Updated Traffic Impact and Access Study

Proposed Development
140 Haverhill Street
Andover, MA

May 27, 2025

Prepared for:
Town of Andover

Applicant:
140 Medico Inc.

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1 Executive Summary

Fuss & O'Neill has prepared this study to assess the traffic impact and to evaluate the access requirements of a proposed medical office building and a childcare center (The Gardner School). This report identifies existing traffic operating parameters on key roadways and intersections within the study area, evaluates the anticipated traffic volume increases as a result of the proposed project, analyzes the project's traffic-related impacts, determines the projects access/egress requirements and identifies appropriate mitigating measures designed to minimize the traffic-related impacts created by the project. The following provides a brief summary of the project and the study's findings.

PROJECT DESCRIPTION

The site is in the northwest corner of the intersection of Haverhill Street (Route 133) and High Street. Currently, the site consists of Doctors Park I and Doctors Park II. Two driveways currently serve the site, one from Haverhill Street and one from High Street. Doctors Park I, approximately 25,000 square feet (sf) of medical office space, is currently a vacant.

The current development proposal consists of construction of two buildings. The first building, consisting of 19,200 gross square feet of space will be a new medical office building. The second building, the Gardner School, will consist of a 17,688 square foot (sf) childcare center. The childcare center is expected to have a maximum enrollment of 195 students and a maximum staff of thirty-two (32) employees. A total of 149 parking spaces will be provided for the site.

The two buildings will replace the existing Doctors Park I building. Access would continue to be provided by way of the driveways to Haverhill Street and High Street. During the peak hours, left turns will be prohibited from the Haverhill Street driveway. Figure 1 shows the site location in relation to the surrounding area.

STUDY METHODOLOGY

This study has been prepared in three stages. The first stage involved an assessment of existing conditions within the study area and included an inventory of roadway geometrics, pedestrian and bicycle facilities and public transportation services. Existing traffic counts were performed at the study area intersections.

In the second stage of the study, future traffic conditions were projected and analyzed. Specific travel demand forecasts for the project were assessed along with future traffic demands due to expected traffic growth independent of the proposed project. In accordance with Massachusetts Department of Transportation (MassDOT) and Executive Office of Environmental Affairs (EEA) guidelines, the year 2032 was selected as the basis for modeling future transportation impacts of the proposed development to reflect a seven-year planning horizon.

Figure 1
Site Location Map

The third stage of the study presents and evaluates measures to address traffic issues, if any, and necessary improvements to accommodate the development.

STUDY AREA

Roadway geometry and traffic control information was collected for the following intersections:

- Haverhill Street and High Street
- Haverhill Street and Existing Site Driveway
- High Street and Existing Site Driveway

EXISTING CONDITIONS

Evaluation of existing conditions within the study area includes a description of roadway geometrics, traffic constraints, land uses at the intersections, and quantification of traffic volumes.

Existing Traffic Volumes

To establish base traffic conditions within the study area, manual turning movement and vehicle classification counts were originally obtained in February 2025. Peak-period turning

movement counts were conducted during the weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:30 PM) periods. Daily traffic counts were conducted on Haverhill Street and on High Street for a two (2) day weekday period using automatic traffic recorders (ATR).

The traffic-volume data gathered as part of this study was collected during the month of February 2025. Data from the MassDOT 2023 Weekday Seasonal Factors table was reviewed to determine the monthly variations of the traffic volumes. February counts on Haverhill Street, an Urban Principal Arterial under group 'U3', are approximately 2 percent lower than average, and February counts on High Street, which is an Urban Minor Arterial under group 'U4', represents average month conditions. Therefore, the February count data for Haverhill Street was adjusted upward by a factor of 1.02 to represent average month conditions.

Haverhill Street was recorded to carry approximately 13,500 vehicles per day (vpd) west of High Street on a weekday. During the weekday morning peak hour, approximately 1,174 vehicles per hour (vph) were recorded, and during the weekday evening peak hour, approximately 1,233 vph were recorded.

High Street was recorded to carry approximately 6,250 vpd north of Haverhill Street on a weekday. During the weekday morning peak hour, approximately 422 vph were recorded, and during the weekday evening peak hour, approximately 630 vph were recorded.

Vehicle Speeds

Existing speed data for Haverhill Street and High Street was also collected using the ATRs. The average speed of vehicles travelling eastbound or westbound on Haverhill Street was found to be 34 and 33 mph, respectively. The 85th percentile speed was found to be 39 mph for both eastbound and westbound vehicles.

The average speed of vehicles travelling northbound or southbound on High Street was found to be 31 and 29 mph, respectively. The 85th percentile speed was found to be 35 mph for northbound vehicles and 34 mph for southbound vehicles.

The 85th percentile speed is the speed at which sight distances are evaluated.

Motor Vehicle Crash Data

Motor vehicle crash data for the study area intersections were obtained from the MassDOT Impact Crash Data Portal (2015 through 2021) and the Andover Police Department for 2022 through 2024. The motor vehicle crash data was reviewed to determine crash trends in the study area. Fifty-two (52) crashes were reported at the study area intersections. Of the fifty-two (52) crashes, fifty-one (51) crashes were reported at the intersection of Haverhill Street and High Street. No fatalities were reported during the ten-year interval. No crashes were reported at the High Street driveway intersection.

Public Transportation

The Merrimack Valley Regional Transportation Authority (MEVA) was reviewed for available public transportation services. Bus Route 21, the Andover Shuttle, provides service along Haverhill Street and to the existing Doctors Park. The route runs between the Andover Senior Center and the Andover/North Andover YMCA. Currently, this bus route has stops within the existing Doctors Park. Route 21 bus service is provided Monday through Friday from 9:20 AM to 4:07 PM. There is no Saturday or Sunday service.

Bus Route 3 provides service from the McGovern Transportation Center in Lawrence to the North Andover Mall. Currently, this bus route has stops within the existing Doctors Park. Route 3 bus service is provided Monday through Friday from 5:00 AM to 7:45 PM. Saturday service is provided from 7:00 AM to 6:45 PM. There is no Sunday service.

Bus Route 9 provides service from McGovern Transportation Center in Lawrence to Merrimack College in North Andover. The route runs along Winthrop Avenue/Turnpike Street (Route 114) which is approximately 0.3 miles northeast of the site. Route 9 bus service is provided Monday through Friday from 5:15 AM to 10:00 PM. Saturday Service is provided 7:15 AM to 7:00 PM. Sunday service is provided from 7:35 AM to 7:00 PM.

Bus Route 2 provides service from the McGovern Transportation Center in Lawrence to the intersection of School Street and Main Street in Andover. This route travels along North Main Street (Route 28) which is approximately 3/4 miles west of the site. Route 2 bus service is provided Monday through Friday from 5:00 AM to 9:45 PM. Saturday service is provided from 7:00 AM to 6:45 PM. Sunday service is provided from 8:20 AM to 5:45 PM.

The MBTA commuter rail also provides service to Andover on the Haverhill Line. The closest stop is at 17 Railroad Street is approximately two (2) miles from the site. Service is provided Monday through Friday from 4:51 AM to 1:06 AM and Saturday and Sunday from 5:20 AM to 12:56 AM.

PROBABLE IMPACTS OF THE PROJECT

No-Build Traffic Volumes

To determine the impact of site-generated traffic volumes generated by the project on the roadway network under future conditions, baseline traffic volumes in the study area were projected to the year 2032. Traffic volumes on the roadway network at that time, in the absence of the proposed project, would include existing traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others expected to be completed by 2032. The Central Transportation Planning Staff (CTPS) was contacted to determine an appropriate growth rate. CTPS indicated growth in the area is 0.19%. A 0.5% compounded growth rate was used in this study.

