SECTION 10

TRAFFIC REPORT

Please note: the following document is a draft. The final traffic impact and access study will be submitted prior to the hearing of this matter.

Proposed Residential Development

Newton, Massachusetts

PREPARED FOR

Waban Realty Ventures, LLC
1521 Beacon Street
Newton, MA 02468

PREPARED BY

vhb

101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770

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Executive Summary

VHB, Inc. has completed a detailed traffic assessment to evaluate the potential impacts associated with the proposed residential development to be located at 1521 Beacon Street in Newton, Massachusetts. The proposed project consists of 36 residential apartment units and 12 townhouses. Access to the site is proposed via a full-access driveway on Karen Road. The existing approximately 13,244 sf church on site is currently vacant. As part of the project, the existing church will be demolished.

Based on the trip generation rates published in the Institute of Transportation Engineers *Trip Generation, 9th Edition*, the proposed development is projected to generate approximately 324 new vehicles per day (vpd) on a typical weekday. The corresponding new weekday morning and evening peak hour trip generation is 23 vehicles per hour (vph) (1 entering/22 exiting) and 40 vph (28 entering/12 exiting), respectively. The traffic volumes projected to be generated by the proposed development will have minimal effect on traffic operations within the study area.

Detailed traffic analyses were conducted for each of the study area intersections under 2015 Existing conditions, 2022 No-Build conditions, and 2022 Build conditions. The capacity analysis showed that the study area intersections are not expected to experience significant impacts to operations as a result of the proposed project. Although the proposed development is projected to have minimal effect on area traffic operations, the proponent is committed to this community and as such is proposing the following improvements upon approval of the proposed project:

- On-site Transportation Demand Management (TDM) program to promote alternative modes of transportation and reduce traffic and parking demands for the site.
- Signal upgrades at the intersection of Beacon Street and Chestnut Street which include actuation and improved timing and phasing in the short-term, and the closure of Short Street to increase green space while still maintaining driveway access in the long-term.

Overall, the study finds that site generated traffic will not have a significant effect on traffic operations within the study area and that the existing transportation infrastructure in the area, in conjunction with the proposed improvements, can adequately accommodate the traffic volumes projected to be generated by the proposed development.

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Introduction

Vanasse Hangen Brustlin, Inc. (VHB) has conducted a traffic impact and access study for a proposed residential development to be located at 1521 Beacon Street in Newton, Massachusetts. This study quantifies existing and projected future traffic conditions, and identifies potential improvements within the study area.

Project Description

The proposed project involves the redevelopment of the approximately 1.6 acre parcel of land located at 1521 Beacon Street in Newton, Massachusetts. Figure 1 shows the site location map. The site is currently occupied by an approximately 13,244 square foot (sf) church, which is no longer active. As part of the project, the existing structure will be demolished and 36 residential apartment units and 12 townhouses will be constructed. Access to the site is proposed via a full-access driveway on Karen Road.

Study Area

The key roadway in the study area is Karen Road. The transportation study area is based on an understanding of traffic conditions in this area, includes the following six intersections identified in Figure 1:

- Karen Road at Montclair Road
- Beacon Street at Montclair Road/Short Street
- Beacon Street at Chestnut Street
- Chestnut Street at Oakvale Road
- Karen Road at Oakvale Road

- Karen Road at Site Driveway

Study Methodology

This traffic assessment has been conducted in three stages. The first stage involved an assessment of existing traffic conditions within the project area, including an inventory of existing roadway geometry, observations of traffic flow, daily and peak period traffic counts, and a review of traffic safety in the area.

The second stage of the study established the framework for evaluating the transportation impacts of the proposed project. Specific travel demand forecasts for the project were assessed along with future traffic demands on the study area roadways due to projected background traffic growth and other proposed area development that may occur independent of the proposed development. The year 2022 (a seven-year time horizon) was selected as the design year for analysis for the preparation of this traffic impact and access assessment, consistent with typical traffic impact studies prepared for the City of Newton. Analysis of area traffic operations in the year 2022 would fully reflect the effects of the proposed development as well as background traffic independent of the proposed development. The traffic analysis conducted in the second stage identified both existing and projected future roadway capacities and demands.

The third and final stage of the study discusses possible measures to improve existing and future traffic operations in the area.

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Existing Conditions

Evaluation of the transportation impacts associated with the proposed project requires a thorough understanding of the existing transportation system in the project study area. A complete inventory and evaluation of the existing transportation system in the project study area was conducted. The analysis of existing transportation conditions is based on the existing roadway network, roadway/intersection geometry, traffic control, existing daily and peak hour traffic volumes, traffic safety conditions, and existing public transportation. A description of existing conditions within the study area is presented below.

