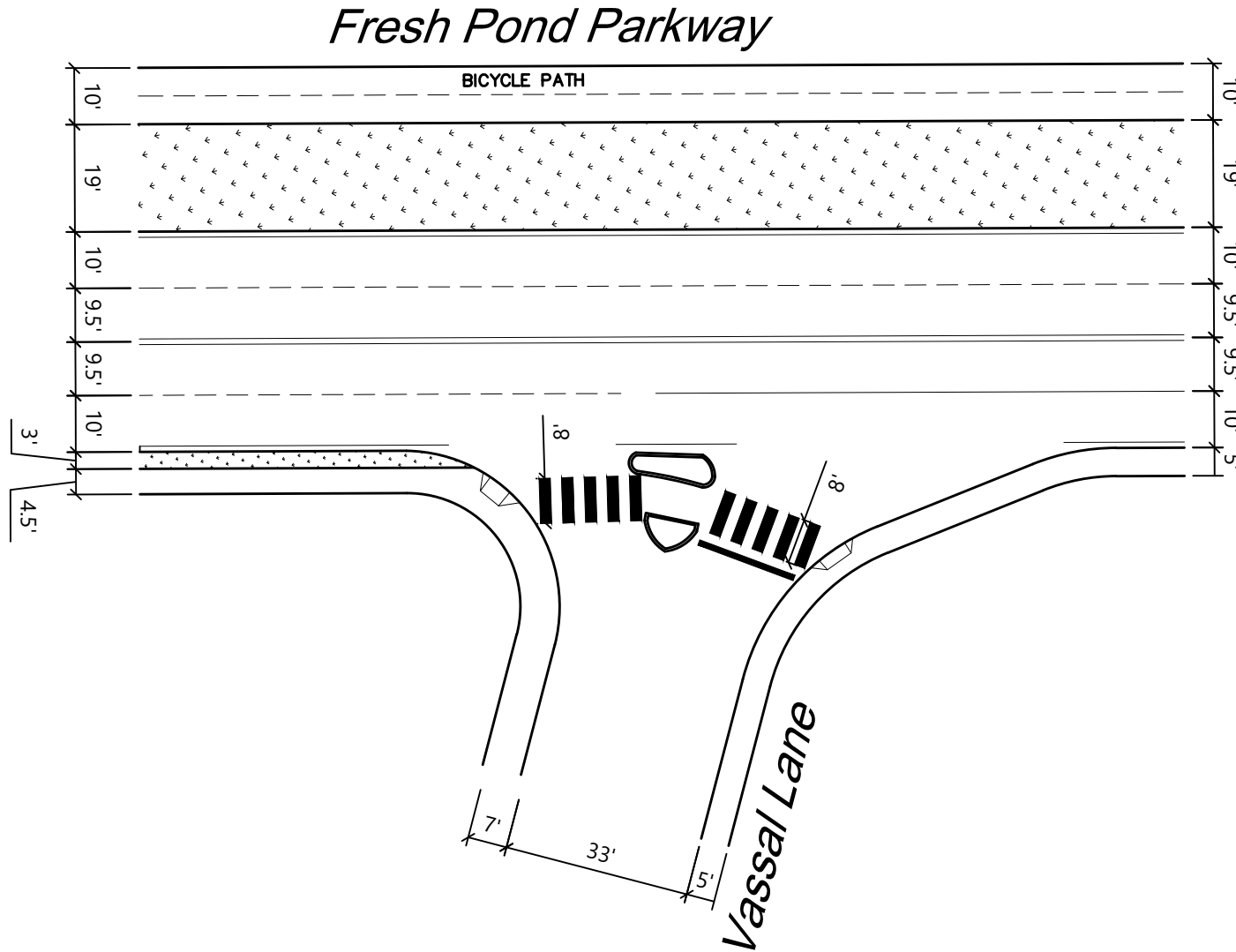
Existing Condition Intersection Sketch **Figure 1.b.5**  
Concord Avenue at Chilton Street

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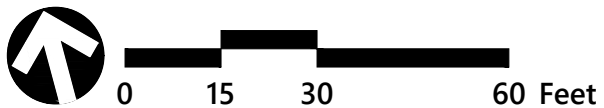
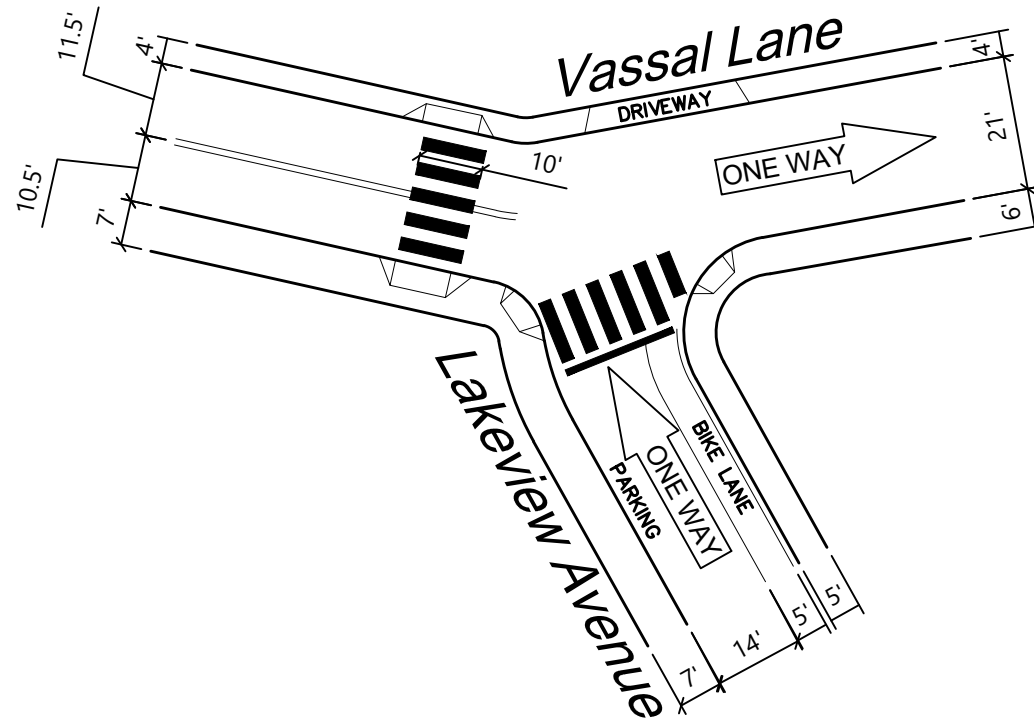


Existing Condition Intersection Sketch **Figure 1.b.6**  
Concord Avenue at Fayerweather Street

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**Cambridge, Massachusetts**

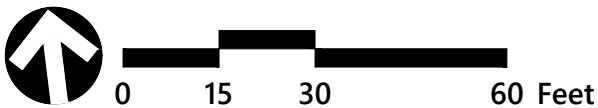
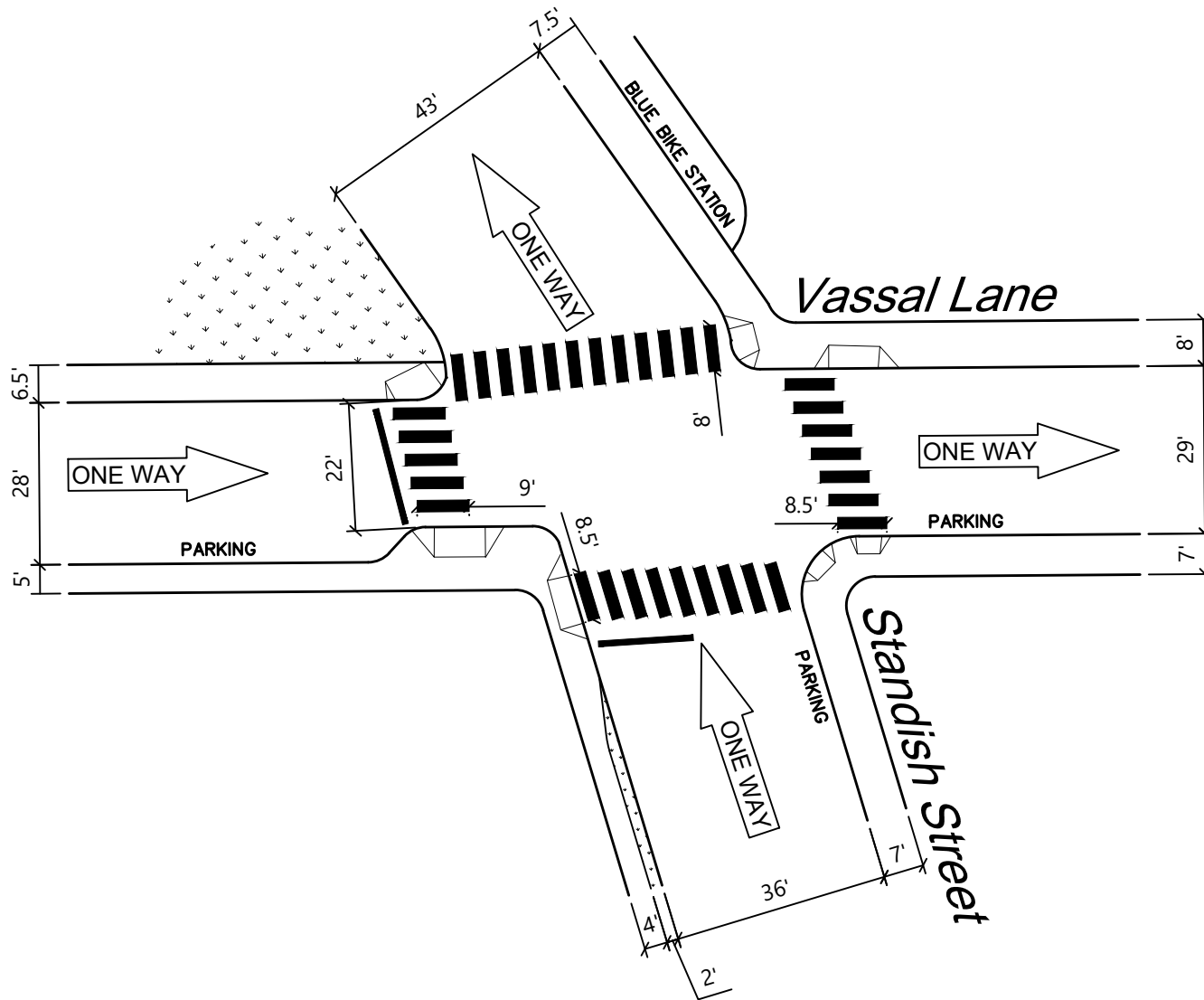


Existing Condition Intersection Sketch **Figure 1.b.7**  
Fresh Pond Parkway at Vassal Lane  
**Tobin Montessori + Vassal Lane Upper School**  
**Cambridge, Massachusetts**



Existing Condition Intersection Sketch **Figure 1.b.8**  
Vassal Lane at Lakeview Avenue

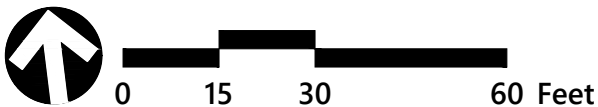
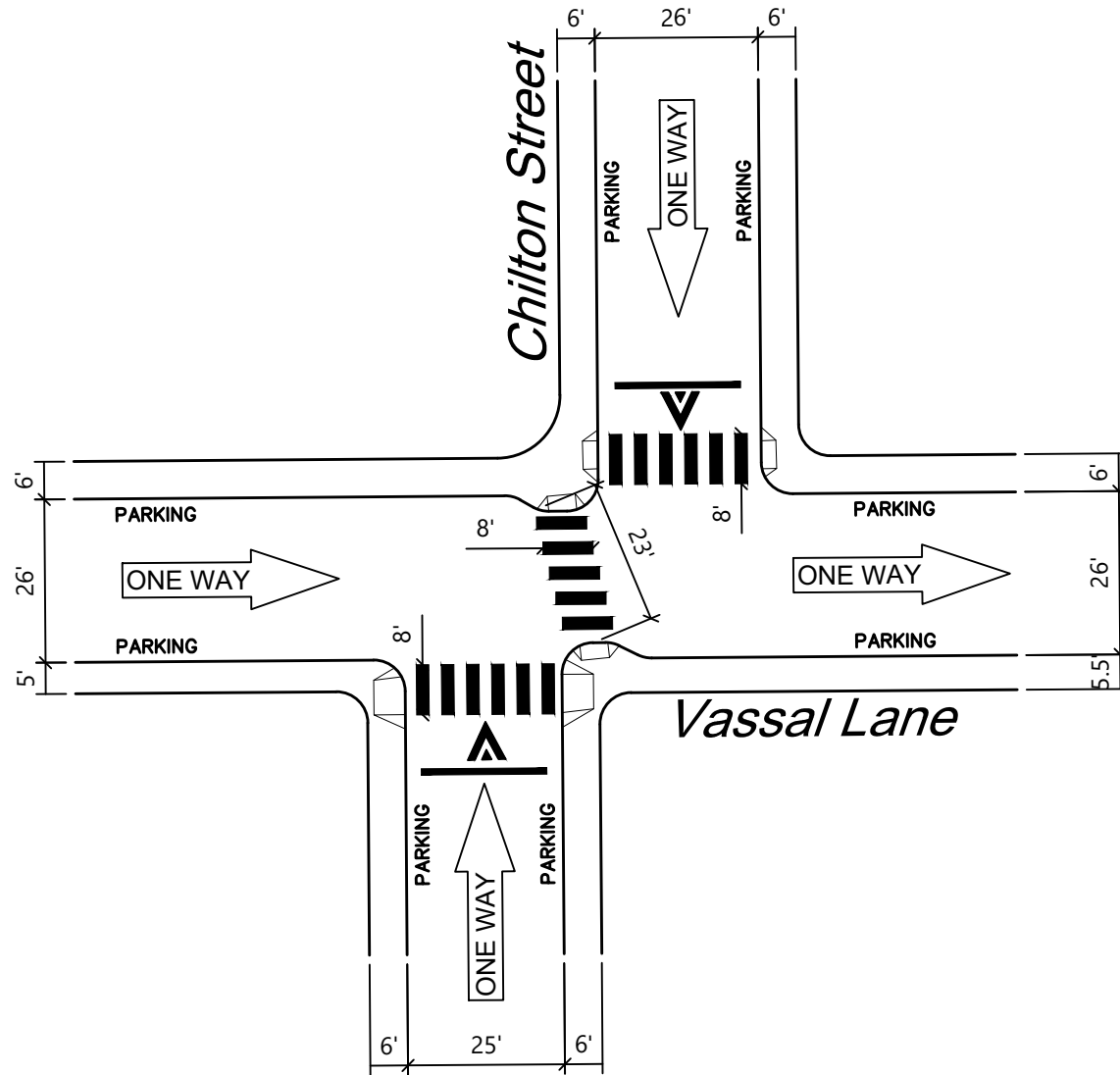
**Tobin Montessori + Vassal Lane Upper School**  
**Cambridge, Massachusetts**



Existing Condition Intersection Sketch **Figure 1.b.9**  
Vassal Lane at Standish Street

**Tobin Montessori + Vassal Lane Upper School**  
**Cambridge, Massachusetts**

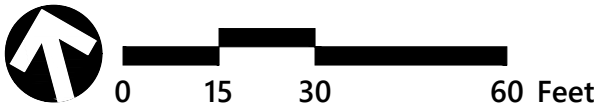
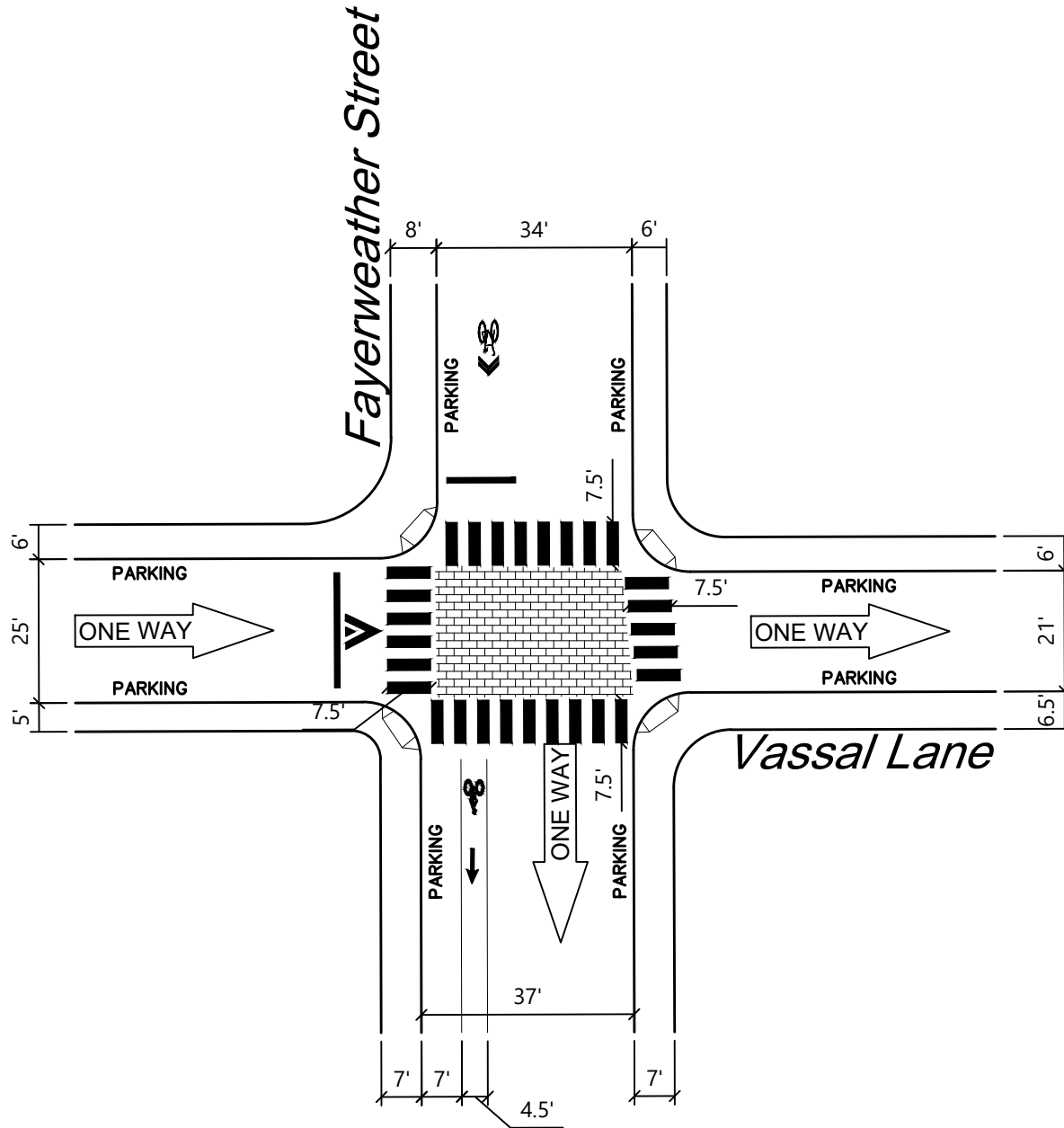