Discussions with the Town of Andover indicate that there is one (1) project that has been identified that could impact traffic volumes in the study area. This project is:

- 7 Tantalon Road (24-unit multi-family residential)

Traffic from the identified background project was included in the background projections.

Build Traffic Volumes

The current development proposal consists of construction of two buildings. The first building, consisting of 19,200 gross square feet of space will be a new medical office building. The second building, the Gardner School, will consist of a 17,688 square foot (sf) childcare center. Site generated traffic for the project was based on trip-generation data published by the ITE in the *Trip Generation* manual[1]. The trip generation data for Land Use Code (LUC) 565 – Day Care Center and LUC 720 – Medical-Dental Office Building were reviewed.

On a typical weekday, the Project is expected to generate a total of 1,516 vehicle trips (758 vehicles entering and 758 vehicles exiting). During the weekday morning peak hour, a total of 192 vehicle trips (116 vehicles entering and 76 vehicles exiting) would be expected. During the weekday evening peak hour, a total of 206 vehicle trips (85 vehicles entering and 121 vehicles exiting) would be expected.

A review of available pass-by trip data from ITE for a day care center was performed. ITE has pass-by trip data obtained from one (1) study which indicates a pass-by trip rate of 44 percent. Applying this pass-by trip rate to the projected day care traffic generation would reduce peak hour trips by approximately 60 trips (30 vehicles entering and 30 vehicles exiting). However, as there is only one (1) study, there is not significant justification to use a 44 percent pass-by trip rate. This does not imply that pass-by trips do not constitute some portion of the trips associated with the day care, it is that the 44 percent pass-by rate is higher than the pass-by trip rate for a retail or fast-food restaurant use.

TRAFFIC OPERATIONS ANALYSIS

To assess the impacts of the proposed project on the roadway network, traffic operations analyses were performed at the study area intersections under 2025 Existing, 2032 No-Build and 2032 Build conditions. These analyses indicate that the proposed project will not result in a significant impact on traffic operations at the study area intersections over No-Build conditions.

Under 2025 Existing conditions, the signalized intersection of Haverhill Street and High Street is projected to operate at LOS B during the weekday morning peak hour and at LOS C during the weekday evening peak hour. Under future 2032 No-Build conditions, the intersection is projected to operate at LOS C during the weekday morning peak hour and at LOS D during the weekday evening peak hour. Under future 2032 Build conditions, with the project, the intersection is projected to continue to operate at LOS C during the weekday morning peak hour and just over the threshold to LOS E during the weekday evening peak hour.

The capacity analyses performed for the site driveway intersections with Haverhill Street and

[1] *Trip Generation,* Eleventh Edition; Institute of Transportation Engineers; Washington, DC; 2021.

High Street indicate that overall, the critical movements at the intersection, shared left and right-turns out of the site will operate at good levels of service, with minor delays for the critical movements.

PARKING

A parking analysis was performed to determine the parking demand for the site with the two buildings fully occupied. This assessment was based on the schedule and staffing of the two facilities along with the hours of operation and shift schedules.

Medical Office Building

Based on zoning, the medical office building would require 107 parking spaces, or 5.57 spaces per 1,000 square feet of space.

Currently, 107 parking spaces are provided on the site plans for the medical office building.

Child Care Center

Based on an independent study, it was determined that the average demand parking rate for the Gardner School would be 1.44 spaces per 1,000 square feet of space, with a peak demand of 1.87 spaces per 1,000 square feet of space. Using the peak rate yields a parking supply of thirty-three (33) parking spaces. As forty-two (42) spaces are provided on the site plans, the parking supply for the Gardner School will be adequate.

RECOMMENDATIONS

The capacity analyses performed for the 2025 Existing and 2032 future No-Build and Build conditions indicate that the proposed project will not result in a significant impact on traffic operations at the study area intersections during the weekday morning or weekday evening peak hours.

The site driveways should continue to provide one entering and one exiting lane and be under STOP-sign control. During the peak hours (7:00 to 9:00 AM and 3:00 PM to 6:00 PM), left turns will be prohibited out of the Haverhill Street driveway.

To maintain sight distances for the measured 85th percentile speeds, it is recommended that a sight triangle be established along the site frontage, in both directions from a point fifteen (15) feet back at Haverhill Street and at High Street and extending to each of the corners of the site along Haverhill Street and High Street. Within this triangle, any existing vegetation should be cut-back, and any plantings and site signage should be designed to be low to not impede sight distances.

Off-Site Mitigation

Haverhill Street and High Street

Independent of the Project, the intersection of Haverhill Street and High Street is projected to operate at LOS D under future No-Build conditions with the eastbound Haverhill Street approach operating at LOS F with a volume to capacity (v/c) ratio over 1.0. In order to improve future operating conditions at the intersection and to off-set the predicted impact of the Project, the Project proponent will monitor the intersection upon substantial Project occupancy. The Applicant offers to contribute $10,000 to a Town transportation fund, or similar, for any future signal improvements the Town feels are necessary.

Transportation Demand Management

Public transportation services are provided within the study area by the Merrimack Valley Regional Transit Authority (MEVA). The MEVA operates fixed route bus service along High Street by way of Route 3, which stops in the Doctors Park. In addition, the MEVA provides two other bus routes in the site vicinity (Route 2 and Route 9) which are a short walk from the Project site.

In an effort to encourage the use of alternative modes of transportation to SOVs, and as a condition of approval, the Applicant will prepare a formal Transportation Demand Management (TDM) plan, which will include, but not be limited to the following measures:

- The Project proponent will become a member of the Merrimack Valley Transportation Management Association (MVTMA) who will manage and coordinate the TDM program for the Project,
- A transportation coordinator will be assigned for the Project to coordinate the TDM program and serve as a point of contact with the MVTMA,
- The transportation coordinator will facilitate a rideshare matching program for employees through the TMA to encourage carpooling,
- A "welcome packet" will be provided to new employees detailing available public transportation services, bicycle and walking alternatives, and other commuter options,
- A "guaranteed-ride-home" program will be offered through the MVTMA to employees that use public transportation, carpool, vanpool, walk or bicycle to the Project site, and that register with the transportation coordinator and the MVTMA,
- Specific amenities will be provided to discourage off-site trips by employees, which may include one or more of the following: providing a breakroom equipped with a microwave and refrigerator; offering direct deposit of paychecks; and other such measures to reduce overall traffic volumes and travel during peak traffic volume periods,
- Pedestrian accommodations will be incorporated within the Project site to encourage walking, and
- Secure bicycle parking will be provided at an appropriate location within the

Project site.

SUMMARY

Review of the proposed facility and access plan shows that in relation to roadway capacity, traffic safety, and traffic impacts upon the surrounding roadway network, the proposed project will meet safety standards and have a minimal impact on existing traffic conditions. With the proposed access, in conjunction with the mitigation measures described above and maintaining sight distances from Haverhill Street and High Street (clear sight lines along frontage), safe and efficient access can be provided to the clienteles of the proposed facility and to the motoring public in the area.

2 Existing Traffic Conditions

The evaluation of a proposed project's transportation impacts requires a complete understanding of the existing transportation system within the study area. Existing conditions include roadway geometrics, traffic control, daily and peak hour traffic flows, public transportation, and vehicular crash data. Each of these are discussed below.

2.1 Study Area

Based on a review of the anticipated trip generation and trip distribution for the proposed development, a local study area was established. The study area includes the following intersections:

- Haverhill Street and High Street
- Haverhill Street and Existing Site Driveway
- High Street and Existing Site Driveway

2.2 Field Survey

A comprehensive field inventory of the proposed site was conducted in February 2025. The inventory included collection of existing roadway geometrics, traffic volumes, and safety data for the existing study area intersections and site access driveway locations. Traffic volumes were measured by means of automatic traffic recorder (ATR) counts and substantiated by manual turning movement counts (TMCs) conducted at the study area intersections.