Study Area Roadways and Intersections

The following description of the major roadways and study area intersections includes the physical characteristics, geometric conditions, traffic control, and adjacent land uses. Figure 2 presents the existing intersection lane geometry and traffic control at each of the study area intersections.

Roadways

Karen Road

Karen Road is a local, two-lane roadway (one lane in each direction) that runs in a general north/south direction. Karen Road is bounded by Oakvale Road to the north and Montclair Road to the south. There is no posted speed limit nor parking restrictions along Karen Road. A sidewalk is present along both sides of the road. Land use within the vicinity of the project site is primarily residential.

Intersections

Karen Road at Montclair Road

Karen Road intersects Montclair Road from the north forming a three-legged unsignalized intersection. The southbound approach of Karen Road is under STOP control. All approaches consist of a single general purpose lane accommodating all movements. Sidewalks exist on all corners of the intersection. No crosswalks exist at the intersection. There is a no parking restriction along the southern side of Montclair Road. Land use near the intersection is primarily residential, with a park on the southern side of Montclair Road.

Beacon Street at Montclair Road/Short Street

Montclair Road intersects Beacon Street from the north and Short Street intersects Beacon Street from the northeast forming a four-legged unsignalized intersection. Short Street is one-way in the south-westbound direction. The Montclair Road southbound approach and Short Street south-westbound approach are under STOP control. All approaches are made up of a single general purpose lane accommodating all movements. Sidewalks exist on all corners of the intersection and there is a crosswalk across the Montclair Road southbound approach. There is a no parking restriction on the southern side of Short Street. Land use near the intersection is primarily residential.

Beacon Street at Chestnut Street

Chestnut Street intersects Beacon Street from the north and south to form a four-legged signalized intersection. All approaches are made up of a single general purpose lane accommodating all movements. Sidewalks exist on all corners of the intersection and crosswalks are located across all approaches. The signal provides an exclusive pedestrian phase that is called every cycle. Land use near the intersection is primarily residential.

Chestnut Street at Oakvale Road

Oakvale Road intersects Chestnut Street from the west to form a three-legged unsignalized intersection. The Chestnut Street eastbound approach is under STOP control. All approaches consist of a single general purpose lane accommodating all movements. Sidewalks exist on both sides of Chestnut Street south of the intersection

and on the west side of Chestnut Street north of the intersection. No crosswalks exist at the intersection. Land use near the intersection is primarily residential.

Karen Road at Oakvale Road

Karen Road intersects Oakvale Road from the south to form a three-legged unsignalized intersection. The Karen Road northbound approach is under STOP control. All approaches consist of a single general purpose lane accommodating all movements. Sidewalks exist on all corners of the intersection. No crosswalks exist at the intersection. Land use near the intersection is primarily residential.

Existing Traffic Volumes

Daily traffic volumes were collected on Karen Road north of Montclair Road over a 48-hour period from April 15, 2015 through April 16, 2015 (Wednesday through Thursday) using automatic traffic recorders (ATR). These dates represent typical weekdays for traffic count purposes (non-holidays) while schools are in session. The volumes are summarized in Table 1 and included in the Appendix to this document.

Table 1 Existing Traffic Volume Summary

		Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location	ADT [a]	Volume	K Factor [b]	Dir. Dist. [c]	Volume	K Factor	Dir. Dist.
Karen Road north of Montclair Road	200	15	9.0%	53% SB	25	13.6%	79% SB

Source: VHB based on automatic traffic recorder counts conducted in April 15-16, 2015.
Note: Peak hours do not necessarily coincide with the peak hours of turning movement counts.
a. Average Daily Traffic volume expressed in vehicles per day.
b. Represents the percent of daily traffic that occurs during the peak hour.
c. Directional distribution of peak hour traffic.

As shown in Table 1 Karen Road north of Montclair Road carries approximately 200 vehicles on a typical weekday with the peak hours accounting for 9.0 percent (morning peak hour) and 13.6 percent (evening peak hour) of the weekday daily traffic flow. Traffic flow along Karen Road is heavier in the southbound direction during both the weekday morning and weekday evening peak hours.

Concurrent with the ATR counts, turning movement counts (TMCs) were conducted at the study area intersections in April 2015 during the weekday morning peak period from 7:00 AM to 9:00 AM and the weekday evening peak period from 4:00 PM to 6:00 PM. The TMC data indicates that, within the study area, the weekday morning peak

hour generally occurs between 7:45 AM and 8:45 AM and the weekday evening peak hour occurs between 5:00 PM and 6:00 PM.