Existing Condition Intersection Sketch **Figure 1.b.11**  
Vassal Lane at Chilton Street

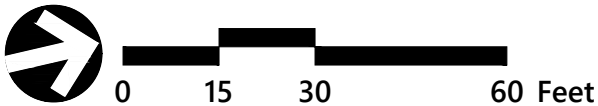
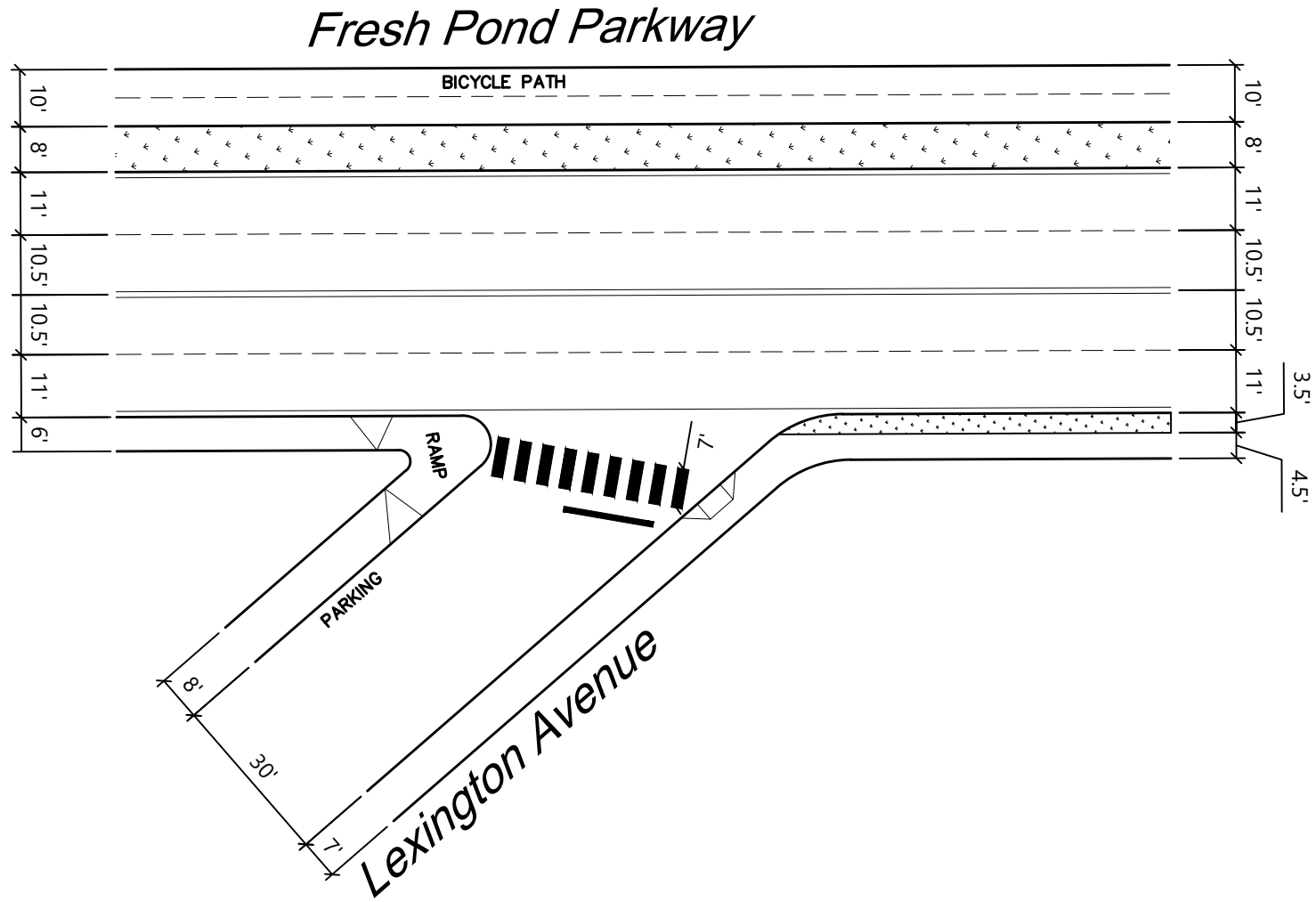
**Tobin Montessori + Vassal Lane Upper School**  
**Cambridge, Massachusetts**





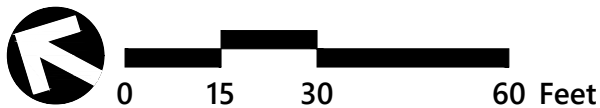
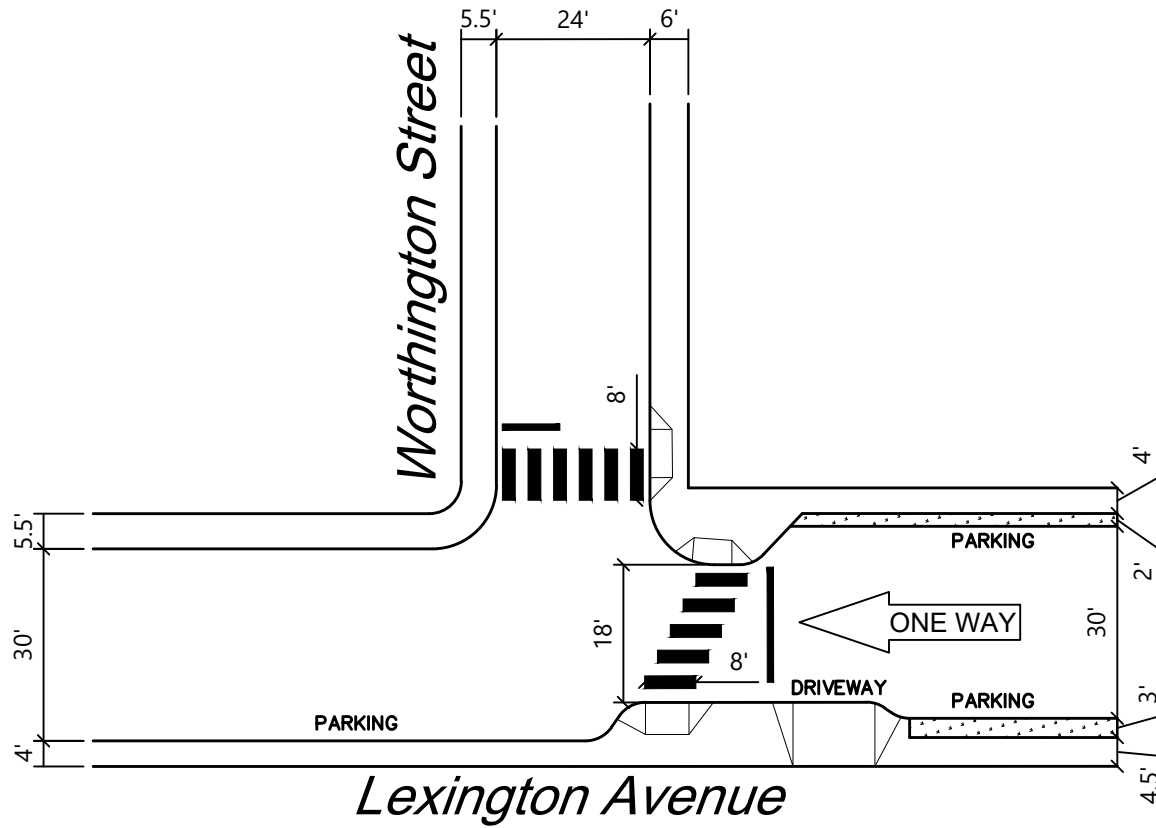
Existing Condition Intersection Sketch **Figure 1.b.12**  
Vassal Lane at Fayerweather Street

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**Cambridge, Massachusetts**



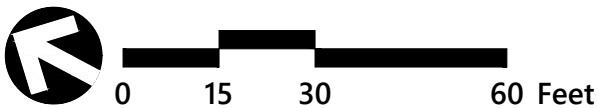
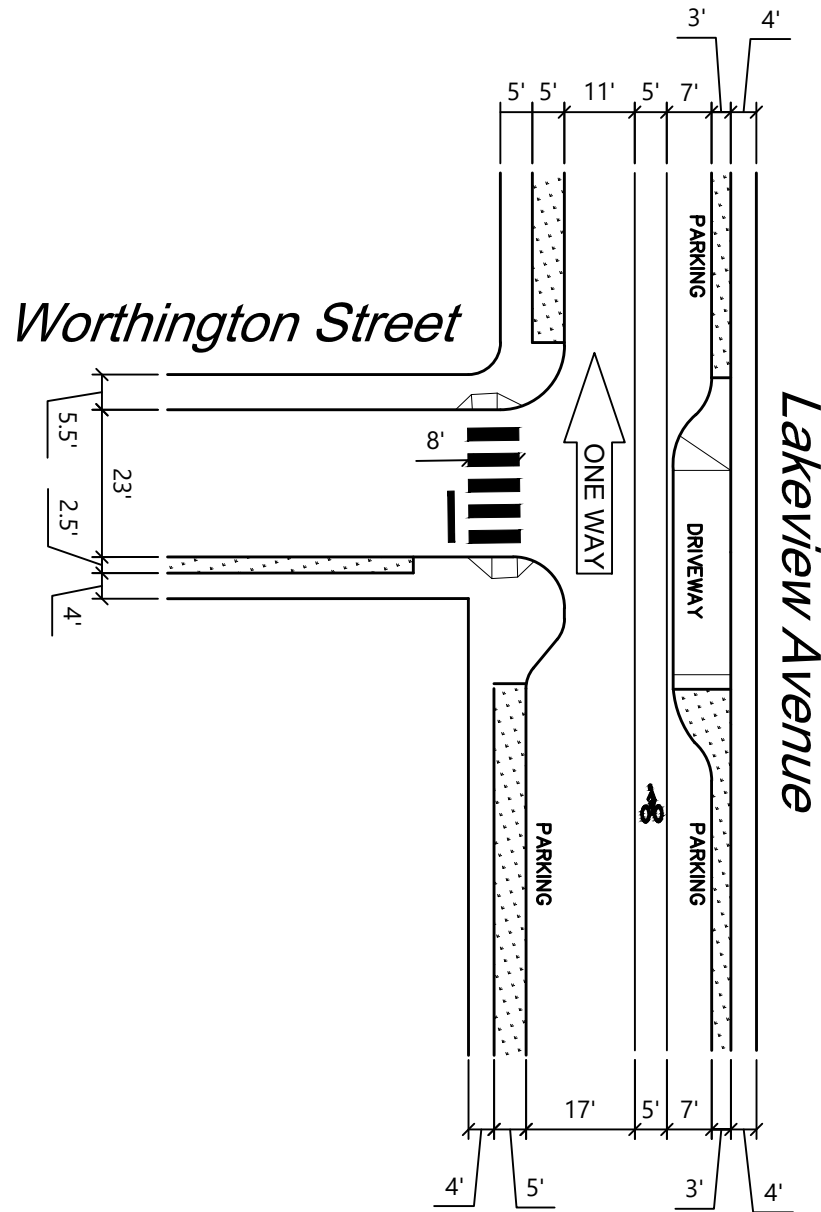
Existing Condition Intersection Sketch **Figure 1.b.13**  
Fresh Pond Parkway at Lexington Avenue

**Tobin Montessori + Vassal Lane Upper School**  
**Cambridge, Massachusetts**



Existing Condition Intersection Sketch **Figure 1.b.14**  
Lexington Avenue at Worthington Street

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**Cambridge, Massachusetts**



Existing Condition Intersection Sketch **Figure 1.b.15**  
Lakeview Avenue at Worthington Street

**Tobin Montessori + Vassal Lane Upper School**  
**Cambridge, Massachusetts**



Source: MassGIS

- Loading Zone
- Tow Zone, No Parking
- Tow Zone, No Stopping Anytime
- Parking by Permit Only
- - - Handicap Reserved Spot
- - - 1-Hour Parking
- 2-Hour Parking
- T MBTA Bus Stop



Figure 1.c.1  
Existing Curb Use

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**





Source: MassGIS



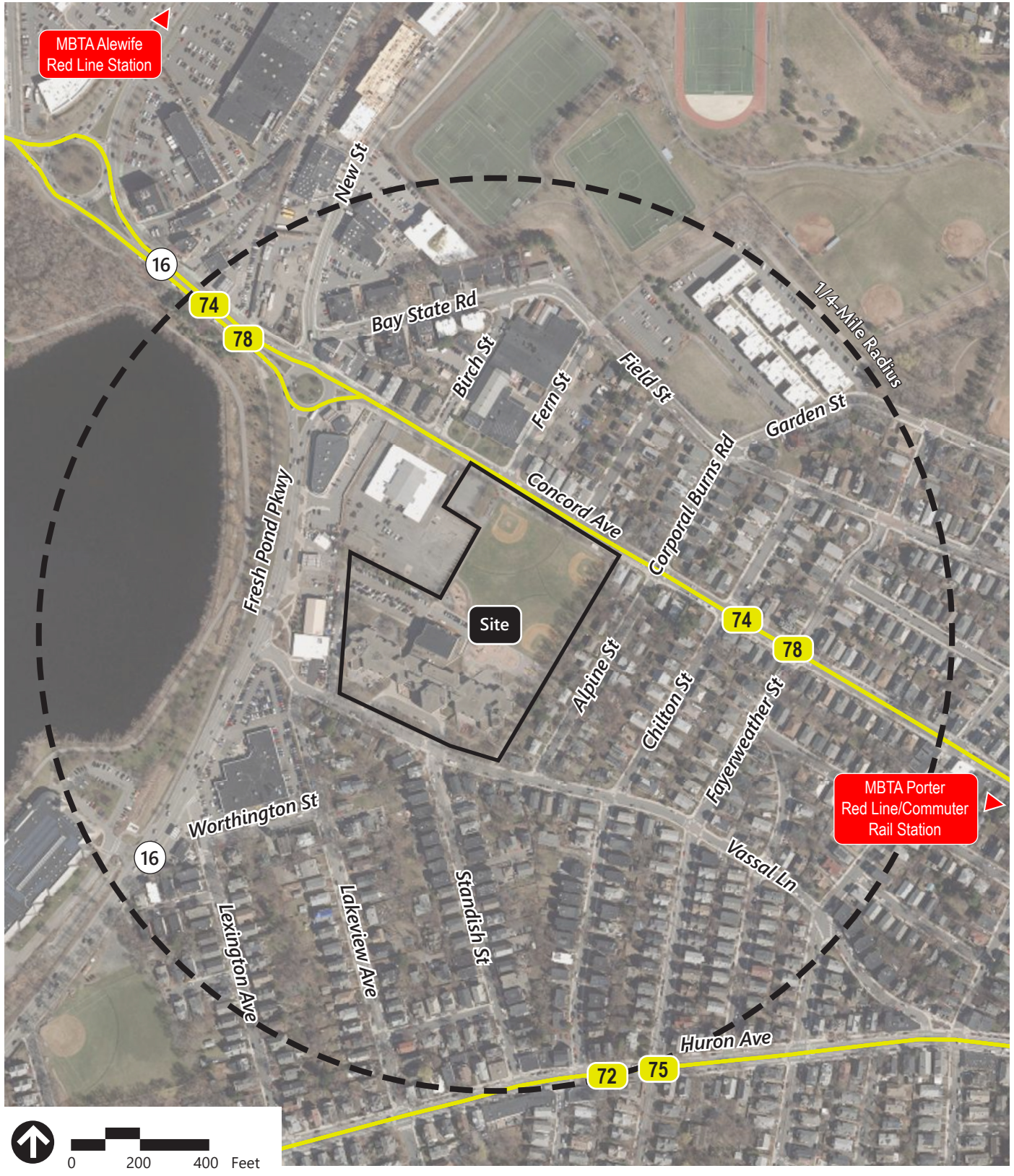
Blue Bikes Station  
Number of Bike Docks