2.3 Geometrics

Primary study area roadways are described below. Figure 2 presents a summary of existing lane uses and traffic control.

Roadways

Haverhill Street (Route 133)

Haverhill Street is an Urban Principal Arterial under the jurisdiction of the Town of Andover. Haverhill Street traverses the study area in a general east/west direction. Haverhill Street is a two-lane roadway. Travel lanes are generally separated by a double yellow centerline. Sidewalks are provided on the south side of Haverhill Street. Marked shoulders are also provided. The posted speed limit on Haverhill Street in the vicinity of the site is 35 miles per hour (mph). Land use along Haverhill Street in the study area is primarily residential.

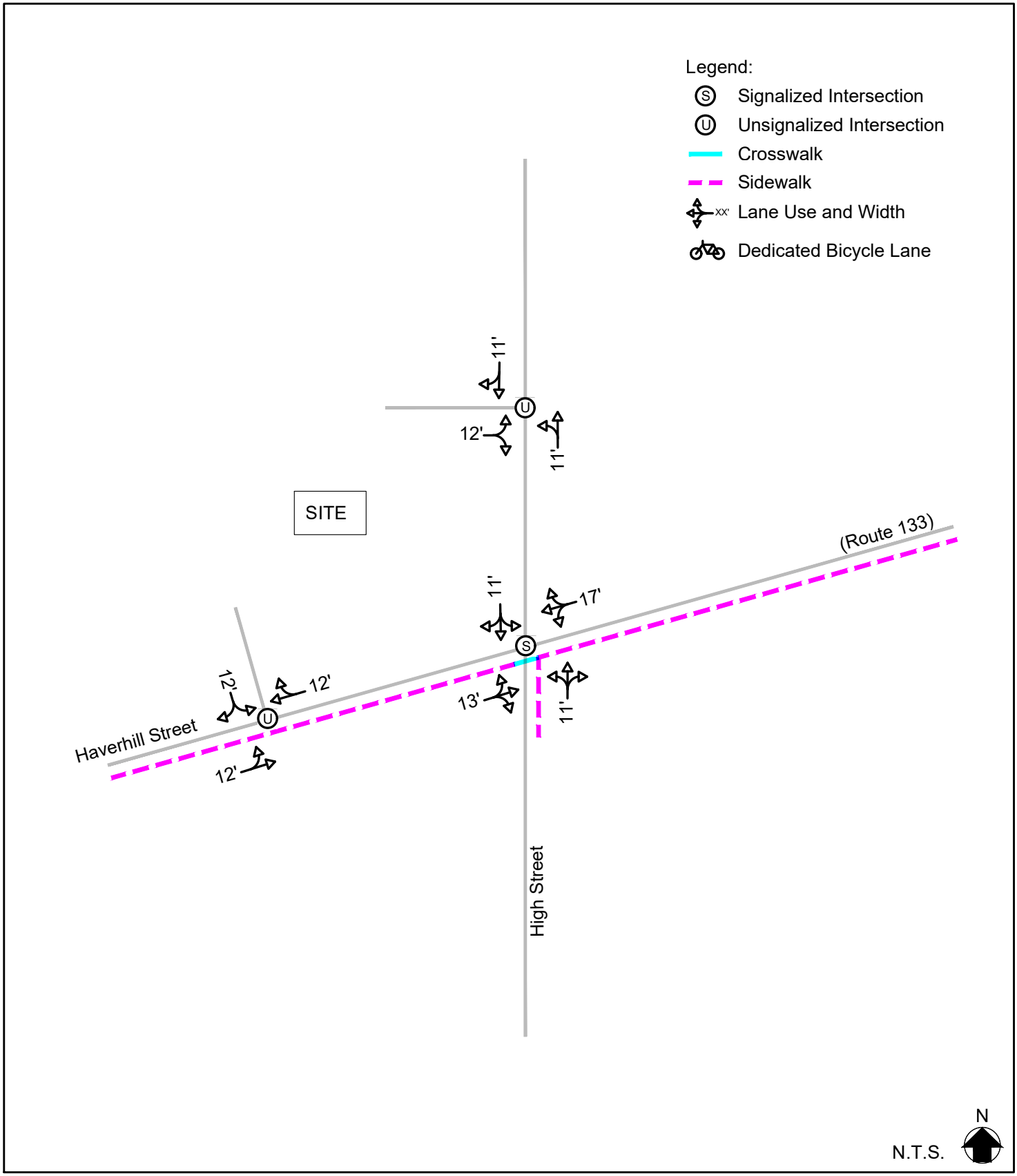

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Figure 2

Existing Lane Use, Travel Lane Width, and Pedestrian/Bicycle Facilities

High Street

High Street is an Urban Minor Arterial under the jurisdiction of the Town of Andover. High Street traverses the study area in a general north/south direction. High Street is a two-lane roadway. Travel lanes are generally separated by a double yellow centerline. Sidewalks are provided on the east side of High Street, south of Haverhill Street. Marked shoulders are also provided. The posted speed limit on High Street in the vicinity of the site is 30 mph. Land use along High Street in the study area is primarily residential.

Intersections

Haverhill Street and High Street

This signalized intersection is under the jurisdiction of the Town of Andover. Haverhill Street forms the east and west legs with High Street forming the north and south legs. The Haverhill Street eastbound and westbound approaches each consist of a single through lane permitting all movements. The High Street approaches each consist of a single through lane permitting all movements. A crosswalk exists across the High Street northbound approach. The intersection is controlled by a two-phase traffic signal without pedestrian activation. Land use at the intersection consists of the existing Doctor's Park and residential homes.

Haverhill Street and Existing Site Driveway

This unsignalized intersection is under the jurisdiction of the Town of Andover. Haverhill Street forms the east and west legs and the site driveway forms the north leg. The Haverhill Street eastbound and westbound approaches each consist of single through lanes permitting left- or right-turn movements. The driveway southbound approach consists of a single lane permitting all movements. Sidewalks are present on the south side of Haverhill Street. The driveway operates under STOP control. Land use at the intersection consists of residential homes and the Doctor's Park.

High Street and Existing Site Driveway

This unsignalized intersection is under the jurisdiction of the Town of Andover. High Street forms the north and south legs and the site driveway forms the west leg. The High Street northbound and southbound approaches each consist of single through lanes permitting left- or right-turn movements. The driveway eastbound approach consists of a single lane permitting all movements. No sidewalks are present on High Street. The driveway operates under STOP control. Land use at the intersection consists of residential homes and the Doctor's Park.

2.4 Traffic Volumes

Existing Traffic Volumes

To establish base traffic conditions within the study area, manual turning movement and

vehicle classification counts were obtained in February 2025. Peak-period turning movement counts were conducted during the weekday morning peak period (7:00 to 9:00 AM) and weekday evening period (4:00 to 6:30 PM) on Tuesday February 4, 2025, at the following intersections:

- Haverhill Street and High Street
- Haverhill Street and Existing Site Driveway
- High Street and Existing Site Driveway

Daily traffic counts were conducted on Haverhill Street for a two-day period using automatic traffic recorders (ATR) on Tuesday February 4 and Wednesday February 5, 2025.

Analysis of the peak-period traffic counts indicated that the weekday morning commuter peak generally hour occurs between 7:30 and 8:30 AM and the weekday evening commuter peak hour generally occurs between 4:45 and 5:45 PM. The traffic count worksheets are provided in the Appendix.