Seasonal Variation

MassDOT historical traffic counts were reviewed to understand the seasonality of traffic count data collected in the month of April. The statewide data for seasonal variation of traffic volumes indicate that traffic counts in April are generally higher (by as much as eight-percent) than the average month. Since the count data were found to be higher than annual average conditions, no further seasonal adjustment factors were applied to the data. The MassDOT seasonal factors are included in the Appendix to this document. Figures 3 and 4 illustrate the resulting 2015 Existing conditions weekday morning and weekday evening peak hour traffic volumes, respectively.

Crash History

To identify motor vehicle crash trends in the project study area, the most current crash data for the study area intersections was obtained from MassDOT for the five-year period from 2008 through 2012. A summary of the vehicular crash data is presented in Table 2 and included in the Appendix to this document.

Crash rates are calculated based on the number of crashes at an intersection and the volume of traffic traveling through that intersection on a daily basis. MassDOT average crash rates for District 6 (the MassDOT district designation for Newton) are 0.76 and 0.58 for signalized and unsignalized intersections, respectively. In other words, on average, 0.76 crashes occurred per million vehicles entering signalized intersections, and 0.58 crashes occurred per million vehicles entering unsignalized intersections throughout District 6 in 2010. The crash rate worksheets for the study area intersections are included in the Appendix to this document.

As shown in Table 2, only two of the five study area intersections experienced crashes over the five-year period, Beacon Street at Chestnut Street and Chestnut Street at Oakvale Road. The calculated crash rates at these two intersections are below the average crash rates for District 6. The majority of the crashes were angle and rear-end collisions resulting in property damage only. One crash at Beacon Street and Chestnut Street involved a non-motorist (bike, pedestrian). No fatal crashes were reported at any of the study area intersections.

Table 2 Vehicular Crash Summary (2008 – 2012)

	Karen Road at Montclair Road	Beacon Street at Montclair Road and Short Street	Beacon Street at Chestnut Street	Chestnut Street at Oakvale Street	Karen Road at Oakvale Road
Signalized?	No	No	Yes	No	No
MassDOT Average Crash Rate	0.58	0.58	0.76	0.58	0.58
Calculated Crash Rate	0.00	0.00	0.25	0.07	0.00
Exceeds Average?	No	No	No	No	No
Year					
2008	0	0	1	1	0
2009	0	0	4	0	0
2010	0	0	3	0	0
2011	0	0	1	0	0
2012	0	0	2	1	0
Total	0	0	11	2	0
Collision Type					
Angle	0	0	6	0	0
Head-on	0	0	1	1	0
Rear-end	0	0	3	1	0
Sideswipe, opposite direction	0	0	0	0	0
Sideswipe, same direction	0	0	0	0	0
Single Vehicle Crash	0	0	1	0	0
Severity					
Fatal Injury	0	0	0	0	0
Non-Fatal Injury	0	0	5	0	0
Property Damage Only	0	0	6	2	0
Time of day					
Weekday ,7:00 AM - 9:00 AM	0	0	0	1	0
Weekday, 4:00 – 6:00 PM	0	0	1	0	0
Saturday 11:00 AM – 2:00 PM	0	0	1	0	0
Weekday, other time	0	0	3	1	0
Weekend, other time	0	0	6	0	0
Pavement Conditions					
Dry	0	0	10	0	0
Wet	0	0	1	1	0
Snow	0	0	0	1	0
Ice	0	0	0	0	0
Slush	0	0	0	0	0
Non-Motorist (Bike, Pedestrian)	0	0	1	0	0

Source: Crash data was obtained from MassDOT.

Public Transportation

Public transportation is readily available in proximity to the site by the Massachusetts Bay Transportation Authority (MBTA) via the Green D Line. Details on the current transit opportunity are provided below and shown in Figure 5:

- **Green D Line:** The Green D Line has a station at Waban in the vicinity of the study area. The approximate walk time is approximately eight minutes. Weekday headways are approximately seven to eight minutes during peak periods. Weekend headways are approximately eight to ten minutes. The Green D Line carries approximately 25,000 passengers on a typical weekday.

Sidewalks are provided throughout the study area along the route to the Green D Line Waban Station and crosswalks exist at the major unsignalized intersections. The route map and schedule for the Green D Line is provided in the Appendix to this document.