Figure 1.c.2  
Existing Bicycle Sharing Services

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**





Source: MassGIS

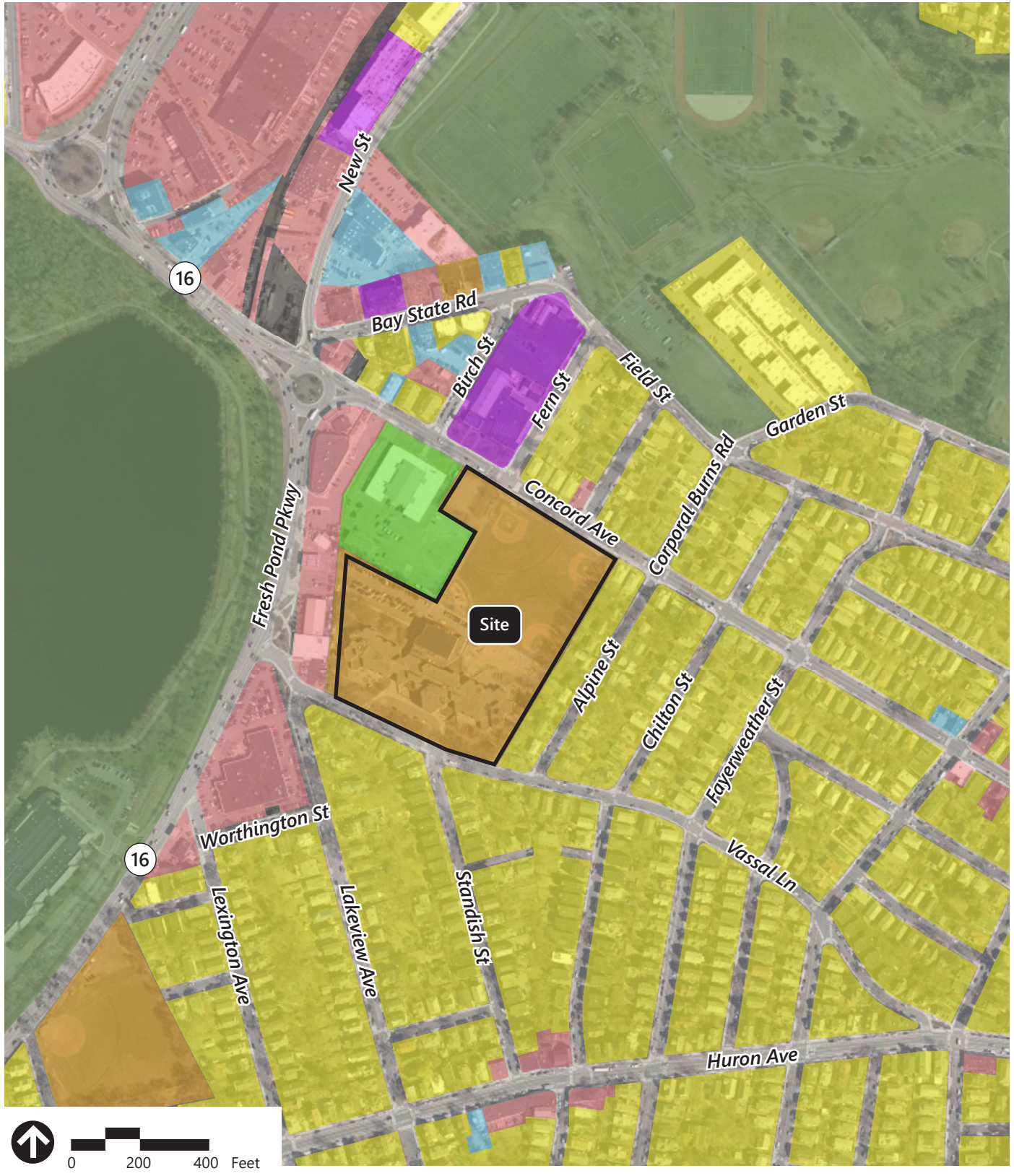
— # — MBTA Bus Route



Figure 1.d.1  
Existing Public Transportation

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**





Source: MassGIS

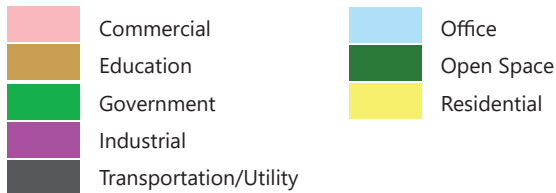
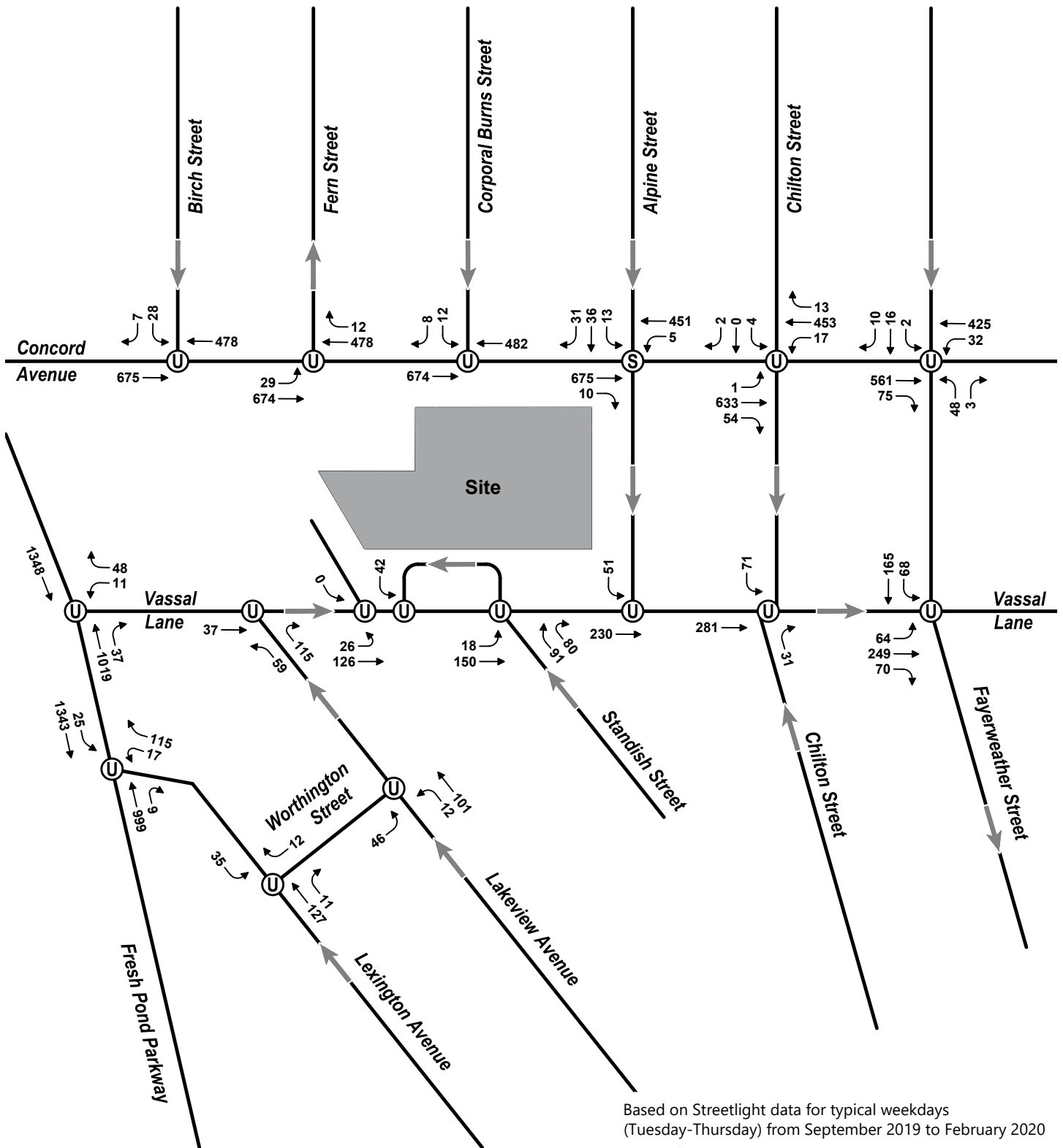


Figure 1.e.1  
Existing Land Use

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**



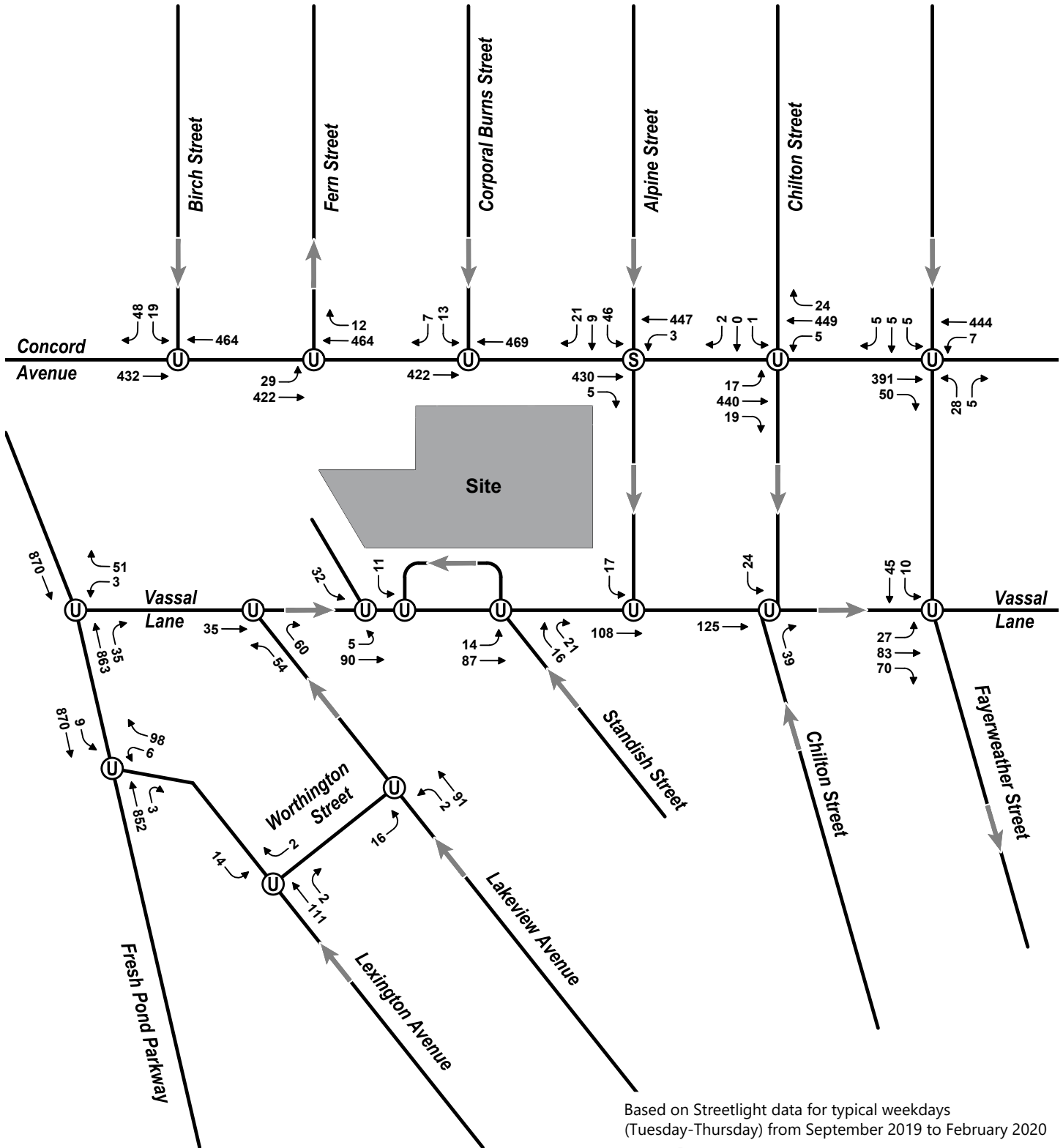


Based on Streetlight data for typical weekdays (Tuesday-Thursday) from September 2019 to February 2020

Not to Scale



Figure 2.b.1  
 2020 Existing Condition Vehicle Volumes  
 Morning Peak Hour (7:00-8:00 AM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



Based on Streetlight data for typical weekdays (Tuesday-Thursday) from September 2019 to February 2020

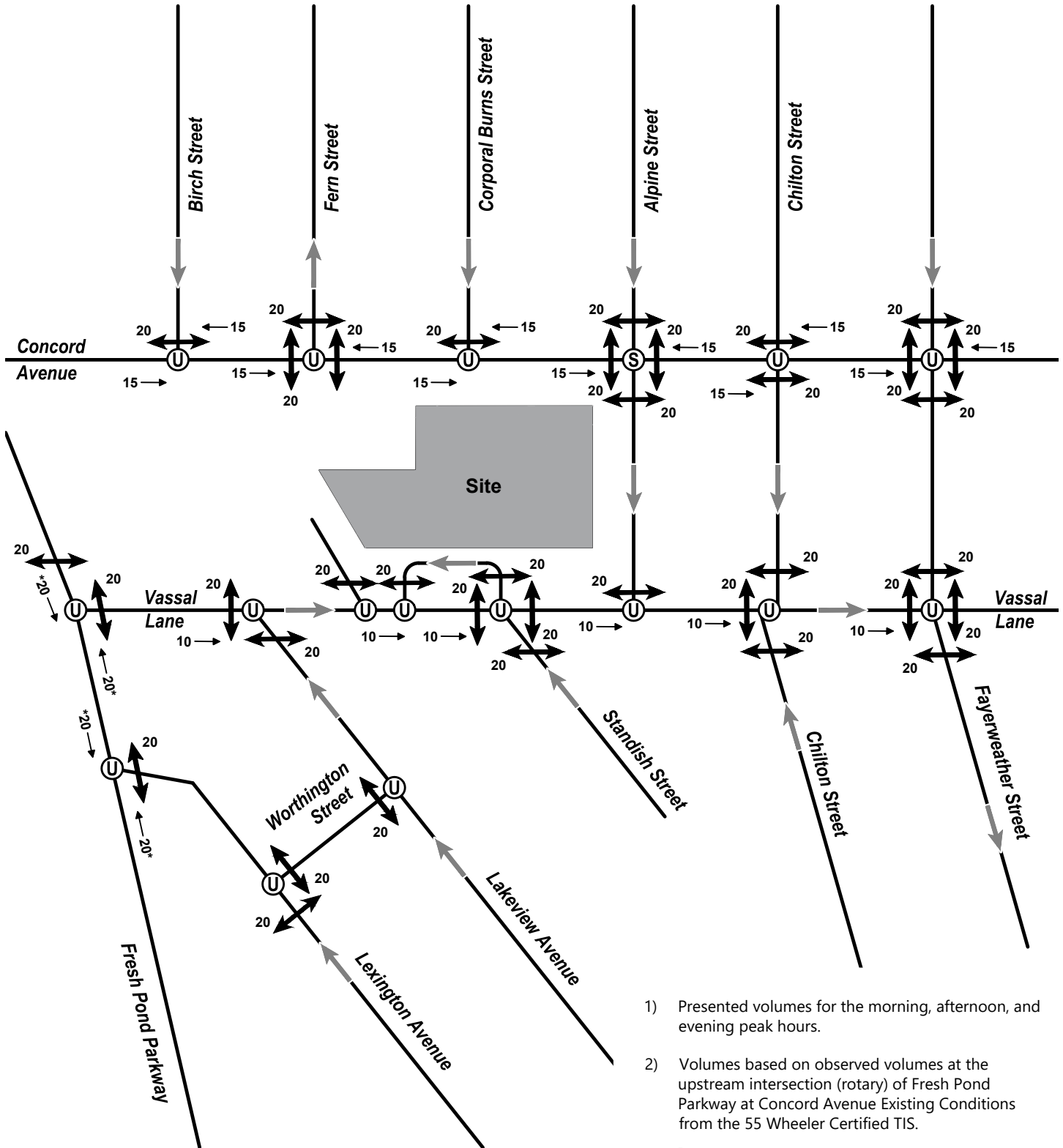
Not to Scale



Figure 2.b.2  
 2020 Existing Condition Vehicle Volumes  
 Afternoon Peak Hour (2:00-3:00 PM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



\* All bicycle volumes on Fresh Pond Parkway are assumed to use the two-way separated cycle facility to the east.



- 1) Presented volumes for the morning, afternoon, and evening peak hours.
- 2) Volumes based on observed volumes at the upstream intersection (rotary) of Fresh Pond Parkway at Concord Avenue Existing Conditions from the 55 Wheeler Certified TIS.