Seasonal Adjustment

The traffic-volume data gathered as part of this study was collected during the month of February 2025. Data from the MassDOT was reviewed to determine the monthly variations of the traffic volumes. Based on MassDOT's Weekday Seasonal Factors Report, February counts on Haverhill Street, an Urban Principal Arterial under group 'U3', are approximately 2 percent lower than average, and February counts on High Street, which is an Urban Minor Arterial under group 'U4', represents average month conditions. Therefore, the February count data for Haverhill Street was adjusted upward by a factor of 1.02 to represent average month conditions.

The 2025 existing weekday daily and peak-hour traffic volumes are summarized in Table 1. Figure 3 shows the 2025 Existing weekday morning and weekday evening peak hour traffic volumes, respectively. The seasonal worksheets are provided in the Appendix.

TABLE 1
EXISTING WEEKDAY TRAFFIC-VOLUME SUMMARY[a]

Location	Weekday Traffic Volume[b]	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
		Traffic Volume[c]	K Factor[d]	Directional Distribution[e]	Traffic Volume	K Factor	Directional Distribution
Haverhill Street, west of High Street	13,500	1,174	8.7	50.1% WB	1,233	9.1	55.3% EB
High Street, north of Haverhill Street	6,250	422	6.8	68.5% SB	630	10.1	60.6% NB

[a]Two-way traffic volume
[b]Daily traffic expressed in vehicles per day.
[c]Expressed in vehicles per hour.
[d]Percent of daily traffic volumes which occurs during the peak hour.
[e]Percent of peak-hour volume in the predominant direction of travel.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Haverhill Street was recorded to carry approximately 13,500 vehicles per day (vpd) west of High Street on a weekday. During the weekday morning peak hour, approximately 1,174 vehicles per hour (vph) were recorded, and during the weekday evening peak hour, approximately 1,233 vph were recorded.

High Street was recorded to carry approximately 6,250 vpd north of Haverhill Street on a weekday. During the weekday morning peak hour, approximately 422 vph were recorded, and during the weekday evening peak hour, approximately 630 vph were recorded.

2.5 Vehicle Speeds

Existing speed data for Haverhill Street and High Street was also collected using the ATRs. The posted speed limit on Haverhill Street is 35 miles per hour (mph) and 30 mph on High Street in the site vicinity. The speed data is summarized in Table 2.

TABLE 2
OBSERVED VEHICLE SPEEDS

Direction	Posted Speed Limit (mph)	Average Observed Speed[a] (mph)	85th Percentile Speed (mph)
Haverhill Street Eastbound	35	34	39
Haverhill Street Westbound	35	33	39
High Street Northbound	30	31	35
High Street Southbound	30	29	34

[a]Based on speed data compiled on February 2 through February 5, 2025.

As shown in Table 2, the average speed of vehicles travelling eastbound or westbound on Haverhill Street was found to be 34 and 33 mph, respectively. The 85th percentile speed was found to be 39 mph for both eastbound and westbound vehicles.

The average speed of vehicles travelling northbound or southbound on High Street was found to be 31 and 29 mph, respectively. The 85th percentile speed was found to be 35 mph for northbound vehicles and 34 mph for southbound vehicles.

The 85th percentile speed is the speed at which sight distances are evaluated.

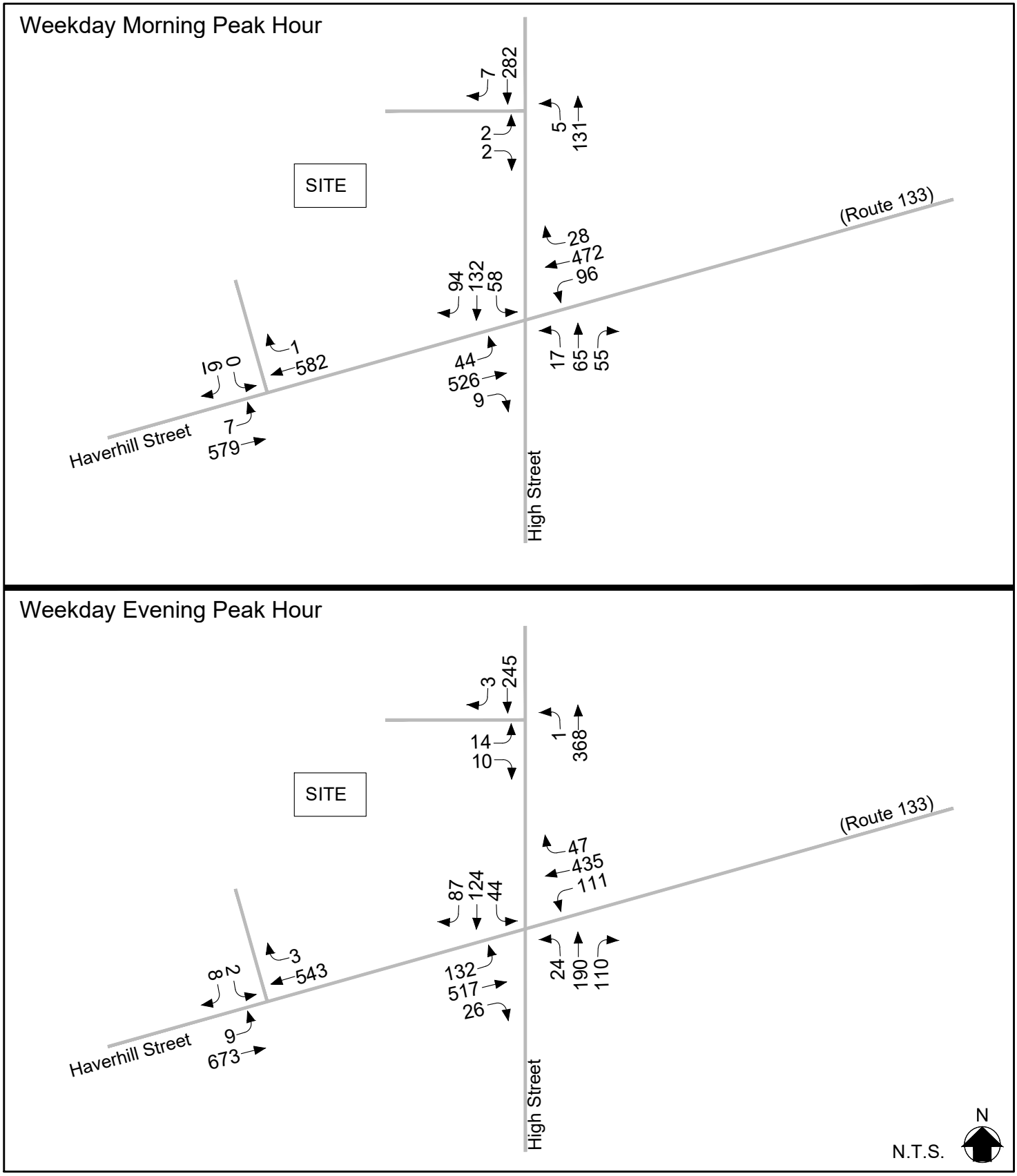

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Figure 3

2025 Existing
Peak Hour Traffic Volumes

2.6 Motor Vehicle Crash Data

Motor vehicle crash data for the study area intersections were obtained from the MassDOT Impact Crash Data Portal (2015 through 2021) and the Andover Police Department for 2022 through 2024. The motor vehicle crash data was reviewed to determine crash trends in the study area. Fifty-two (52) crashes were reported at the study area intersections. Of the fifty-two (52) crashes, fifty-one (51) crashes were reported at the intersection of Haverhill Street and High Street. No fatalities were reported during the ten-year interval. No crashes were reported at the High Street driveway intersection. The crash data is summarized in Table 3 and included in the Appendix.