3

Future Conditions

To determine future roadway operations, traffic volumes in the study area were projected to the year 2022 to reflect a seven-year planning horizon from the Existing conditions consistent with MassDOT guidelines.

Traffic volumes on the roadway network under future conditions without the project (No-Build) are assumed to include all existing traffic, any new traffic due to regional and area background traffic growth, and traffic related to any specific nearby development projects expected to be completed by the 2022 horizon year. Roadway improvements proposed within the boundaries of the study area were also considered and incorporated where appropriate. The anticipated traffic volumes from the proposed development were added to the No-Build traffic volumes to reflect future conditions with the project in place (Build).

No-Build Conditions

No-Build traffic volumes were determined by considering existing traffic volumes and adding regional traffic growth and traffic from other nearby developments. Traffic growth is a function of expected new development, changes in demographics, and changes in auto usage and ownership in the region. Regional traffic growth is projected by examining historic traffic growth trends.

Regional Traffic Growth

Traffic studies conducted in the City of Newton and historic count data were reviewed to establish a rate at which traffic volumes can be expected to grow. A review of recent traffic studies showed a 0.5-percent per year growth rate was utilized. Historical count data available from MassDOT at permanent count station 4165, located on I-95/Route 128 north of the Route 16 westbound to I-95 southbound

ramp, show fluctuations in traffic volumes over the last five years, with no consistent increase or decrease in traffic volumes. Based on this research, a growth rate 0.5-percent per year is acceptable for this study.

Planned/Approved Developments

In addition to accounting for background growth, the traffic associated with other planned/approved developments near the site was also considered. Based on discussions with the City of Newton, it was determined that there is one planned development project within the vicinity of the study area and was considered as part of the background development.

- **Riverside MBTA Station Redevelopment:** The Riverside MBTA Station is located on Grove Street adjacent to Route 128/I-95. The project involves the redevelopment of the existing site to include office space, residential units, ancillary retail space, and community space in addition to the already existing transit uses.

Projected traffic volumes expected to be generated by this project were obtained from the published traffic study submitted as part of the permitting process for the project. The projected site-generated traffic are included in the Appendix to this document.

Additionally, the following project is currently under construction within the vicinity of the study area, however was not considered as part of the background development.

- **Angier Elementary School Renovation:** The Angier Elementary School located at 1697 Beacon Street just west of the proposed project. The school is currently being renovated and expected to re-open in early 2017. During the renovations, Angier Elementary School students are attending the Carr School located at 225 Nevada Street.

No published traffic study was completed for this project, however an alternative assessment was completed that includes the traffic redistribution that will potentially result with the re-opening of the Angier Elementary School. The Angier Elementary School alternative assessment is included in the Appendix to this document.

No-Build Traffic Volumes

The year 2022 No-Build traffic volume networks were developed by applying the 0.5-percent annual growth rate over the seven-year study horizon to the existing volume networks and adding the traffic volumes associated with the background development described above. Figures 6 and 7 show the resulting 2022 No-Build peak hour traffic

volume networks for the weekday morning and weekday evening peak hours, respectively.

Additionally, to assess the traffic impacts associated with the traffic redistribution that will potentially result with the re-opening of the Angier Elementary School, alternative 2022 No-Build traffic volumes have been developed and are included in the Appendix to this document.

Future Roadway Conditions

In assessing future traffic conditions, proposed roadway improvements within the study area were considered. Based on discussions with the City of Newton and information available from MassDOT, no roadway improvement projects located within the vicinity of the site were identified.

Build Conditions

Build traffic volumes were determined by estimating site-generated traffic volumes and distributing these volumes over the study area roadways. The site generated traffic volumes include new trips that are likely to be generated by the proposed development of the property.

Site-Generated Traffic Volumes

The rate at which any development generates traffic is dependent upon a number of factors such as size, location, and concentration of surrounding developments. As previously discussed, the proposed redevelopment plan consists of the removal of the existing Church and construction of the proposed 36 apartment units and 12 townhouses. Traffic credits for the removal of the existing use have been assessed along with the proposed development. Trip generation estimates for the existing and proposed uses were projected using trip generation rates published by the Institute of Transportation Engineers (ITE) *Trip Generation, 9th Edition*[1].The number of vehicle-trips generated by the existing and proposed uses were estimated based on ITE LUC 560 (Church), ITE LUC 220 (Apartment), and ITE LUC 230 (Residential

▼

1 Trip Generation, 9th Edition, Institute of Transportation Engineers, Washington D.C., 2012.

Condominium/Townhouse). Table 3 summarizes the projected trip generation associated with the proposed development.