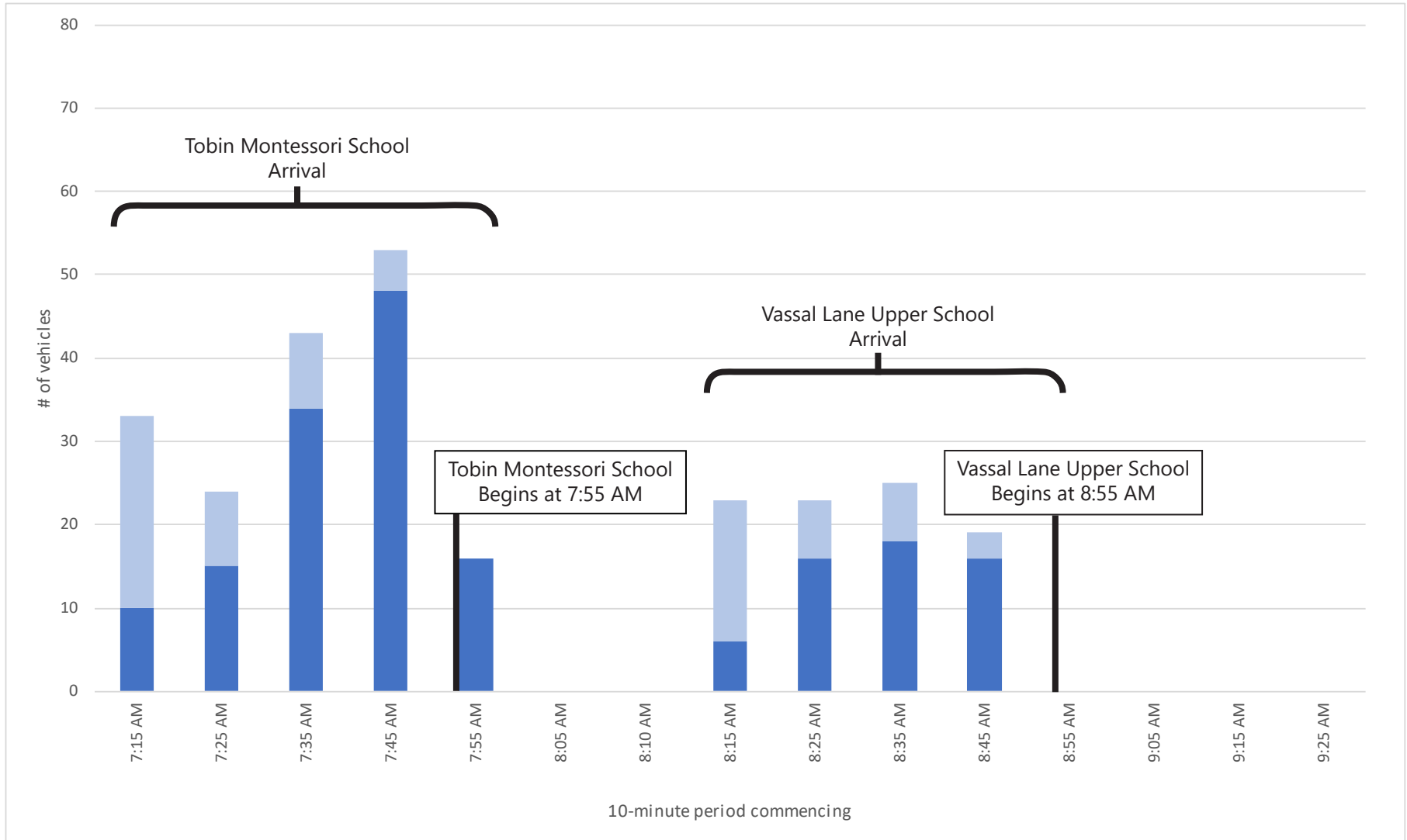
Not to Scale



XX ↔ Pedestrian Volume  
 XX → Bicycle Volume



Figure 2.b.4  
 2020 Existing Condition  
 Pedestrian + Bicycle Volumes  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts

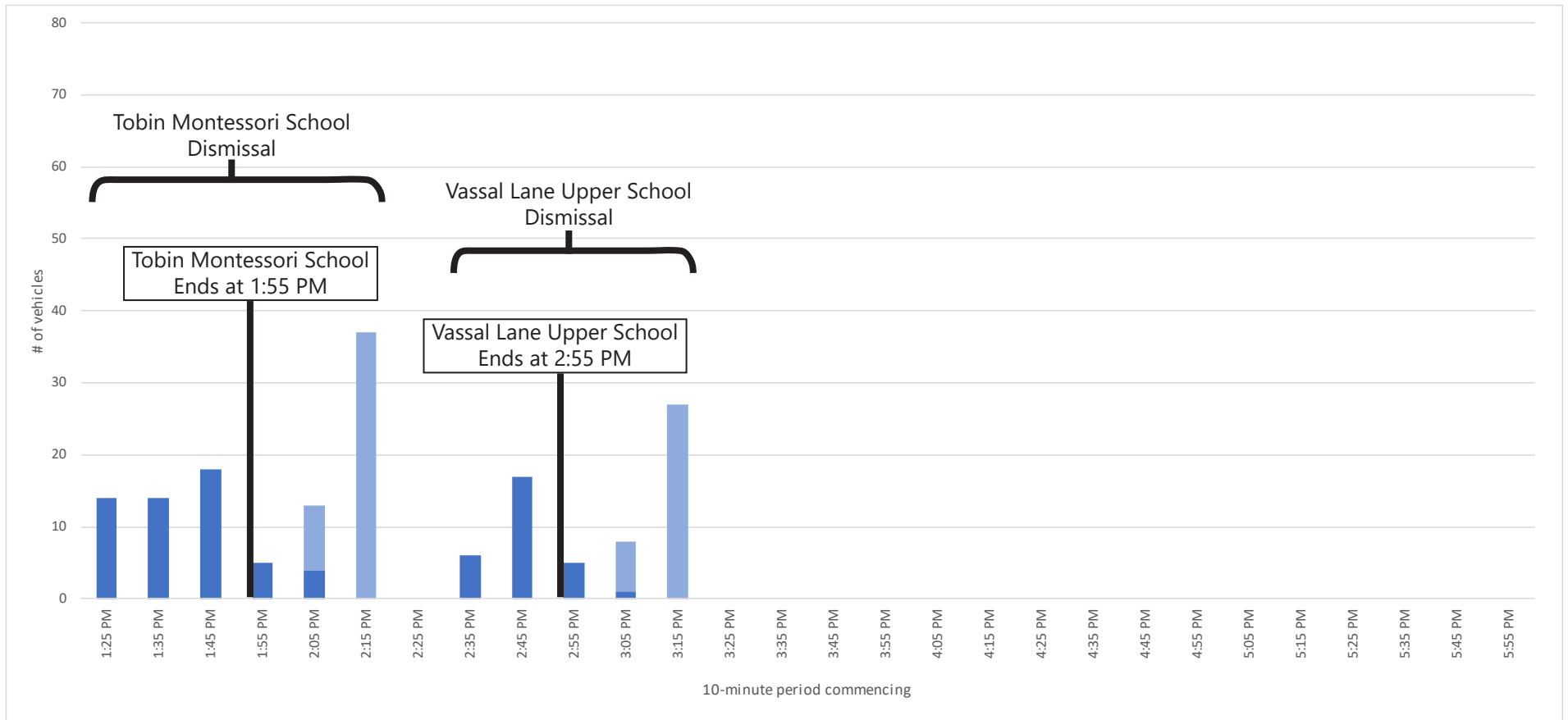


Existing Staff Vehicles  
Existing Parent and Bus Drop-off



Figure 2.f.1  
Existing Vehicular School Arrival  
Morning Arrival

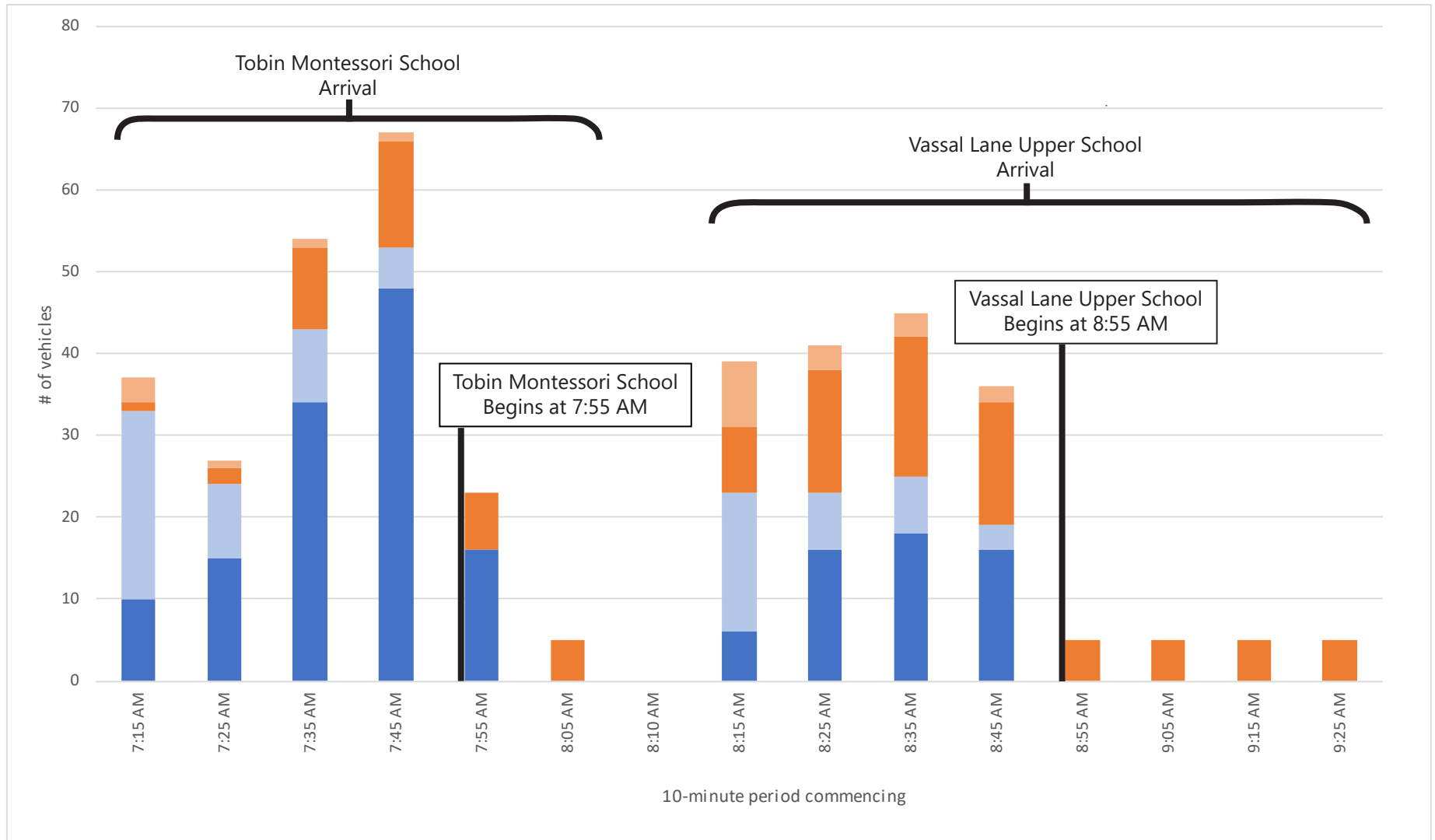
**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**



Existing Staff Vehicles  
Existing Parent and Bus Pick-up



Figure 2.f.2  
Existing Vehicular School Dismissal  
Afternoon/Evening Dismissal  
**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

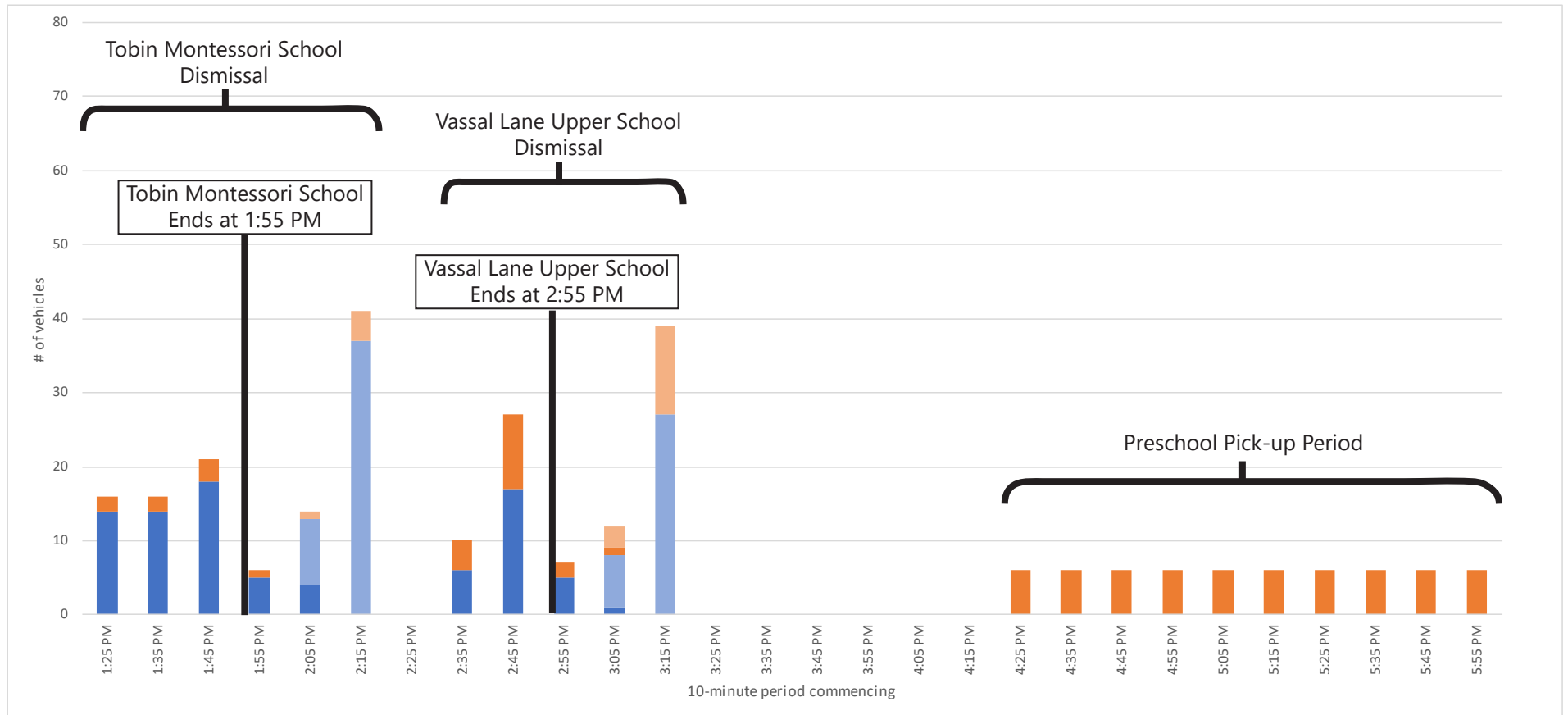


- Existing Staff Vehicles
- Existing Parent and Bus Drop-off
- Proposed Net-Increase of Parent and Bus Drop-off Vehicles
- Proposed Net-Increase of Staff Vehicles



Figure 3.b.1  
Future Vehicular School Arrival  
Morning Arrival

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**



- Existing Staff Vehicles
- Existing Parent and Bus Pick-up
- Proposed Net-Increase of Parent and Bus Pick-up Vehicles
- Proposed Net-Increase of Staff Vehicles