2.7 Public Transportation

The Merrimack Valley Regional Transportation Authority (MEVA) was reviewed for available public transportation services. Bus Route 21, the Andover Shuttle, provides service along Haverhill Street and to the existing Doctors Park. The route runs between the Andover Senior Center and the Andover/North Andover YMCA. Currently, this bus route has stops within the existing Doctors Park. Route 21 bus service is provided Monday through Friday from 9:20 AM to 4:07 PM. There is no Saturday or Sunday service.

Bus Route 3 provides service from the McGovern Transportation Center in Lawrence to the North Andover Mall. Currently, this bus route has stops within the existing Doctors Park. Route 3 bus service is provided Monday through Friday from 5:00 AM to 7:45 PM. Saturday service is provided from 7:00 AM to 6:45 PM. There is no Sunday service.

Bus Route 9 provides service from McGovern Transportation Center in Lawrence to Merrimack College in North Andover. The route runs along Winthrop Avenue/Turnpike Street (Route 114) which is approximately 0.3 miles northeast of the site. Route 9 bus service is provided Monday through Friday from 5:15 AM to 10:00 PM. Saturday Service is provided 7:15 AM to 7:00 PM. Sunday service is provided from 7:35 AM to 7:00 PM.

Bus Route 2 provides service from the McGovern Transportation Center in Lawrence to the intersection of School Street and Main Street in Andover. This route travels along North Main Street (Route 28) which is approximately 3/4 miles west of the site. Route 2 bus service is provided Monday through Friday from 5:00 AM to 9:45 PM. Saturday service is provided from 7:00 AM to 6:45 PM. Sunday service is provided from 8:20 AM to 5:45 PM.

The MBTA commuter rail also provides service to Andover on the Haverhill Line. The closest stop is at 17 Railroad Street is approximately two (2) miles from the site. Service is provided Monday through Friday from 4:51 AM to 1:06 AM and Saturday and Sunday from 5:20 AM to 12:56 AM.

The available transit data is included in the Appendix.

TABLE 3
MOTOR VEHICLE CRASH DATA SUMMARY[a]

Scenario	Location		
	Haverhill Street and High Street	Haverhill Street and Site Driveway	High Street and Site Driveway
Year[b]:			
2015	1	1	0
2016	5	0	0
2017	6	0	0
2018	6	0	0
2019	6	0	0
2020	3	0	0
2021	6	0	0
2022	10	0	0
2023	5	0	0
2024	3	0	0
Total	51	1	0
Average[b]	5.1	0.1	0.0
Crash Rate[c]	0.67	0.02	0.0
Significant[d]	No	No	No
Type:			
Angle	26	1	0
Rear-End	15	0	0
Head-On	2	0	0
Sideswipe	3	0	0
Pedestrian	0	0	0
Bicycle	0	0	0
Single Vehicle Crash	4	0	0
Unknown	1	0	0
Total	51	1	0
Time of Day:			
Morning (7:00 to 9:00 AM)	9	0	0
Evening (4:00 to 6:00 PM)	10	0	0
Remainder of Day	32	1	0
Total	51	1	0
Pavement Conditions:			
Dry	31	1	0
Wet	11	0	0
Snow/Ice/Slush	8	0	0
Unknown	1	0	0
Total	51	1	0
Severity:			
Property Damage Only	32	1	0
Personal Injury	15	0	0
Fatal Accident	0	0	0
Unknown	4	0	0
Total	51	1	0

[a]Source: MassDOT Crash Portal.
[b]Average crashes over analysis period.
[c]Crash rate per million entering vehicles (mev).
[d]Signalized intersections are significant if rate >0.73 crashes per million vehicles, and unsignalized intersections are significant if rate >0.57 crashes per million vehicles.

2.8 Planned Roadway Improvements

Officials for MassDOT and the City of Andover were contacted regarding roadway improvements planned for the study area intersections. No improvements are currently planned in the vicinity of the site.

However, further to the east on Route 133 there is a proposed project. The project consists of intersection and roadway improvements along Route 133 (Lowell Street) between Shawsheen Road and North Main Street (Route 28). Improvements include provision of full pedestrian and bicycle accommodations as well as traffic signal upgrades. The project includes a new shared use path for pedestrian and bicyclist use on the north side of Route 133, stormwater drainage system upgrades, replacement of two traffic signal systems, intersection geometric modifications, addition of designated turn lanes, ADA/AAB compliant curb ramps, pavement resurfacing, new signage, and pavement markings along the corridor and at intersections. Lighting, landscape, and streetscape elements that complement and enhance the historic character of the area will also be included in the project.

3 2032 No-Build and Build Traffic Conditions

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to the year 2032. Traffic volumes on the roadway network at that time, in the absence of the proposed project, would include existing traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others expected to be completed by 2032. Consideration of these factors resulted in the development of 2032 No-Build traffic volumes. Anticipated site-generated traffic volumes were then superimposed upon these No-Build traffic flow networks to develop 2032 Build conditions.

3.1 No-Build Traffic Volumes

Traffic growth on area roadways is a function of the expected land development in the immediate area as well as the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This produces a more realistic estimate of growth for local traffic. However, the drawback of this procedure is that the potential growth in population and development external to the study area would not be accounted for in the traffic projections.

To provide a conservative analysis framework, both procedures were used.

Background Traffic Growth

To determine the impact of site-generated traffic volumes generated by the project on the roadway network under future conditions, baseline traffic volumes in the study area were projected to the year 2032. Traffic volumes on the roadway network at that time, in the absence of the proposed project, would include existing traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others expected to be completed by 2032. The Central Transportation Planning Staff (CTPS) was contacted to determine an appropriate growth rate. CTPS indicated growth in the area is 0.19 percent. Therefore, a 0.5 percent compounded growth rate was used to develop future No-Build conditions.

Specific Development by Others

Traffic volumes generated by the specific local developments by others were included in the 2032 No-Build condition. The Town of Andover was contacted to identify specific planned developments. Based on these discussions, there is one (1) project that has been identified

that could impact traffic volumes in the study area. This project is:

- 7 Tantalon Road (24-unit multi-family residential)

No traffic study was prepared for the 7 Tantalon Road project. Traffic expected to be generated by the 24 dwelling units were obtained from the ITE Trip Generation Manual.

The background project traffic generation is included in the Appendix for the project.

No-Build Condition Traffic Volumes

The 2032 No-Build weekday morning and evening peak-hour traffic volumes were developed by applying a compounded 0.5 percent annual growth rate to the 2025 Existing peak-hour traffic volumes and adding traffic from any identified background developments. Figure 4 shows the projected 2032 No-Build peak hour traffic volumes for the weekday morning and weekday evening peak-hours, respectively.

3.2 Build Traffic Volumes

Project Description

The current development proposal consists of construction of two buildings. The first building, consisting of 19,200 gross square feet of space will be a new medical office building. The second building will consist of a 17,688 square foot (sf) childcare center. The childcare center is expected to have an enrollment of 195 students and a maximum staff of thirty-two (32) employees. A total of 149 parking spaces will be provided for the site.

Traffic Generation

Site generated traffic for the project was based on trip-generation data published by the Institute of Transportation Engineers (ITE) in the *Trip Generation* manual[2]. The trip generation data for Land Use Code (LUC) 565 – Day Care Center and LUC 720 – Medical-Dental Office Building were reviewed. The expected trip generation for the project is summarized in Table 4 and the trip generation worksheets are included in the Appendix.

[2]Ibid.