Table 3 Project Trip Generation Summary

Time Period	Existing Church Trips [a]	Proposed Apartment Trips [b]	Proposed Townhouse Trips [c]	Proposed Total Trips	Net New Trips
Weekday Daily	120	342	102	444	324
Weekday Morning Peak Hour					
Enter	5	4	2	6	1
Exit	3	17	8	25	22
Total	8	21	10	31	23
Weekday Evening Peak Hour					
Enter	3	24	7	31	28
Exit	4	13	3	16	12
Total	7	27	10	47	40

a. Trip Generation estimate based ITE LUC 560 (Church) for 13.244 ksf of space.
b. Trip Generation estimate based ITE LUC 220 (Apartment) for 36 units.
c. Trip Generation estimate based ITE LUC 230 (Residential Condominium/Townhouse) for 12 units.

As shown in Table 3, the proposed development is estimated to generate approximately 324 new weekday daily trips. Of this total, it is estimated that approximately 23 site-generated trips (1 entering/22 exiting) will occur during the weekday morning peak hour and approximately 40 trips (28 entering/12 exiting) during the weekday evening peak hour. The trip generation worksheets are included in the Appendix to this document.

Trip Distribution

The directional distribution of the traffic approaching and departing the site is a function of population densities, the location of employment opportunities, existing travel patterns, and the efficiency of the roadway system. Trips made from and to the proposed development during the peak hours are expected to be predominantly home-to-work and work-to-home trips in the morning and evening peak hours, respectively. Accordingly, the trip distribution for the proposed development has been derived based on Journey-to-Work data for the City of Newton updated with the 2010 U.S. Census data. Table 4 and Figure 8 illustrate the trip distribution. Detailed trip distribution calculations are provided in the Appendix to this document.

Table 4 Trip Distribution Summary

Travel Route	Direction (to/from)	Percent of New Site-Generated Traffic Assigned to Route
Beacon Street	West	11%
Beacon Street	East	21%
Chestnut Street	North	47%
Chestnut Street	South	21%
Total		100%

Build Traffic Volumes

The site-generated traffic volumes were assigned to the roadway network according to the distribution and travel patterns described above, and added to the No-Build traffic volumes to develop the peak hour Build traffic volume networks. Figures 9 and 10 present the resulting 2022 Build traffic volumes for the weekday morning and weekday evening peak hours, respectively.

Additionally, to assess the traffic impacts associated with the traffic redistribution that will potentially result with the re-opening of the Angier Elementary School, alternative 2022 Build traffic volumes have been developed and are included in the Appendix to this document.

Sight Distance

Sight distance analysis, in conformance with guidelines of the American Association of State Highway and Transportation Officials (AASHTO)[2] was performed for the site driveway on Karen Road. Speed observations recorded during the data collection phase (85th percentile speed of approximately 26 mph in the northbound direction and 28 mph in the southbound direction in the vicinity of the site driveway) were used to calculate the required stopping sight distance (SSD) for traffic approaching the site driveway and intersection sight distance (ISD) for traffic exiting the site driveway.

2 A Policy on the Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, 2013

SSD is the distance required for a vehicle approaching an intersection from either direction to perceive, react and come to a complete stop before colliding with an object in the road, in this case a vehicle exiting from a driveway. In this respect, SSD can be considered as the minimum visibility criterion for the safe operation of an unsignalized intersection.

ISD, on the other hand, is based on the time required for perception, reaction and completion of the desired critical exiting maneuver (typically, a left turn) once the driver on a minor street approach (or a driveway) decides to execute the maneuver. Calculation for the critical ISD includes the time to (1) turn left, and to clear the near half of the intersection without conflicting with the vehicles approaching from the left; and (2) upon turning left, to accelerate to the operating speed on the roadway without causing approaching vehicles on the main road to unduly reduce their speed. In this context, ISD can be considered as a desirable visibility criterion for the safe operation of an unsignalized intersection. Table 5 summarizes the sight distance analysis. The sight distance worksheet is included in the Appendix to this document.

Table 5 Sight Distance Summary

	Stopping Sight Distance (feet)			Intersection Sight Distance (feet)		
Location	Traveling	Required [a]	Measured [b]	Looking	Desirable [a]	Measured [b]
Karen Road at Site Driveway	NB	165	210	Left	310	210
	SB	180	250	Right	310	320

a. Based on standards established in A Policy on the Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, 2013. Based on 85th percentile speed of 26 mph northbound and 28 mph southbound measured in April 2015 in the vicinity of the proposed site driveway.
b. Based on field measurements taken by VHB.