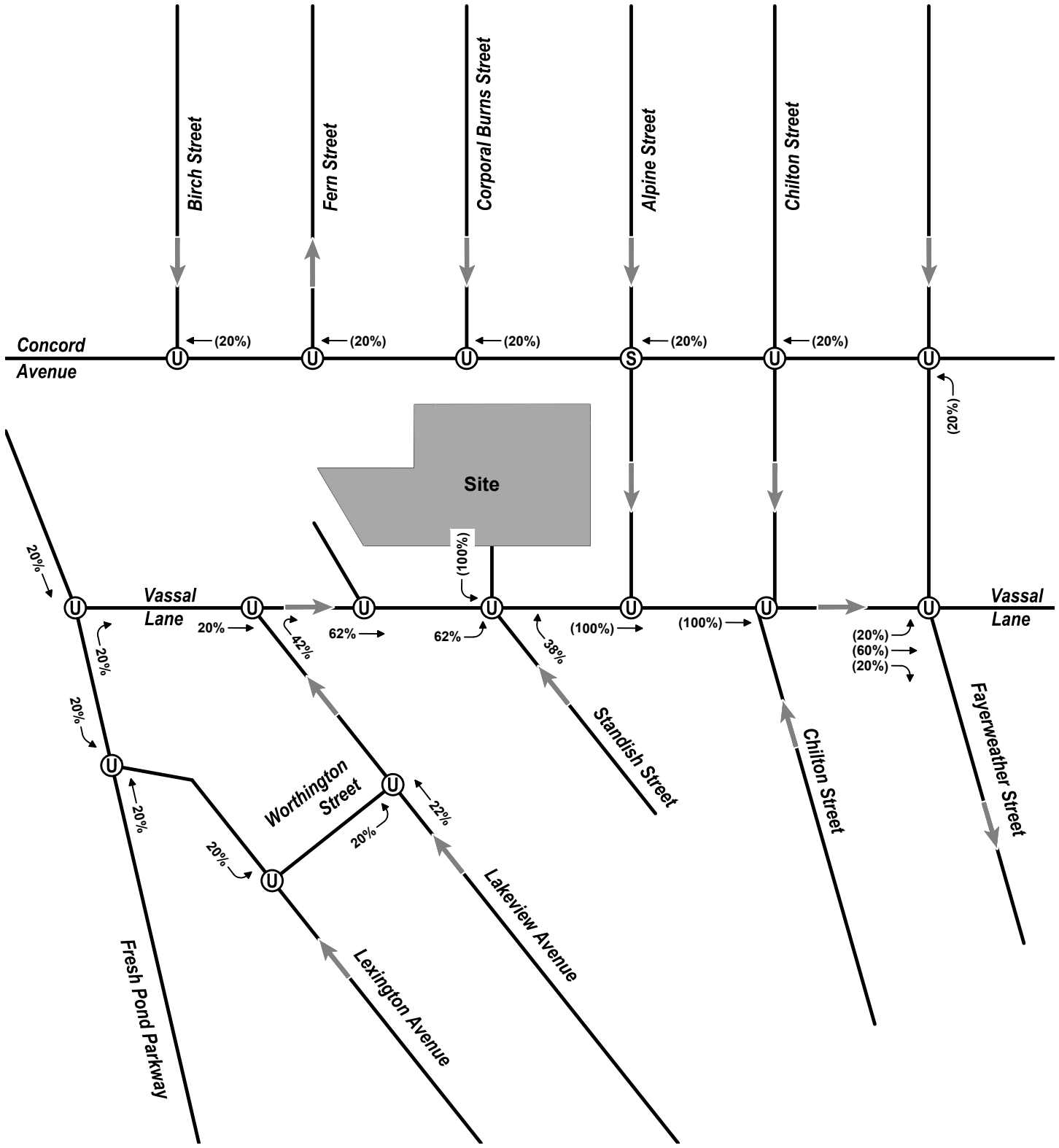


Figure 3.b.2

Future Vehicular School Dismissal  
Afternoon/Evening Dismissal

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**





Not to Scale

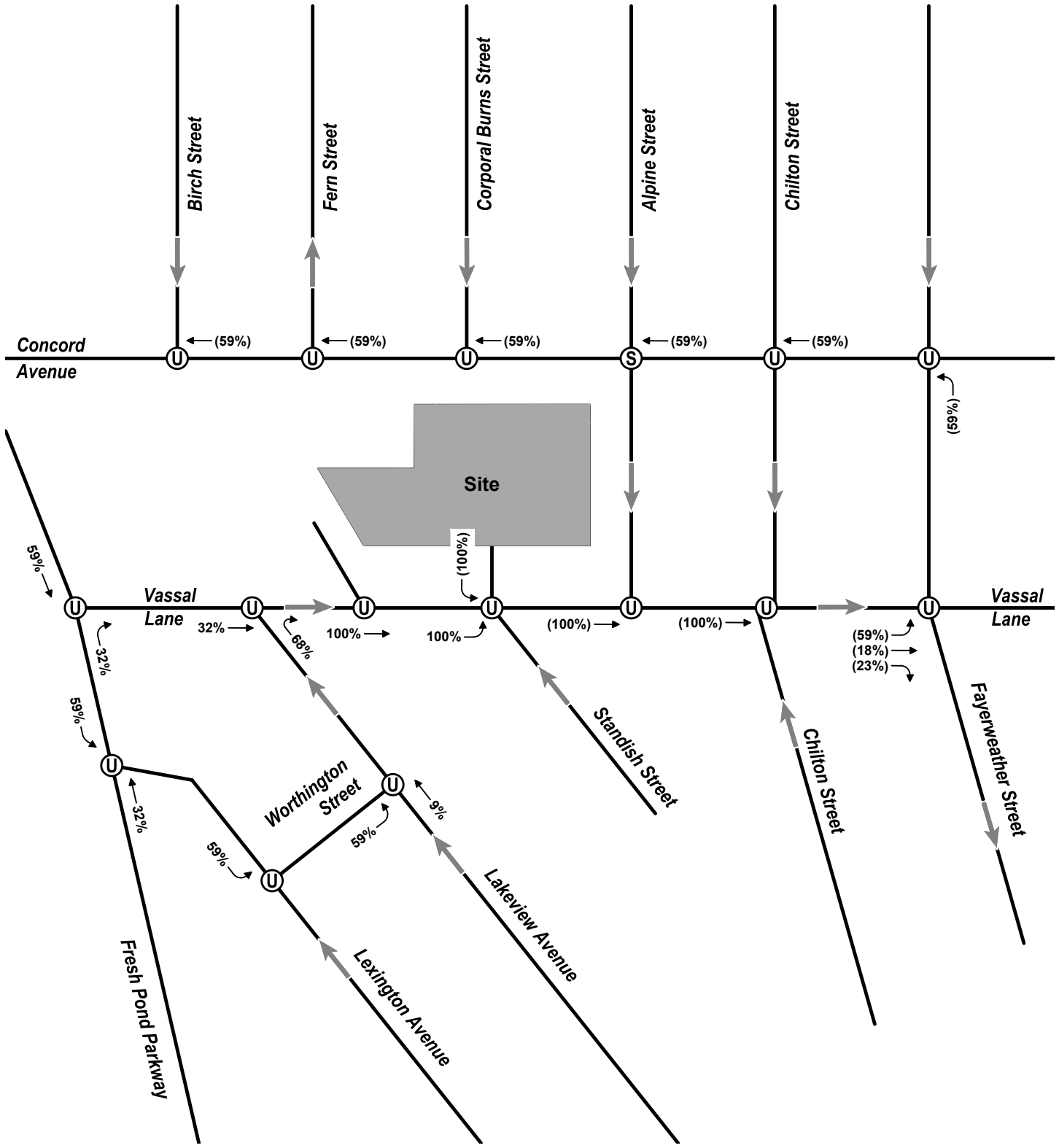


IN →  
 (OUT) ←



Figure 3.d.1  
 Parent / Student Trip Distribution

Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



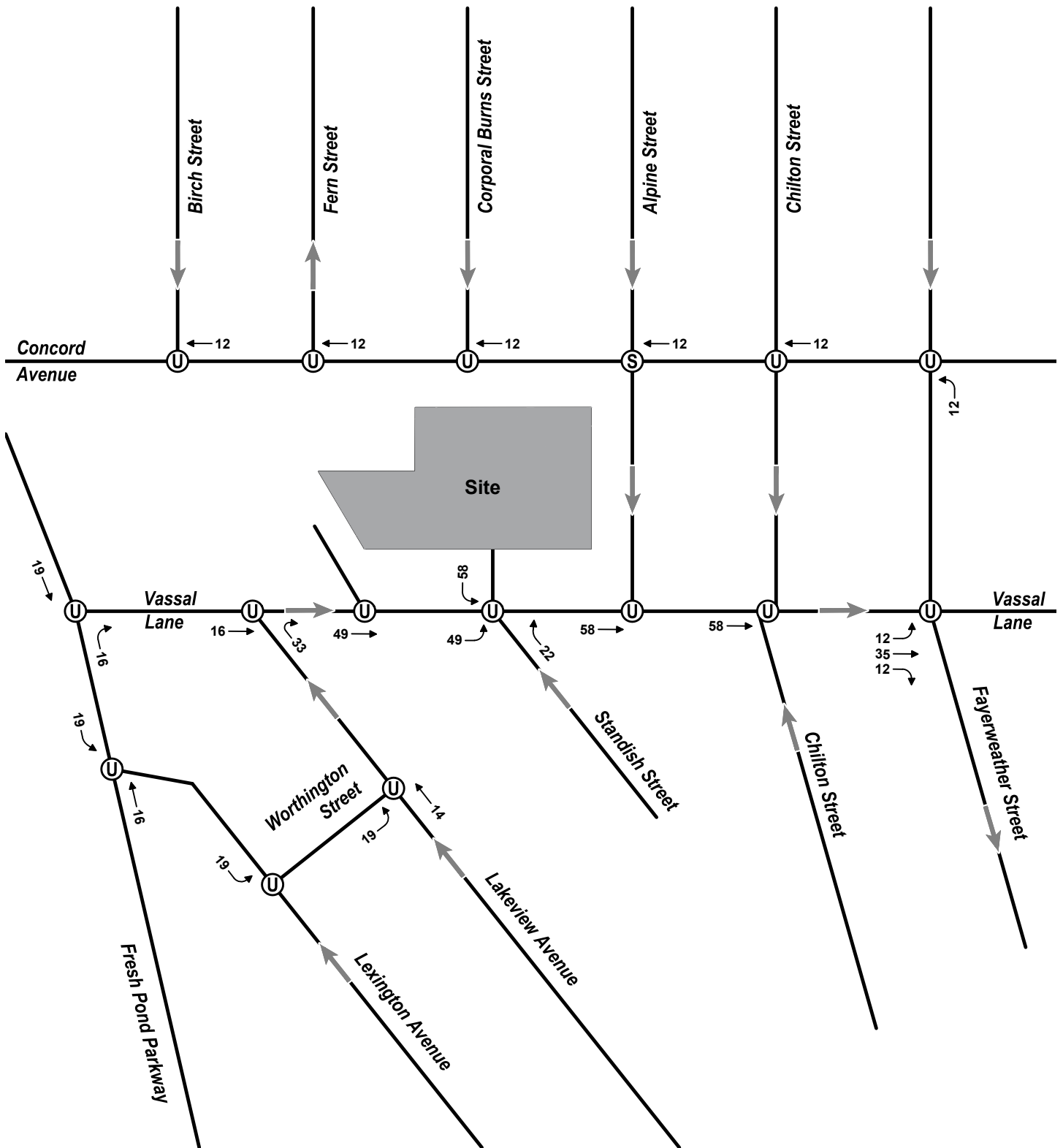
Not to Scale

IN →  
(OUT) →



Figure 3.d.2  
Staff Trip Distribution

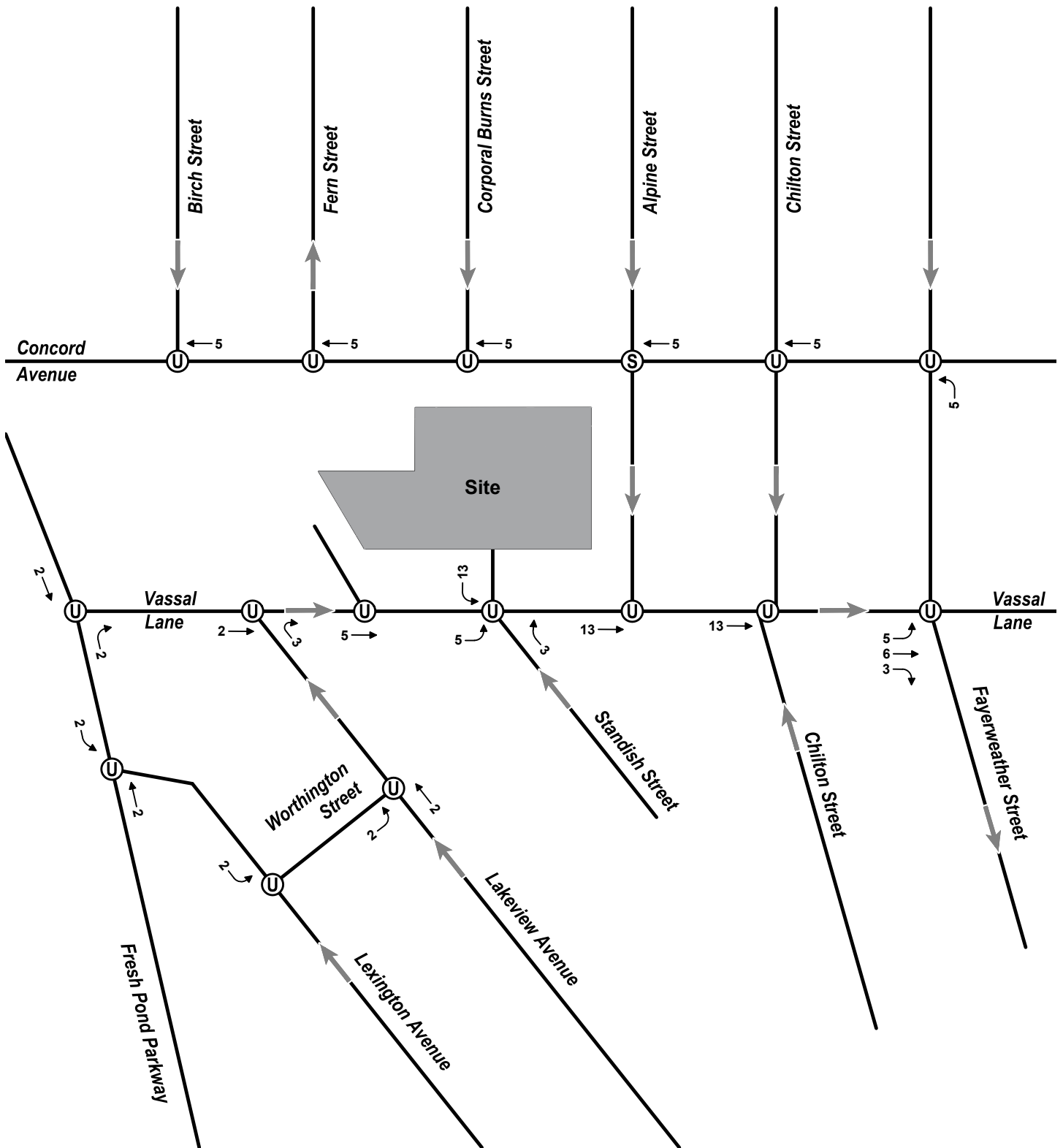
Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts



Not to Scale



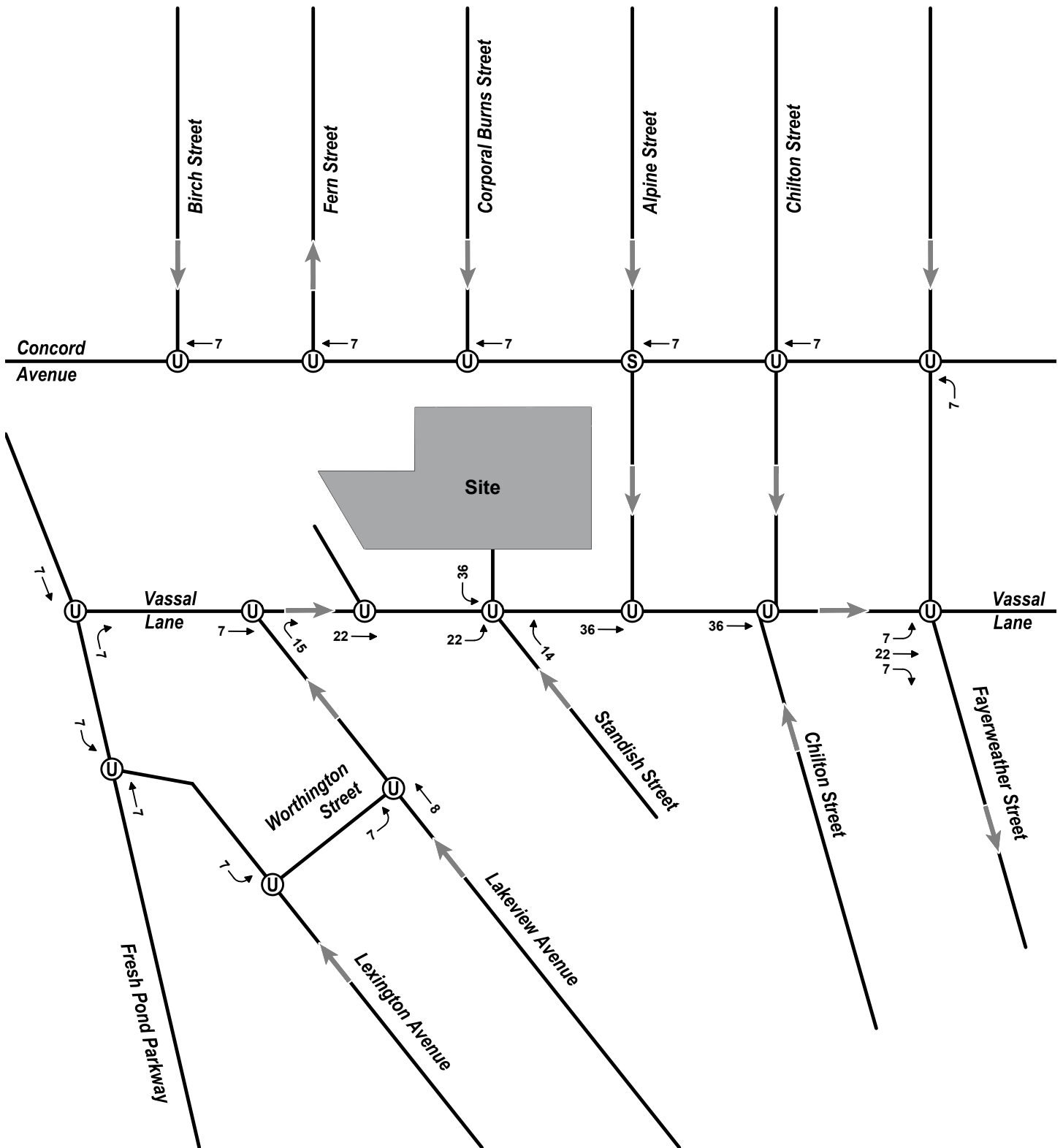
Figure 3.d.3  
 Project-Generated Trips  
 Morning Peak Hour (7:00-8:00 AM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



Not to Scale



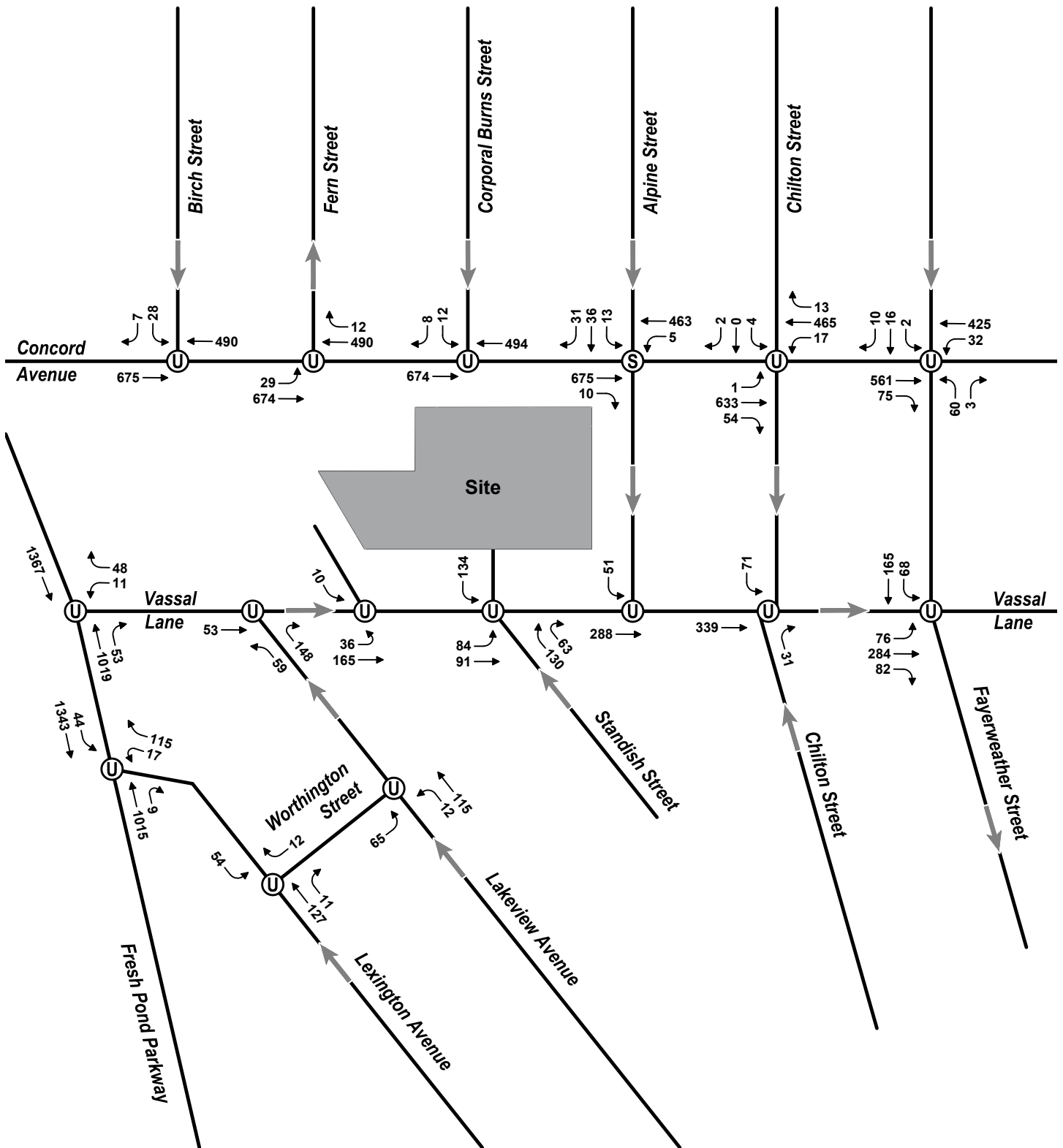
Figure 3.d.4  
Project-Generated Trips  
Afternoon Peak Hour (2:00-3:00 PM)  
Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts



Not to Scale



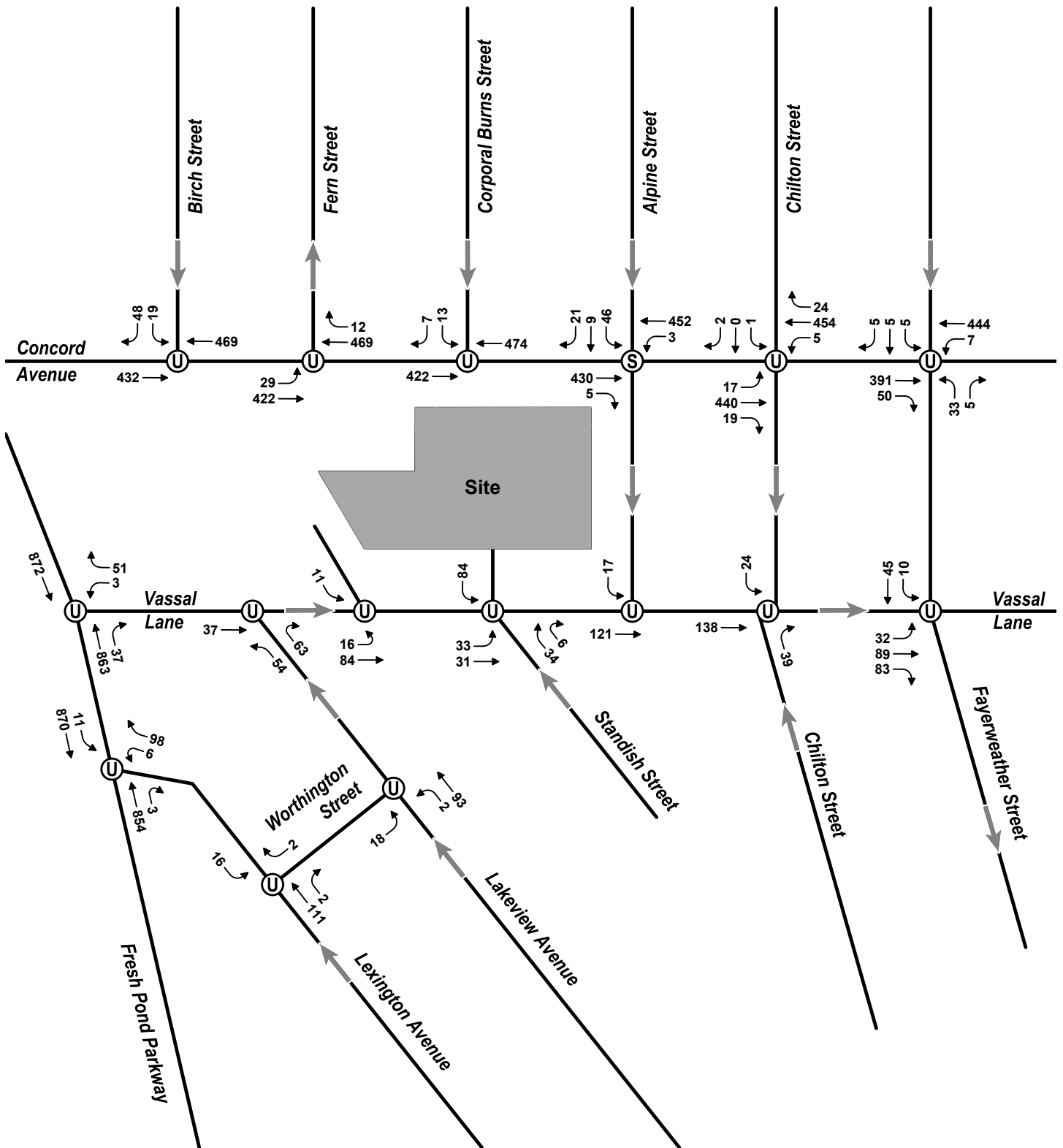
Figure 3.d.5  
 Project-Generated Trips  
 Evening Peak Hour (5:00-6:00 PM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



Not to Scale



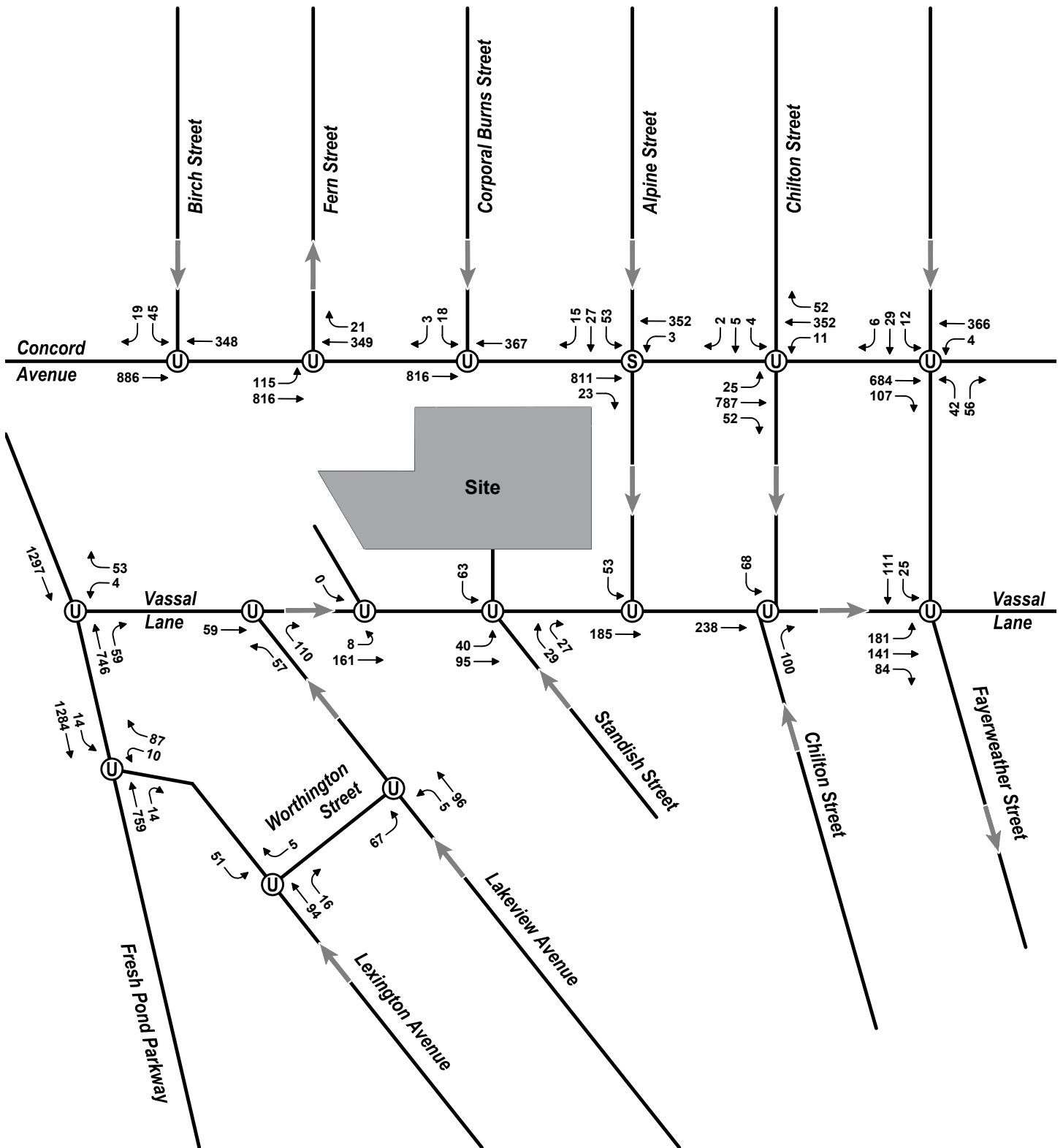
Figure 5.b.1  
 2020 Build Conditions  
 Morning Peak Hour (7:00-8:00 AM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



Not to Scale



Figure 5.b.2  
 2020 Build Conditions  
 Afternoon Peak Hour (2:00-3:00 PM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts

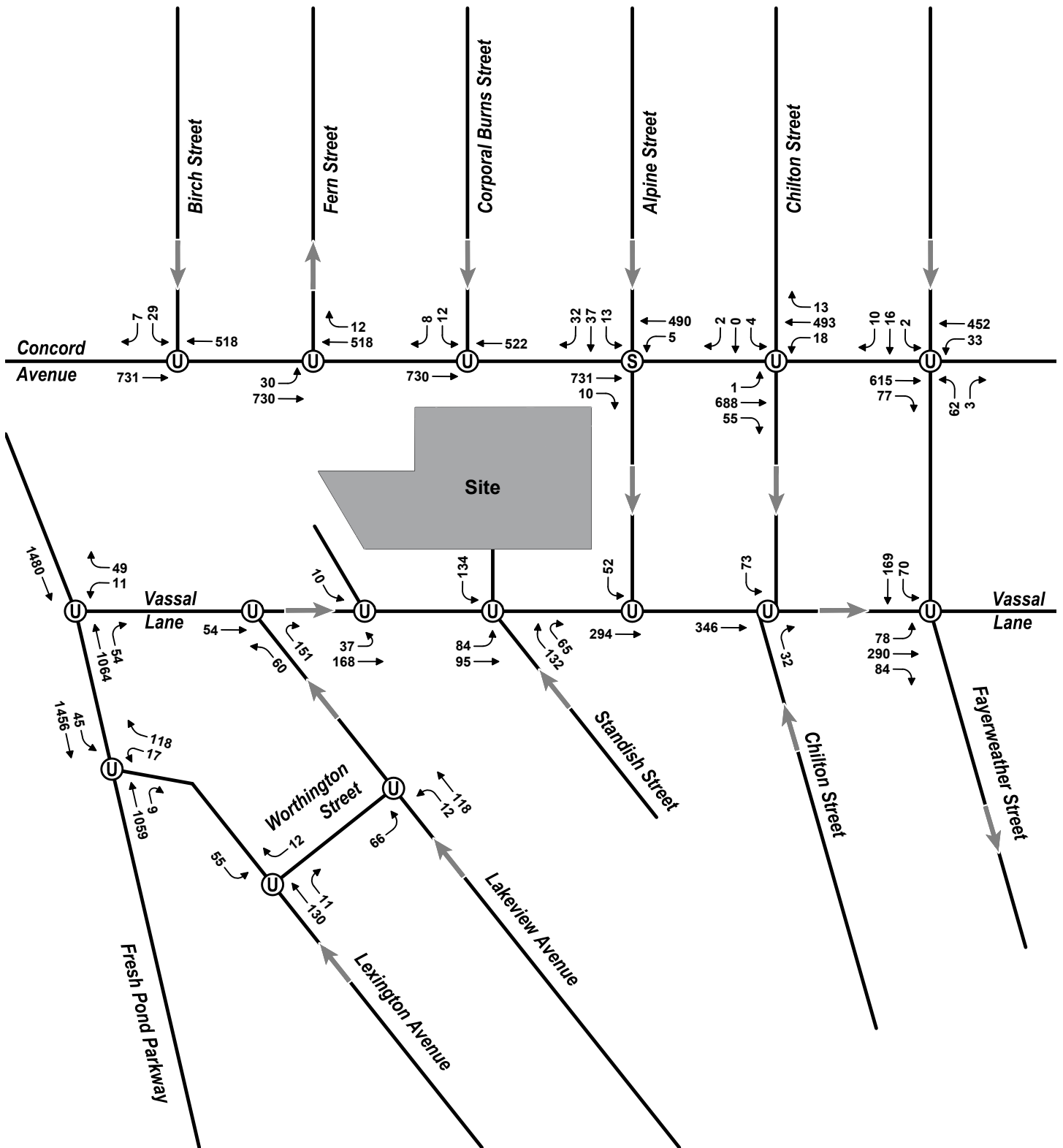


Not to Scale



Figure 5.b.3  
 2020 Build Conditions  
 Evening Peak Hour (5:00-6:00 PM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts

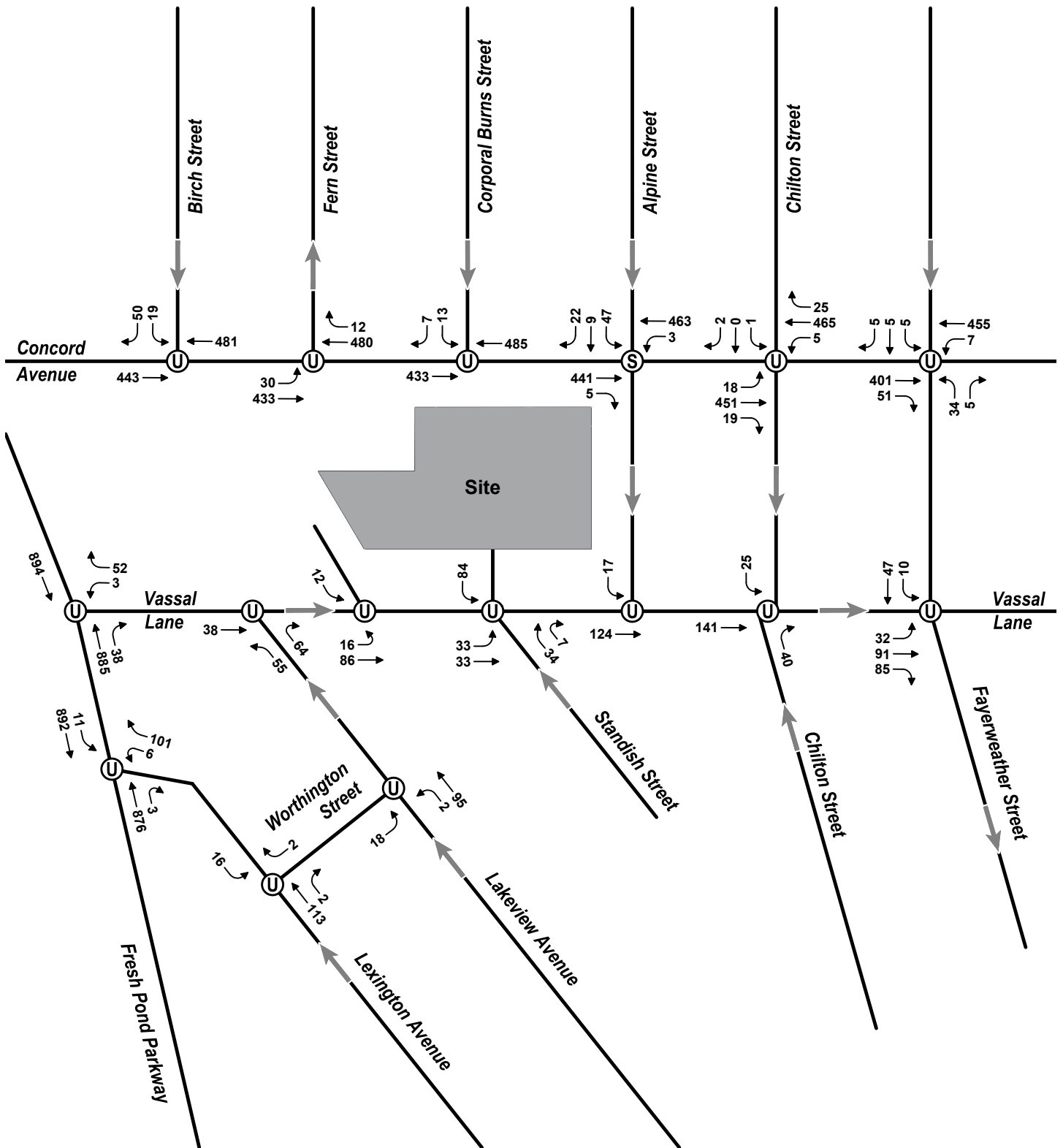




Not to Scale



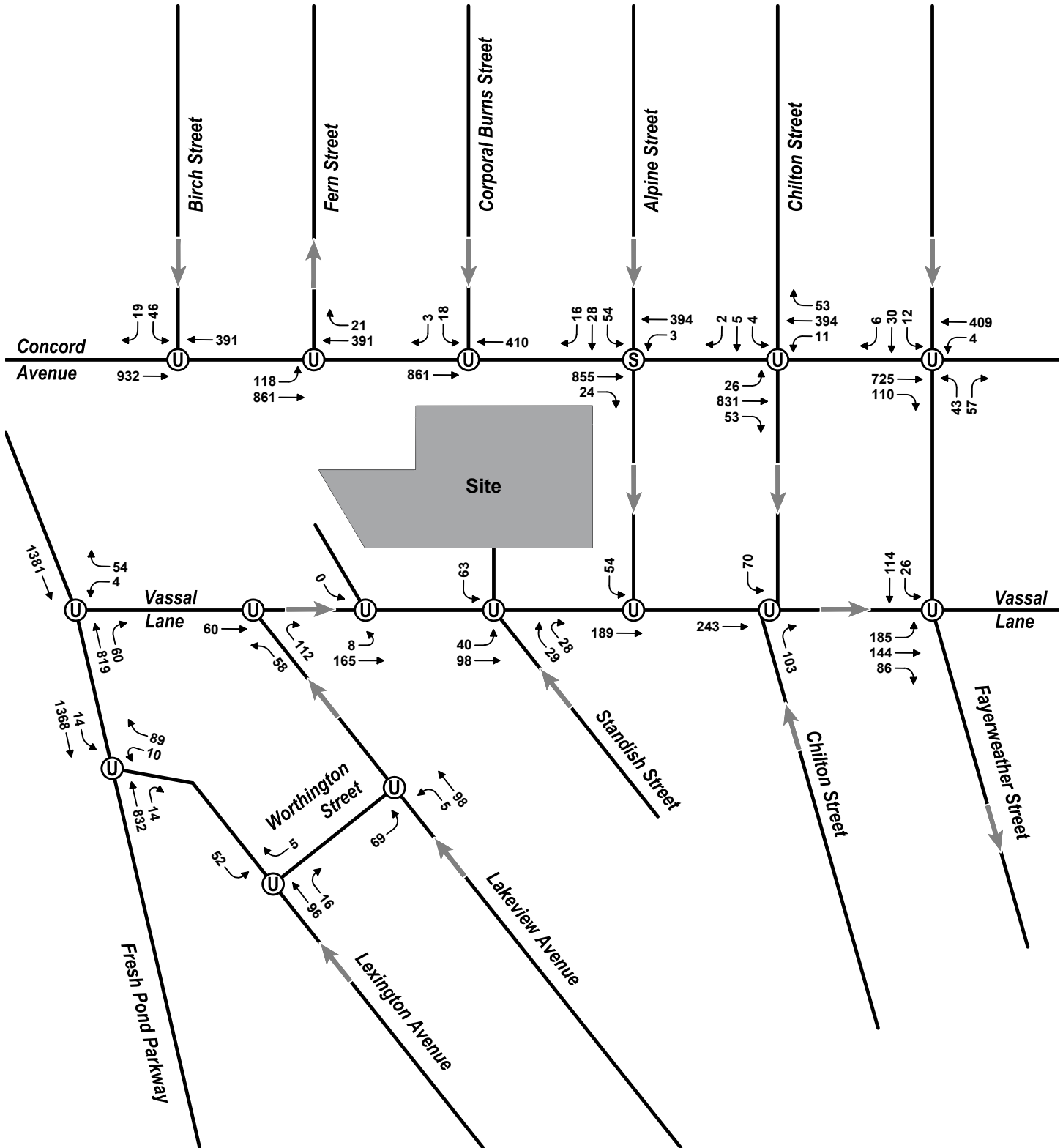
Figure 5.c.1  
 2025 Future Conditions  
 Morning Peak Hour (7:00-8:00 AM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