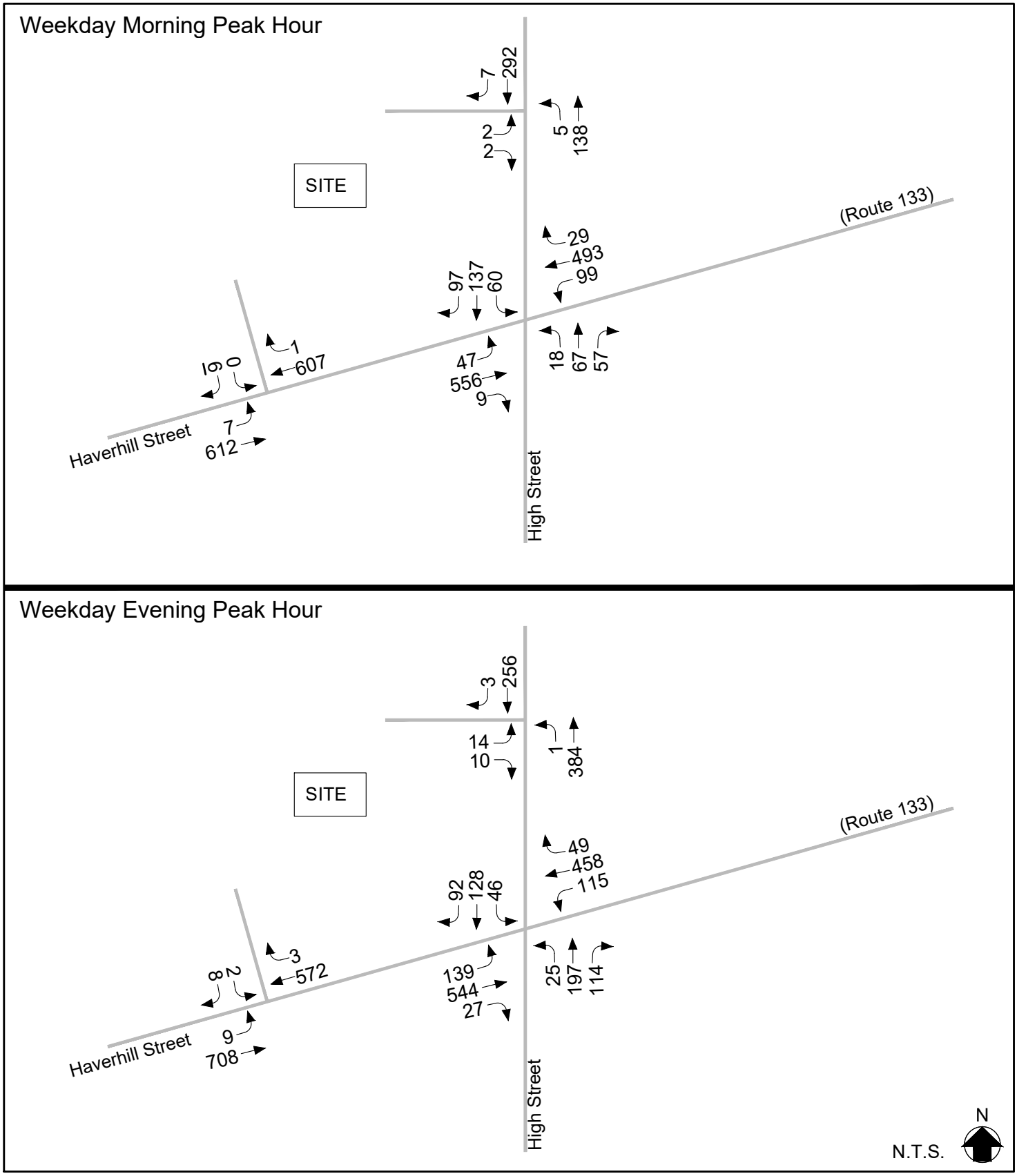

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Figure 4

2032 No-Build
Peak Hour Traffic Volumes

TABLE 4
TRIP-GENERATION SUMMARY

	Proposed Day Care Center Trips[a]	Proposed Medical Office Trips[a]	Total Trips
Weekday Daily	798	718	1,516
Weekday Morning Peak Hour:			
Entering	73	43	116
Exiting	64	12	76
Total	137	55	192
Weekday Evening Peak Hour:			
Entering	62	23	85
Exiting	69	52	121
Total	131	75	206

[a]Based on ITE LUC 565 – Day Care Center; 195 students.
[b]Based on ITE LUC 720 – Medical-Dental Office Building; 19,200 sf.

On a typical weekday, the Project is expected to generate a total of 1,516 vehicle trips (758 vehicles entering and 758 vehicles exiting). During the weekday morning peak hour, a total of 192 vehicle trips (116 vehicles entering and 76 vehicles exiting) would be expected. During the weekday evening peak hour, a total of 206 vehicle trips (85 vehicles entering and 121 vehicles exiting) would be expected.

A review of available pass-by trip data from ITE for a day care center was performed. ITE has pass-by trip data obtained from one (1) study which indicates a pass-by trip rate of 44 percent. Applying this pass-by trip rate to the projected day care traffic generation would reduce peak hour trips by approximately 60 trips (30 vehicles entering and 30 vehicles exiting). However, as there is only one (1) study, there is not significant justification to use a 44 percent pass-by trip rate. This does not imply that pass-by trips do not constitute some portion of the trips associated with the day care, it is that the 44 percent pass-by rate is higher than the pass-by trip rate for a retail or fast-food restaurant use.

Trip Distribution

The directional distribution of the vehicular traffic approaching and departing the site is a function of population densities, the location of employment, existing travel patterns, similar uses, and the efficiency of the existing roadway system. For purposes of this analysis, the existing traffic entering and exiting the study area were reviewed and used to develop the expected trip generation patterns for the proposed facilities. Table 5 summarizes the expected trip distribution for the project, also shown on Figure 5.

TABLE 5
PROPOSED TRIP DISTRIBUTION

Route	Direction	Percent of Trips
Haverhill Street	East	36
Haverhill Street	West	34
High Street	North	16
High Street	South	14
TOTAL		100

Future Traffic Volumes - Build Condition

The site-generated traffic was distributed within the study area according to the percentages summarized in Table 5. The site generated volumes for the Project are shown on Figure 6 for the respective weekday morning and weekday evening peak hours. The site generated traffic volumes for the Project were superimposed onto the 2032 No-Build traffic flow network and are shown on Figure 7 for the weekday morning and weekday evening peak hours, respectively. These volumes were used as the basis for all analysis as well as to identify potential mitigation measures to ameliorate the project's impacts.