As shown in Table 5, the required SSD is exceeded in both directions at the proposed site driveway on Karen Road. The desirable ISD is met when looking right (north) at the proposed site driveway, but is not met when looking left (south) of the proposed site driveway. The intersection of Karen Road at Montclair Road is located south of the site driveway, which limits the ISD. Vehicles traveling through this intersection to Karen Road would be able to see the site driveway as soon as they depart the intersection. It should be noted that the minimum ISD (which is equal to the SSD), is met when looking left (south) at the proposed site driveway.

4

Traffic Operations Analysis

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic within the study area. To assess quality of flow, roadway capacity analyses were conducted with respect to Existing conditions and projected No-Build and Build traffic volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed on them. Calculated levels of service classify roadway operating conditions.

Level of Service Criteria

Level of service (LOS) is the term used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers a number of factors including roadway geometry, speed, travel delay, freedom to maneuver, and safety. Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level of service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

For signalized intersections, the evaluation criteria used to analyze study area intersections are based on the percentile-delay method (SYNCHRO results). For unsignalized intersections, the analysis assumes that traffic on the mainline is not affected by traffic on the side streets. The level of service is only determined for left-turns from the main street and all movements from the minor street. The evaluation

criteria used to analyze unsignalized intersections are based on the *2010 Highway Capacity Manual* (HCM)[3].

It should be noted that the analytical methodologies typically used for the analysis of unsignalized intersections use conservative analysis parameters such as high critical gaps. Actual field observations indicate that drivers on minor streets generally accept smaller gaps in traffic than those used in the analysis procedures and therefore experience less delay than reported by the analysis software. The net effect of these procedural limitations of the analysis software is the over-estimation of calculated delays at unsignalized intersections. Cautious judgment should therefore be exercised when interpreting the capacity analysis results at unsignalized intersections.

Intersection Capacity Analysis

Intersection capacity analyses were conducted at all intersections in the study area. Analyses were conducted for the 2015 Existing, 2022 No-Build and 2022 Build conditions. Tables 6 and 7 summarize the capacity analyses for signalized and unsignalized intersections, respectively. The capacity analyses results are included in the Appendix to this document.

As shown in Table 6, operations at the signalized intersection of Beacon Street and Chestnut Street are expected to be minimally impacted by the proposed project traffic and the intersection is expected to operate at the same level of service under 2022 Build conditions as under 2022 No-Build conditions during both peak hours.

As shown in Table 7, none of the unsignalized intersections are expected to experience a drop in level of service between 2022 No-Build conditions and 2022 Build conditions. Overall, only minimal increases in delay and queues are expected. The intersection of Karen Road at the proposed site driveway is expected to operate at LOS A under 2022 Build conditions during both peak hours.

Additionally, to assess the traffic impacts associated with the traffic redistribution that will potentially result with the re-opening of the Angier Elementary School, alternative intersection capacity analyses were conducted at the study area intersections for the 2022 No-Build and 2022 Build conditions. The alternative capacity analyses results are included in the Appendix to this document.

3 Transportation Research Board, Highway Capacity Manual, Washington, D.C., 2010.

Table 6 Signalized Intersection Capacity Analysis

		2015 Existing Conditions					2022 No-Build Conditions					2022 Build Conditions				
Location	Movement	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Chestnut Street at Beacon Street																
Weekday	EB L/T/R	0.98	61	E	186	#548	1.05	79	E	205	#585	1.09	93	F	~246	#607
Morning	WB L/T/R	0.92	45	D	213	#494	0.98	56	E	231	#530	0.99	58	E	232	#532
	NB L/T/R	0.86	34	C	223	#625	0.89	37	D	238	#661	0.89	37	D	238	#661
	SB L/T/R	0.75	28	C	185	#519	0.78	29	C	195	#548	0.78	29	C	195	#548
	Overall		**41**	**D**				**49**	**D**				**53**	**D**		
Weekday	EB L/T/R	0.85	36	D	190	#484	0.89	40	D	203	#514	0.93	46	D	212	#534
Evening	WB L/T/R	1.08	86	F	~240	#613	1.15	113	F	~286	#652	1.16	118	F	~291	#658
	NB L/T/R	0.90	38	D	243	#659	0.93	43	D	260	#697	0.95	45	D	263	#705
	SB L/T/R	0.86	34	C	231	#637	0.89	37	D	243	#664	0.89	37	D	243	#664
	Overall		**47**	**D**				**57**	**E**				**60**	**E**		

a. Volume to capacity ratio.
b. Average total delay, in seconds per vehicle.
c. Level-of-service.
d. 50th percentile queue, in feet.
e. 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.