Not to Scale



Figure 5.c.2  
 2025 Future Conditions  
 Afternoon Peak Hour (2:00-3:00 PM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



Not to Scale



Figure 5.c.3  
 2025 Future Conditions  
 Evening Peak Hour (5:00-6:00 PM)  
 Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts



Source: MassGIS



Figure 6.a.1  
Vehicle LOS Map  
Morning Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Morning Peak Hour; Morning (Commuter) Peak / Morning Peak Student Arrival Period  
Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions





Source: MassGIS



Figure 6.a.2  
Vehicle LOS Map  
Afternoon Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Afternoon Peak Hour; Afternoon Peak Student + Staff Departure Period  
Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions





Source: MassGIS



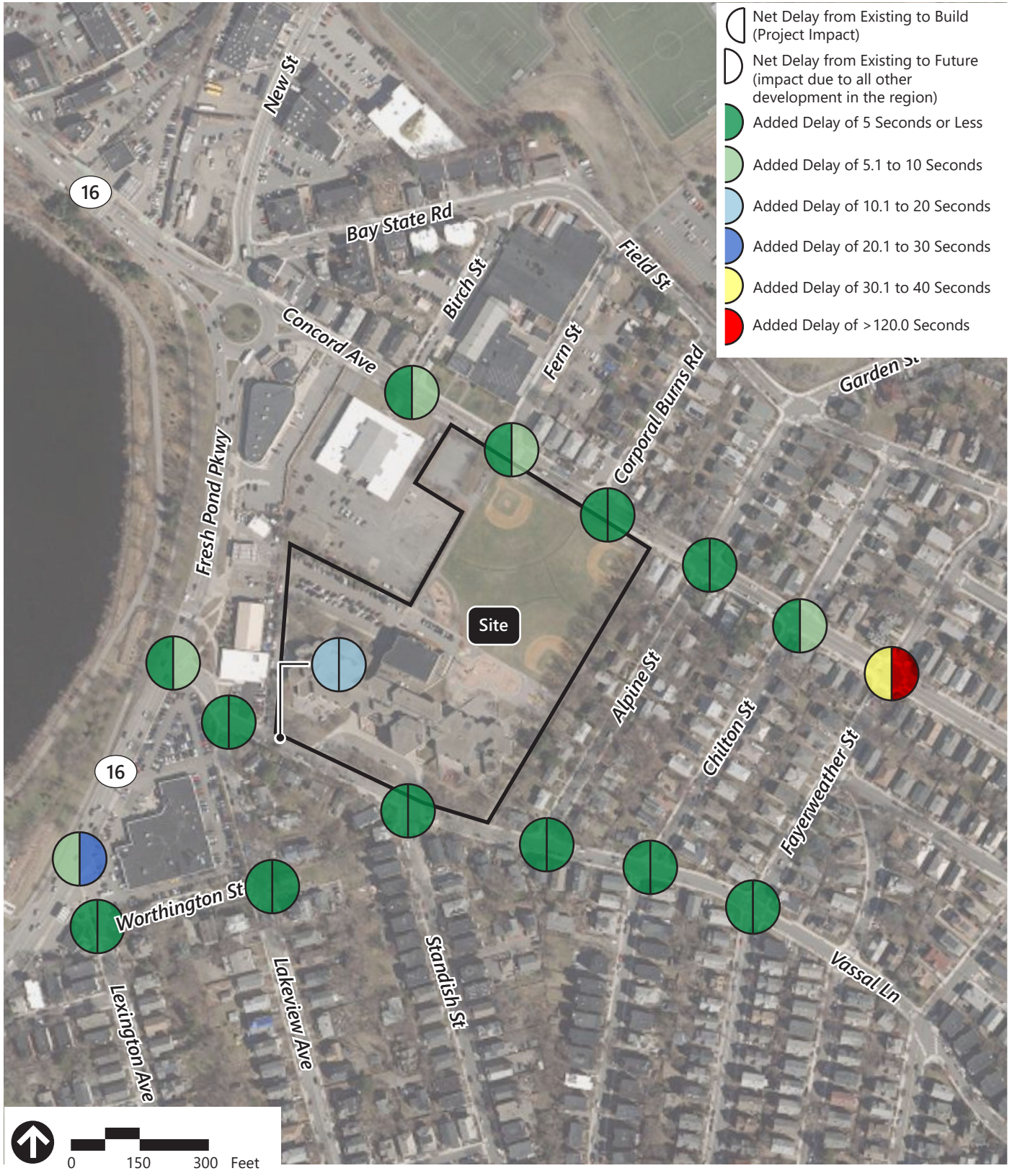
Figure 6.a.3  
Vehicle LOS Map  
Evening Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Evening Peak Hour; Evening (Commuter) Peak

Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions





Source: MassGIS

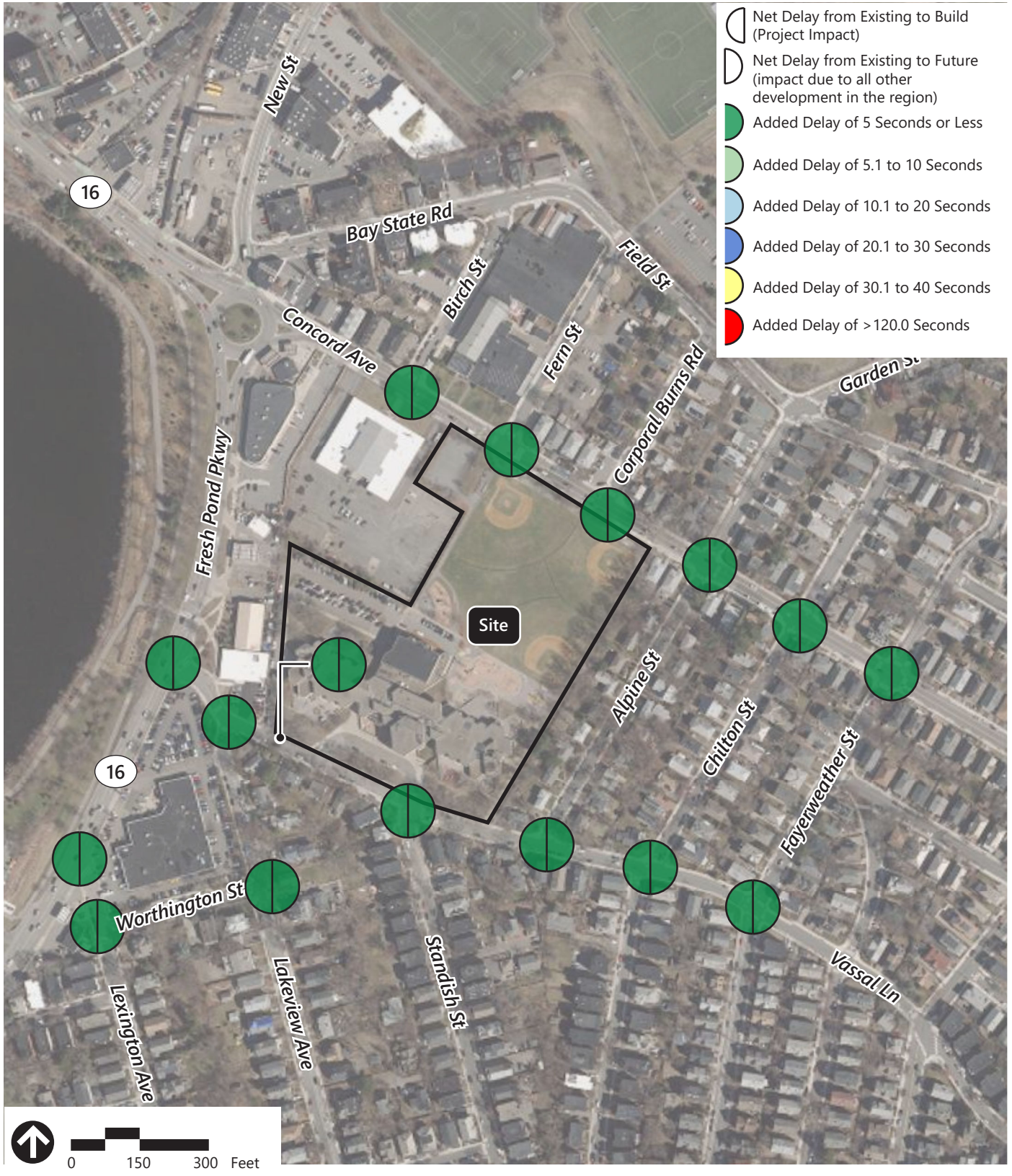


Figure 6.a.4  
Vehicle Delay Map  
Morning Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Morning Peak Hour; Morning (Commuter) Peak / Morning Peak Student Arrival Period  
Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions





Source: MassGIS

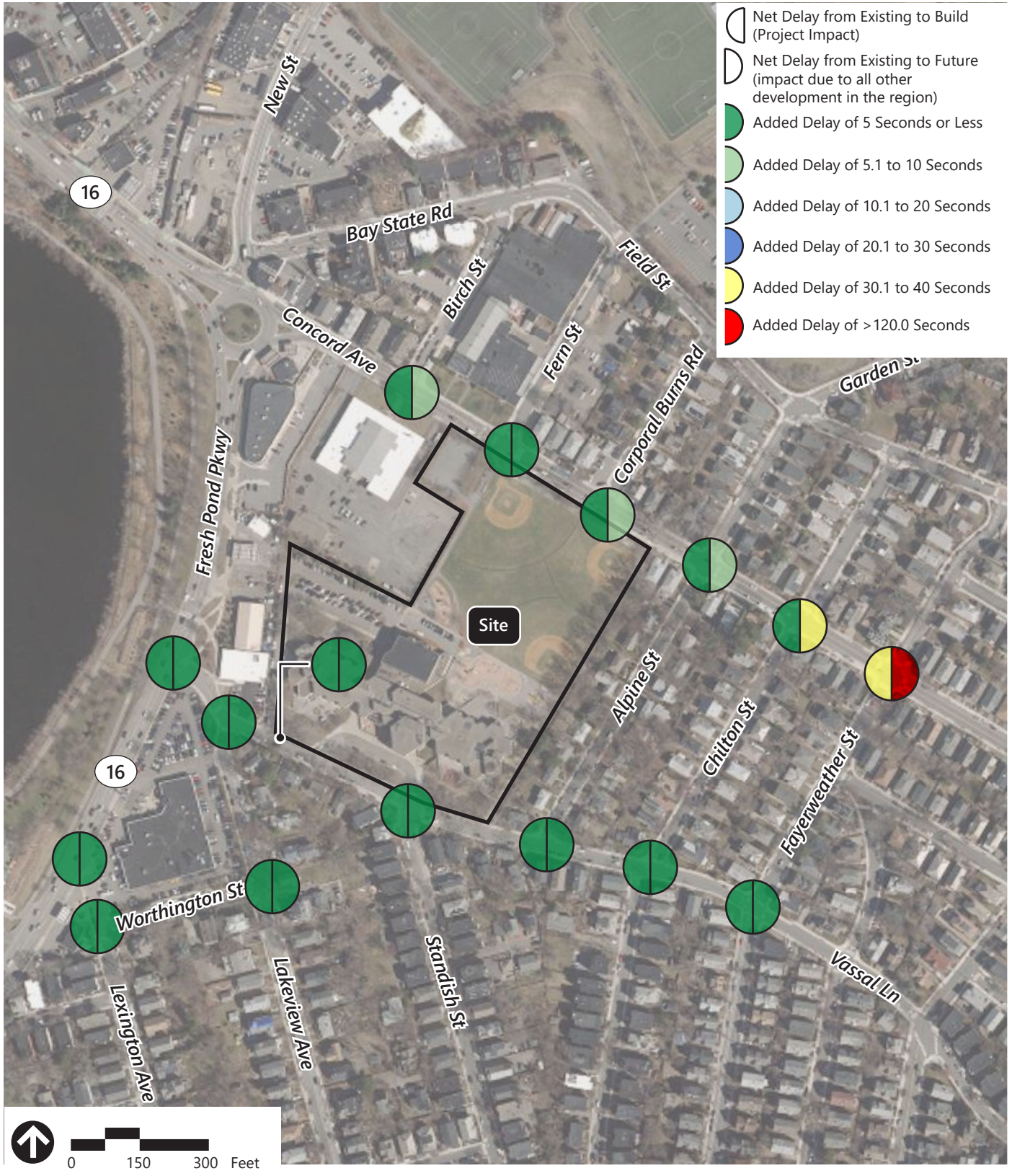


Figure 6.a.5  
Vehicle Delay Map  
Afternoon Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Afternoon Peak Hour; Afternoon Peak Student + Staff Departure Period  
Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions





Source: MassGIS



Figure 6.a.6  
Vehicle Delay Map  
Evening Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Evening Peak Hour; Evening (Commuter) Peak

Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions



Source: Perkins Eastman

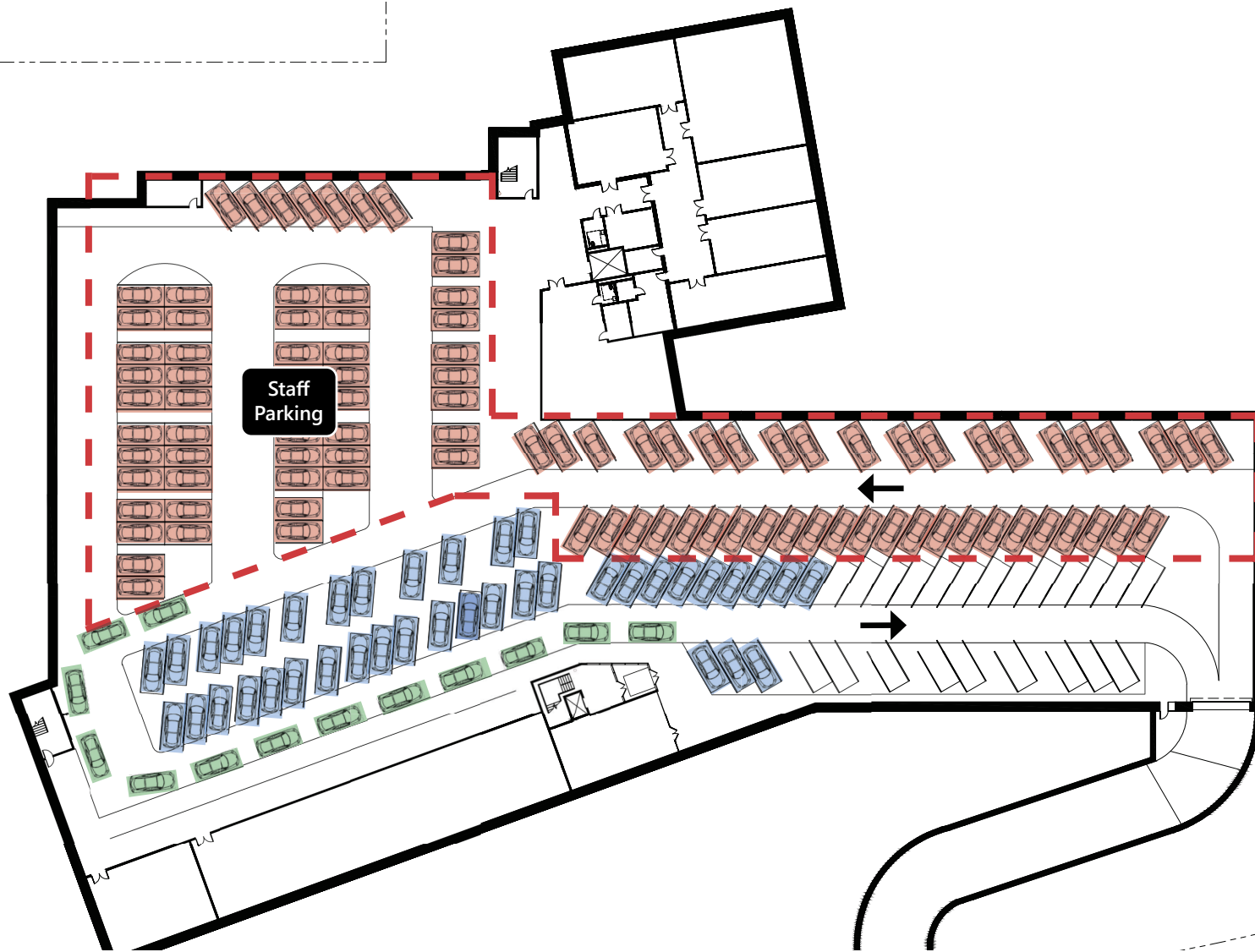
- Occupied Staff Parking Space
- Occupied Parent Drop-Off Space
- Queued Drop-Off Vehicle