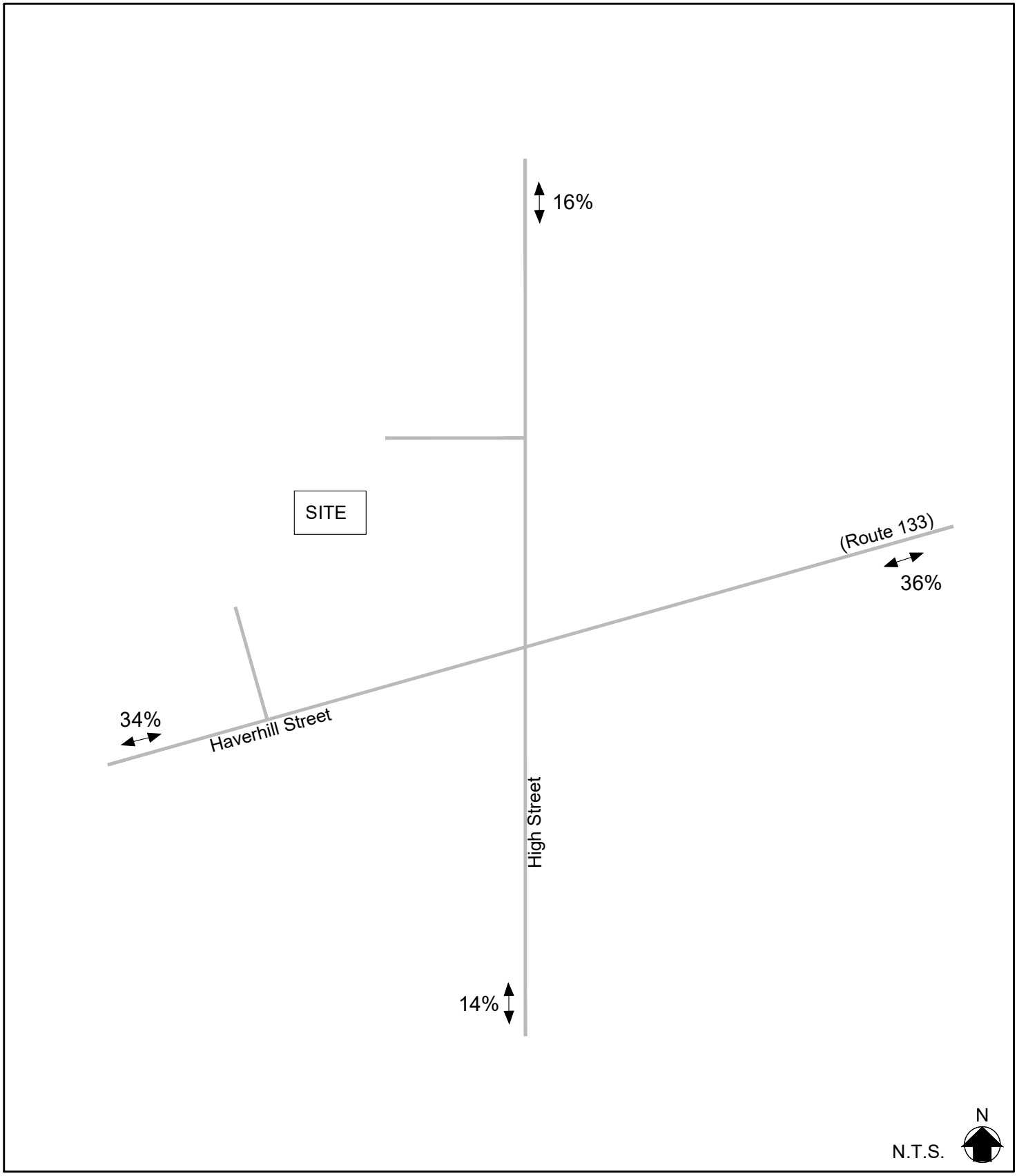

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Figure 5

Trip Distribution

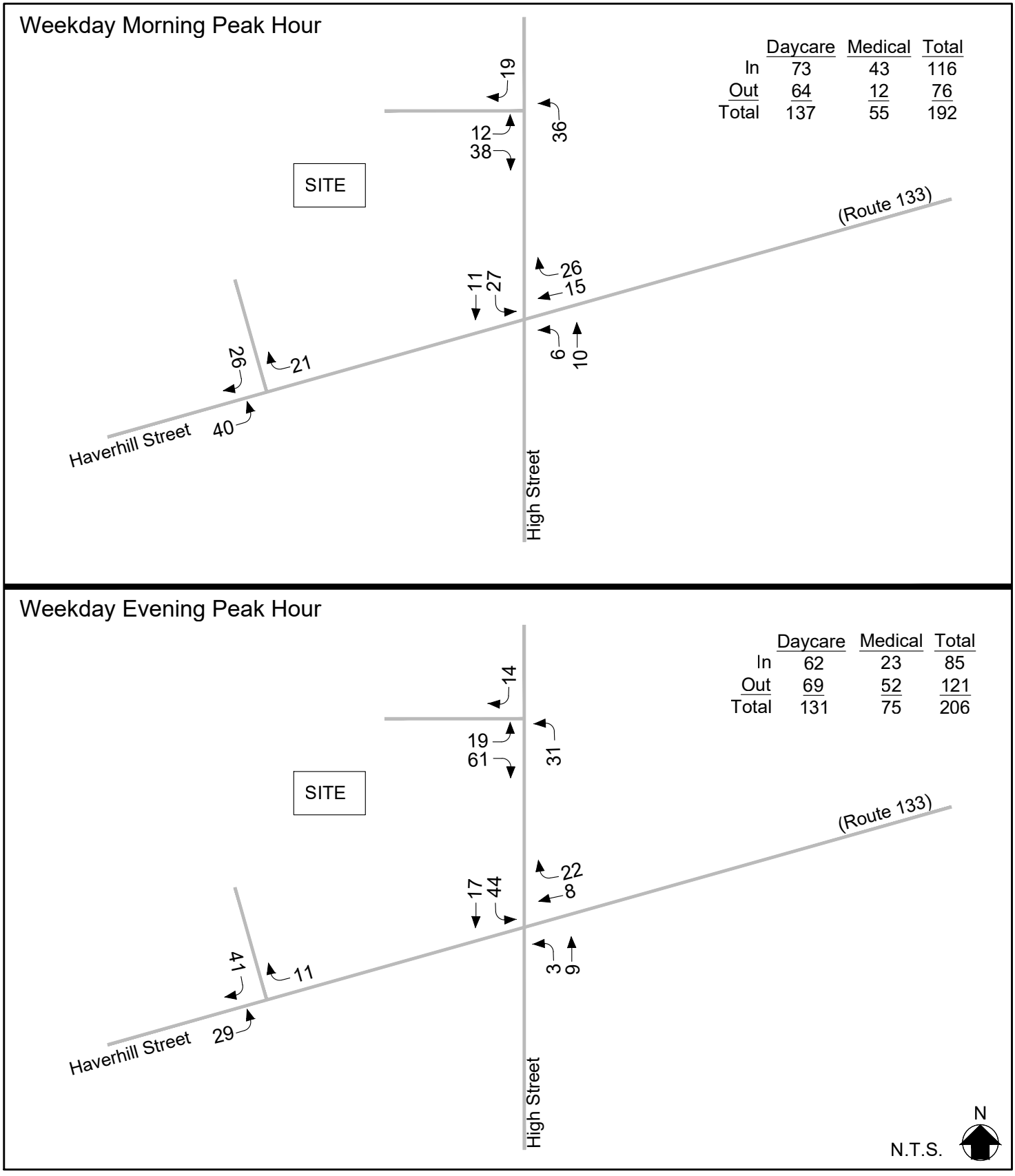

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Figure 6

Site Generated
Peak Hour Traffic Volumes

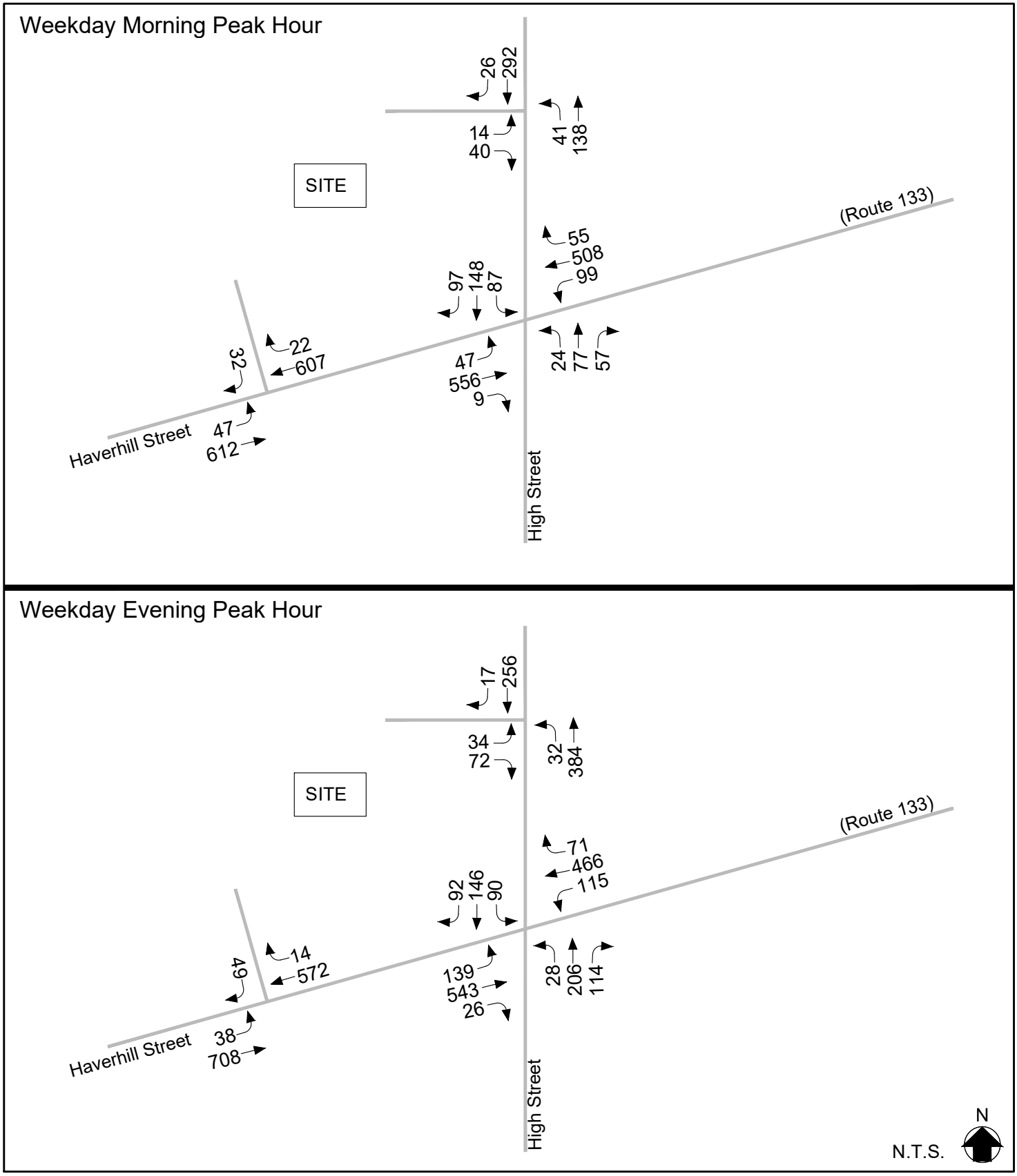

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Figure 7

2032 Build
Peak Hour Traffic Volumes

A summary of peak-hour projected traffic-volume changes in the site vicinity is shown in Table 6. These volumes are based on the expected increases from the site traffic generation.

TABLE 6
TRAFFIC-VOLUME INCREASES[a]

Location/Peak Hour	2032 No-Build	2032 Build	Volume Increase over No-Build
Haverhill Street, west of Site Driveway			
Weekday Morning	1,232	1,298	66
Weekday Evening	1,297	1,367	70
Haverhill Street, east of High Street			
Weekday Morning	1,294	1,362	68
Weekday Evening	1,326	1,399	73
High Street, north of Site Driveway			
Weekday Morning	439	470	31
Weekday Evening	657	691	34
High Street, south of Haverhill Street			
Weekday Morning	387	414	27
Weekday Evening	606	635	29

[a]All volumes are vehicles per hour, total of both directions.

As shown in Table 6, project-related increases are in the range of twenty-seven (27) to seventy-three (73) bi-directional vehicles during the peak hours. This is less than one additional vehicle every minute or less per direction on average during the peak hours.

4 Analysis

4.1 Methodology

To assess intersection operations, capacity analyses were conducted for Existing, No-Build, and Build traffic-volume conditions. Capacity analyses provide an indication of how well the study area intersections serve existing and projected traffic volumes. Vehicle queue analyses provide a secondary measure of the operational characteristics of an intersection or section of roadway under study in terms of lane use and demand.

Levels of Service

Level-of-service (LOS) is a quantitative measure used to describe the operation of an intersection or roadway segment. The Level-of-Service definition is described by the quality of traffic flow and is primarily defined in terms of traffic delays. The primary result of capacity analyses[3] is the assignment of a level-of-service to traffic intersections or roadway segments under various traffic-flow conditions. Six levels of service are defined for traffic intersections and roadway segments. Levels-of-service criteria range from LOS A to LOS F. LOS A represents very good operating conditions while LOS F represents very poor operating conditions.

Signalized Intersections

Levels of service for signalized intersections are calculated using the methodology and procedures described in the 7th Edition *Highway Capacity Manual*[4] *(HCM7)*. The methodology assesses the intersection based on type of signal operation, signal timing and phasing, progression, vehicle mix, and intersection geometrics. Level-of-service designations are based on the delay per vehicle. Table 7 summarizes the relationship between Level-of-Service and delay for signalized intersections. The calculated delay values result in levels-of-service designations which are applied to individual lane groups, to individual intersection approaches, and to the entire intersection. In the HCM7 methodology, the critical lane group volume to capacity ratio is reported.