Table 7 Unsignalized Intersection Capacity Analysis

		2015 Existing Conditions					2022 No-Build Conditions					2022 Build Conditions				
Location	Movement	D [a]	v/c [b]	Del [c]	LOS [d]	95 Q [e]	D	v/c	Del	LOS	95 Q	D	v/c	Del	LOS	95 Q
Montclair Road at Karen Road																
Weekday	EB L	neg	0.00	7	A	0	neg	0.00	7	A	0	neg	0.00	7	A	0
Morning	SB L/R	10	0.02	9	A	1	10	0.02	9	A	1	25	0.05	9	A	1
Weekday	EB L	5	0.01	7	A	0	5	0.01	7	A	0	5	0.01	7	A	0
Evening	SB L/R	20	0.03	9	A	1	20	0.03	9	A	1	30	0.05	9	A	1
Beacon Street at Montclair Road																
Weekday	EB L	5	0.01	9	A	0	5	0.01	9	A	0	5	0.01	9	A	0
Morning	SB L/R	15	0.06	15	B	1	15	0.06	15	C	1	30	0.15	20	C	1
	SWB R	80	0.20	12	B	1	85	0.15	12	B	1	85	0.15	12	B	1
Weekday	EB L	10	0.01	9	A	0	10	0.01	9	A	0	15	0.02	9	A	1
Evening	SB L/R	35	0.14	17	C	1	35	0.15	18	C	1	45	0.22	21	C	1
	SWB R	100	0.19	12	B	1	105	0.18	12	B	1	105	0.18	12	B	1
Chestnut Street at Oakvale Road																
Weekday	EB L/R	10	0.12	25	C	1	10	0.13	26	D	1	15	0.23	33	D	1
Morning	NB L	5	0.01	9	A	0	5	0.01	9	A	0	5	0.01	9	A	0
Weekday	EB L/R	15	0.09	17	C	1	15	0.09	17	C	1	20	0.15	23	C	1
Evening	NB L	10	0.01	10	A	0	10	0.01	10	A	0	10	0.01	10	A	0
Karen Road at Oakvale Road																
Weekday	WB L	5	0.01	7	A	0	5	0.01	7	A	0	5	0.01	7	A	0
Morning	NB L/R	5	0.01	9	A	0	5	0.01	9	A	0	10	0.02	9	A	1
Weekday	WB L	10	0.01	7	A	0	10	0.01	7	A	0	25	0.03	7	A	1
Evening	NB L/R	15	0.02	9	A	1	15	0.02	9	A	1	20	0.03	9	A	1
Karen Road at Site Driveway																
Weekday	WB L/R											20	0.02	9	A	1
Morning	SB L											neg	-	0	A	0
		Intersection does not exist					*Intersection does not exist*									
Weekday	WB L/R											15	0.02	9	A	1
Evening	SB L											15	0.01	7	A	0

a. Demand of critical movement.
b. Volume to capacity ratio.
c. Average total delay, in seconds per vehicle.
d. Level-of-service.
e. 95th percentile queue, in vehicles.

5

Mitigation

As outlined above, the proposed development project is expected to have very minor impacts on traffic conditions in the study area. However, the Proponent proposes to implement Transportation Demand Management (TDM) measures on site and provide signal improvements at the intersection of Beacon Street and Chestnut Street.

Transportation Demand Management (TDM)

Given the site's proximity to the Waban Green D Line station, there are strong opportunities to implement Transportation Demand Management (TDM) measures on site to minimize the proposed project's impacts on the surrounding roadways. Implementation of TDM measures will offer alternatives to traveling in single occupancy vehicles, which will reduce traffic and parking demand on the site. As part of the proposed project, the following TDM measures will be implemented on site:

- Display all public transit schedules in a central location within the facility.
- To promote pedestrian safety, a map of the area will be provided for transit users that displays the location of Waban station, sidewalks, and crosswalks. This information will be distributed to residents and will also be posted in common areas.
- Provide a secure bicycle storage area on site.