Figure 7.b.1  
Peak Vehicle Queuing Accumulation  
Morning Peak Hour (Drop-Off)

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**





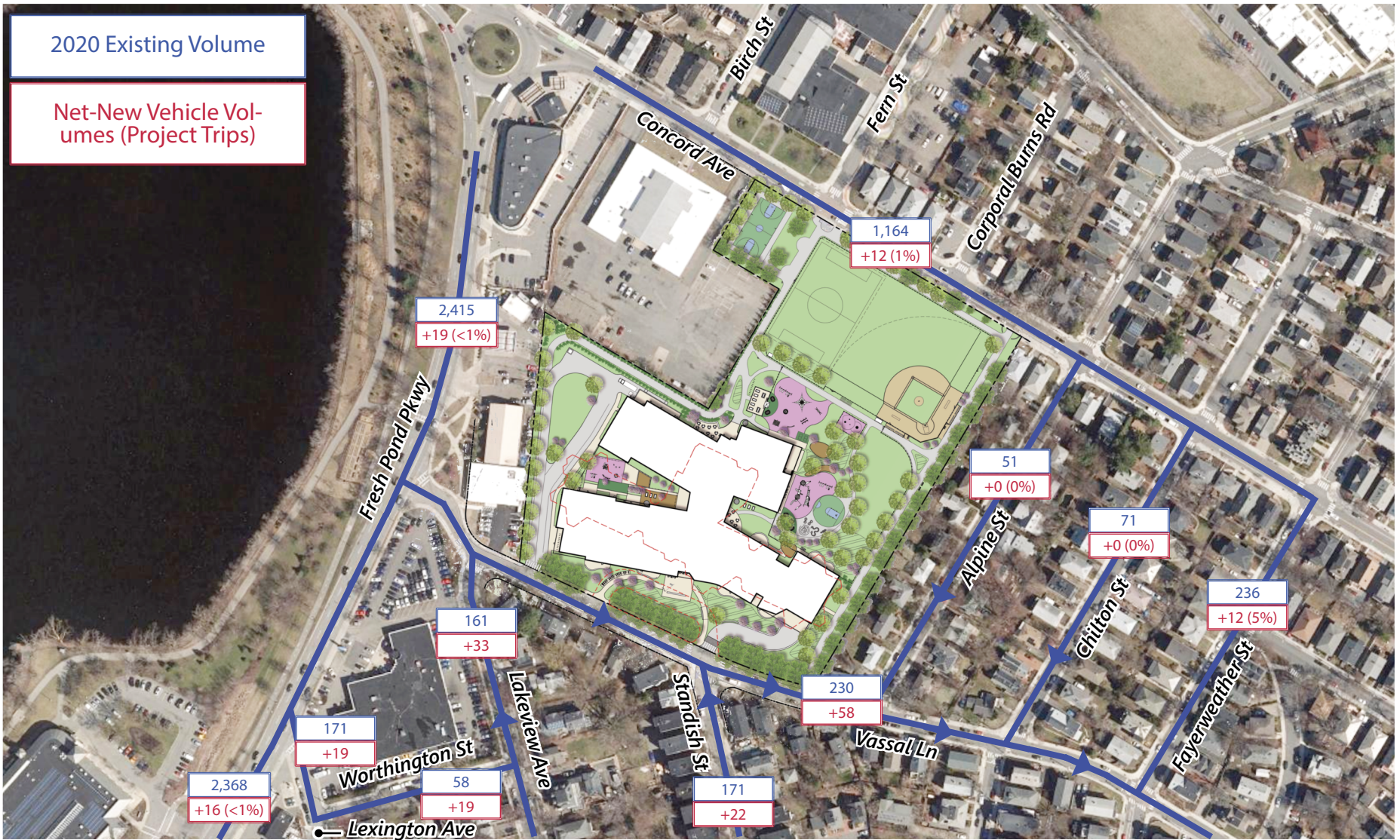
Source: Perkins Eastman

- Occupied Staff Parking Space
- Occupied Parent Drop-Off Space
- Queued Drop-Off Vehicle



Figure 7.b.2  
Peak Vehicle Queuing Accumulation  
Afternoon Peak Hour (Pick-Up)

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**



Source: Traverse Landscape Architects



Figure 8.a.1  
 Vehicle Traffic Summary  
 Morning Peak Hour

**Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts**





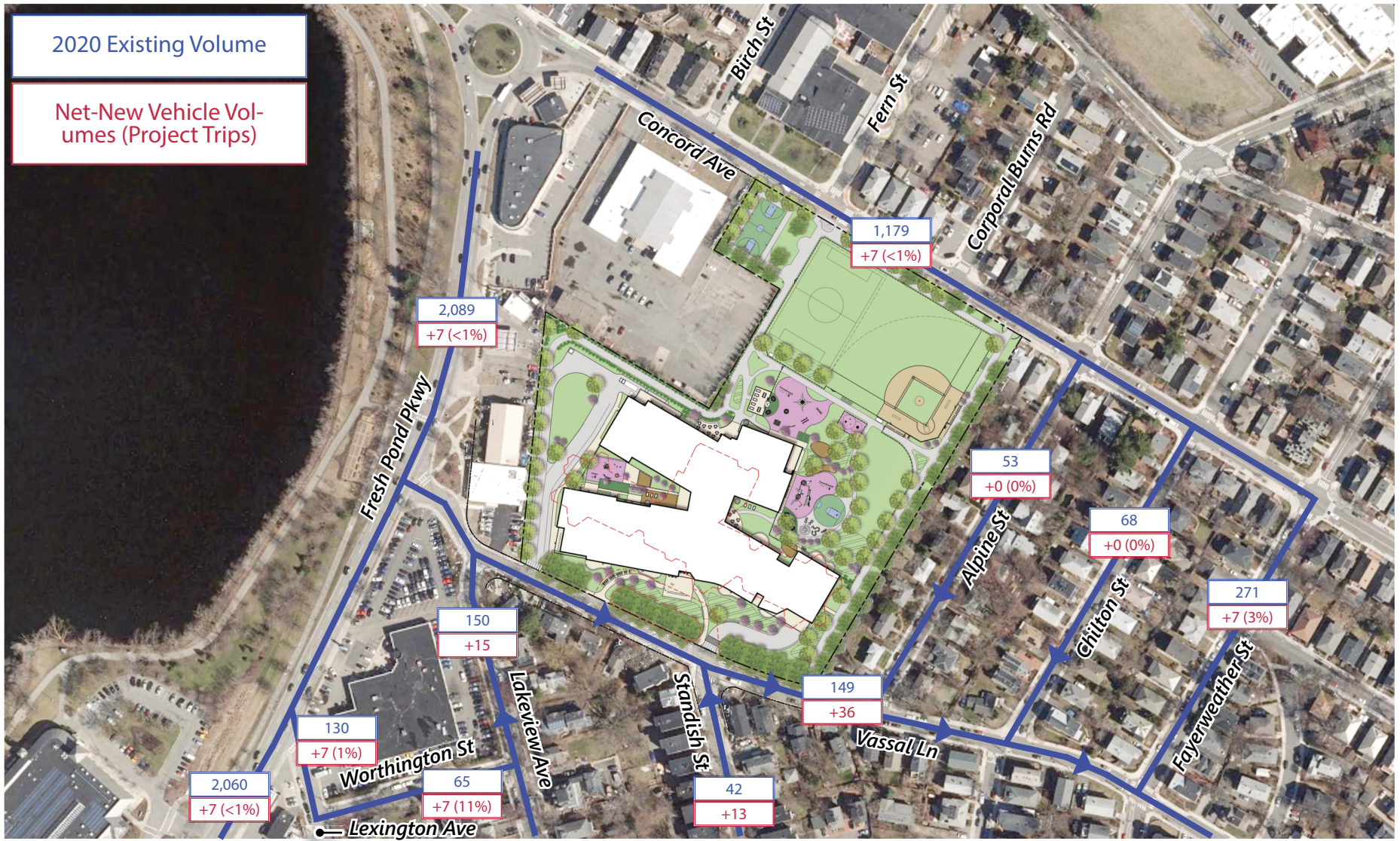
Source: Traverse Landscape Architects



Figure 8.a.2  
Vehicle Traffic Summary  
Afternoon Peak Hour

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**





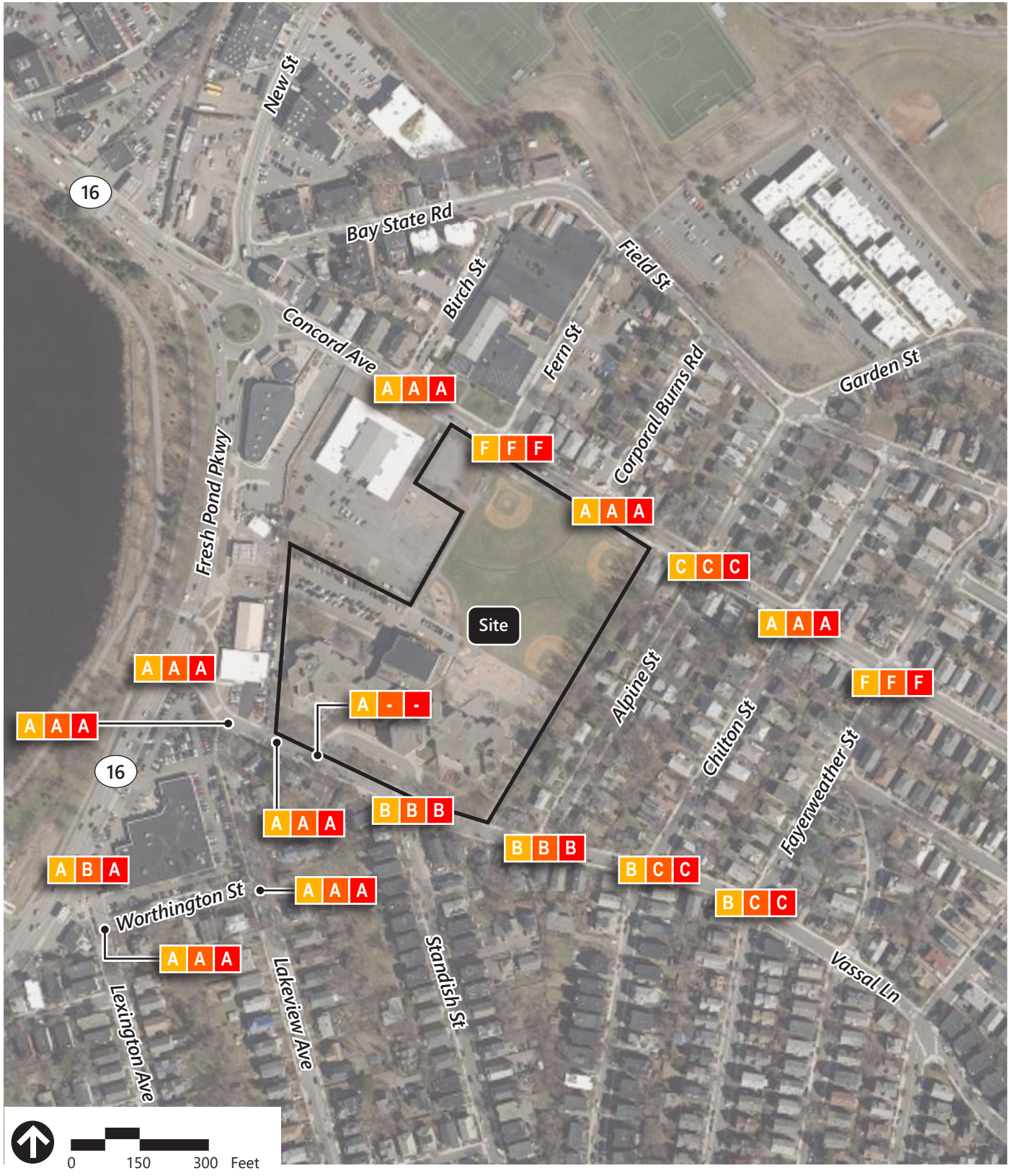
Source: Traverse Landscape Architects



Figure 8.a.3  
 Vehicle Traffic Summary  
 Evening Peak Hour

**Tobin Montessori + Vassal Lane Upper School  
 Cambridge, Massachusetts**





Source: MassGIS



Figure 11.a.1  
Pedestrian LOS Map  
Morning Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Morning Peak Hour; Morning (Commuter) Peak / Morning Peak Student Arrival Period

Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions





Source: MassGIS

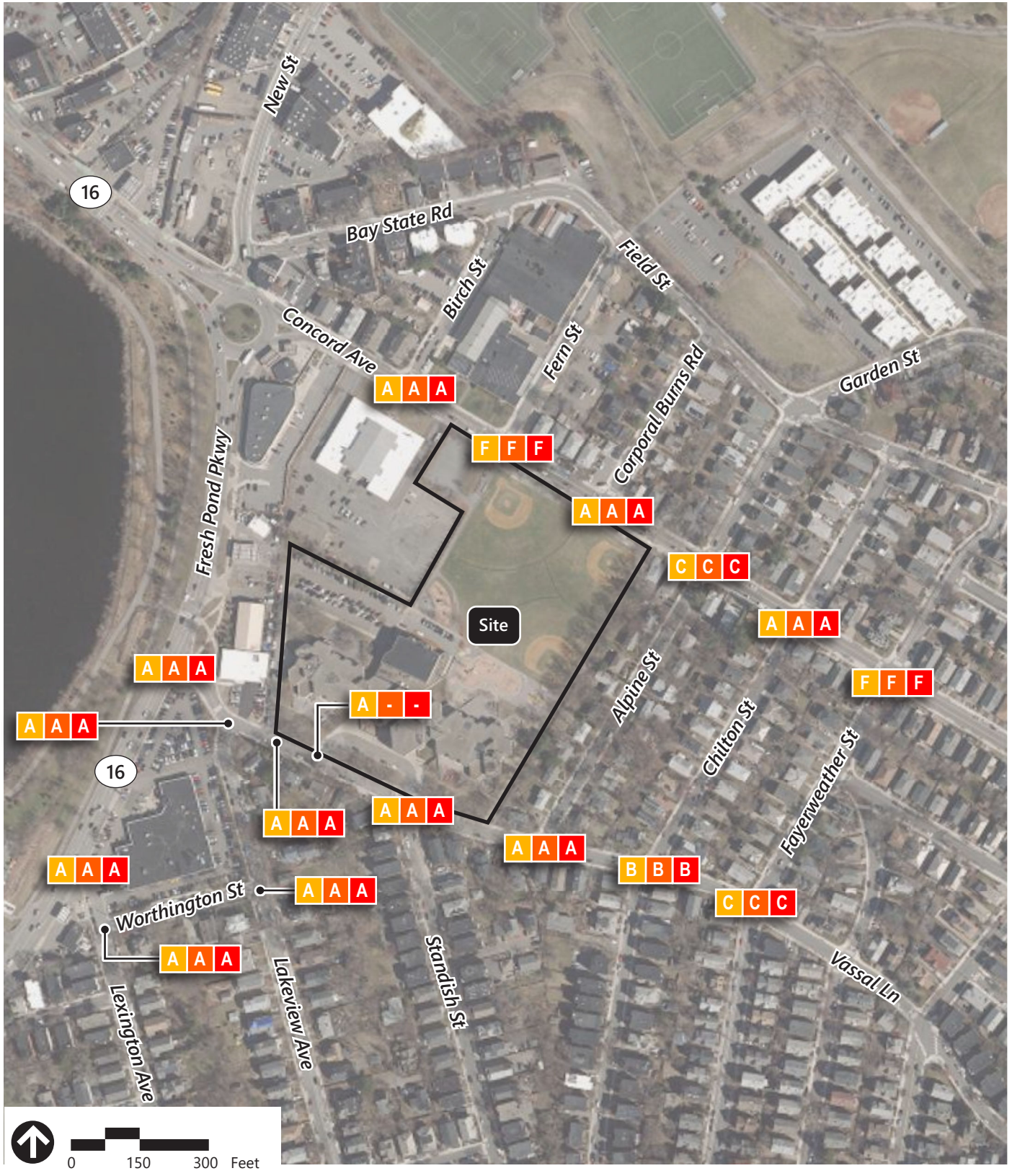


Figure 11.a.2  
Pedestrian LOS Map  
Afternoon Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Afternoon Peak Hour; Afternoon Peak Student + Staff Departure Period  
Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions





Source: MassGIS



Figure 11.a.3  
Pedestrian LOS Map  
Evening Peak Hour\*

**Tobin Montessori + Vassal Lane Upper School  
Cambridge, Massachusetts**

\* Evening Peak Hour; Evening (Commuter) Peak

Note: Vassal Lane at TMVLUS Bus Loop (Exit) is removed in both Build Conditions