Beacon Street at Chestnut Street

The intersection of Beacon Street at Chestnut Street currently operates poorly and opportunities for operational improvements exist. The Proponent proposes both a

short-term improvement option and a long-term improvement option for this intersection. The short-term improvement option consists of updating the signal equipment to add actuation and changing the pedestrian accommodation from an exclusive pedestrian phase to concurrent pedestrian phases. Under the long-term option, the Proponent proposes to close Short Street to provide more green space but still maintain access to the existing residential driveways and redirect traffic traveling along Short Street through the intersection of Beacon Street and Chestnut Street. Table 8 summarizes the capacity analysis results for the signalized intersection of Beacon Street at Chestnut Street under both the short-term and long-term improvement options. The capacity analyses results are included in the Appendix to this document.

As shown in Table 8, both the short-term and long-term improvement options results in better operations at the intersection of Beacon Street at Chestnut Street than under the 2022 No-Build condition.

Table 8 Signalized Intersection Capacity Analysis with Mitigation

		2022 No-Build Conditions			2022 Build Conditions						2022 Build Conditions with Mitigation (Short-term)					2022 Build Conditions with Mitigation (Long-term)				
Location	Movement	v/c[a]	Del[b]	LOS[c]	v/c	Del	LOS	50 Q	95 Q	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Chestnut Street at Beacon Street																					
Weekday	EB L/T/R	1.05	79	E	205	#585	1.09	93	F	~246	#607	0.92	42	D	201	#397	0.92	42	D	201	#397
Morning	WB L/T/R	0.98	56	E	231	#530	0.99	58	E	232	#532	0.78	25	C	210	269	0.78	25	C	210	269
	NB L/T/R	0.89	37	D	238	#661	0.89	37	D	238	#661	0.91	38	D	260	#467	0.91	38	D	260	#467
	SB L/T/R	0.78	29	C	195	#548	0.78	29	C	195	#548	0.80	28	C	216	#382	n/a	n/a	n/a	n/a	n/a
	SB L/T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.79	28	C	216	#381
	SB R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.13	5	A	3	28
	Overall		49	D				53	D				33	C				32	C		
Weekday	EB L/T/R	0.89	40	D	203	#514	0.93	46	D	212	#534	0.74	25	C	231	312	0.74	25	C	231	312
Evening	WB L/T/R	1.15	113	F	~286	#652	1.16	118	F	~291	#658	1.01	64	E	~291	#494	1.01	64	E	~291	#494
	NB L/T/R	0.93	43	D	260	#697	0.95	45	D	263	#705	0.90	38	D	321	#535	1.04	68	E	~391	#592
	SB L/T/R	0.89	37	D	243	#664	0.89	37	D	243	#664	1.01	62	E	~338	#567	n/a	n/a	n/a	n/a	n/a
	SB L/T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.01	61	E	~336	#567
	SB R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.18	7	A	10	40
	Overall		57	E				60	E				47	D				54	D		

a. Volume to capacity ratio.
b. Average total delay, in seconds per vehicle.
c. Level-of-service.
d. 50th percentile queue, in feet.
e. 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.

6

Conclusion

This study evaluated the impacts associated with the construction of a 36 residential apartment units 12 townhouses on an approximately 1.6 acre site located at 1521 Beacon Street in Newton, Massachusetts. Access to the site is proposed via a full-access driveway on Karen Road. The site is currently occupied by an approximately 13,244 sf church, which is no longer active. As part of the project, the existing structure will be demolished.

The proposed development is projected to generate approximately 324 new vehicles per day (vpd) on a typical weekday. The corresponding new weekday morning and evening peak hour trip generation is 23 vehicles per hour (vph) (1 entering/22 exiting) and 40 vph (28 entering/12 exiting), respectively. The relatively low traffic volumes projected to be generated by the proposed development will have minimal effect on traffic operations within the study area.

Detailed traffic analyses were conducted for each of the study area intersections under 2015 Existing conditions, 2022 No-Build conditions, and 2022 Build conditions. The capacity analysis showed that the study area intersections are not expected to experience significant impacts to operations as a result of the proposed project. Although the proposed development is projected to have minimal effect on area traffic operations, the proponent is committed to this community and as such is proposing the following improvements upon approval of the proposed project:

- On-site Transportation Demand Management (TDM) program to promote alternative modes of transportation and reduce traffic and parking demands for the site.
- Signal upgrades at the intersection of Beacon Street and Chestnut Street which include actuation and improved timing and phasing in the short-term, and the closure of Short Street to increase green space while still maintaining driveway access in the long-term.

Overall, the study finds that site generated traffic will not have a significant effect on traffic operations within the study area and that the existing transportation infrastructure in the area, in conjunction with the proposed improvements, can adequately accommodate the traffic volumes projected to be generated by the proposed development.