[3]The capacity analysis methodology is based on procedures presented in the *Highway Capacity Manual 7th Edition;* Transportation Research Board; Washington, DC; 2022.

[4]*Highway Capacity Manual 7th Edition*; Transportation Research Board; Washington, DC; 2022.

TABLE 7
LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS[a]

Delay per Vehicle (Seconds)	Defined Level-of-Service $v/c^b < 1.0$	Defined Level-of-Service $v/c^b > 1.0$
≤10.0	A	F
10.1 to 20.0	B	F
20.1 to 35.0	C	F
35.1 to 55.0	D	F
55.1 to 80.0	E	F
>80.0	F	F

[a]*Highway Capacity Manual 7th Edition*; Transportation Research Board; Washington, DC; 2022; page 19-16.
[b]Volume to capacity ratio.

Unsignalized Intersections

The level-of-service (LOS) for an unsignalized intersection is determined by the methodology and procedures described in the HCM7. The level-of-service for unsignalized intersections is measured in terms of average delay for the critical movements (typically side street turning movements or mainline turning movements). The delay for the critical movements is a function of the available capacity for the movement and the degree of saturation of the lane group containing the critical movement. The delay calculation includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. The definitions for level-of-service at unsignalized intersections are also provided in the *Highway Capacity Manual 7th Edition*. Table 8 summarizes the relationship between level- of-service and average control delay for the critical movements at unsignalized intersections.

TABLE 8
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[a]

Average Delay (seconds per vehicle)	Defined Level-of-Service v/c[b] < 1.0	Defined Level-of-Service v/c > 1.0
≤ 10.0	A	F
10.1 to 15.0	B	F
15.1 to 25.0	C	F
25.1 to 35.0	D	F
35.1 to 50.0	E	F
>50.0	F	F

[a]*Highway Capacity Manual 7th Edition*; Transportation Research Board; Broad, DC; page 20-6
[b]Volume to capacity ratio.

The analytical methodologies used for the analysis of unsignalized intersections use conservative analysis parameters, such as high critical gaps. The critical gap is defined as the minimum time between successive main line vehicles for a side street vehicle to execute the appropriate turning maneuver. Actual field observations indicate that drivers at the study area intersections accept smaller gaps in traffic than those used in the analysis procedures and therefore experience less delay than calculated by the HCM methodology. **The analysis results from the HCM model overstate the actual delays experienced in the field.** It should be noted that the unsignalized intersections along heavily trafficked roadways operate at constrained levels and the resulting calculated results of the unsignalized intersection analyses should be considered highly conservative.

4.2 Capacity Analysis Results

Level-of-service analyses were conducted for both average and peak month conditions for 2025 Existing, 2032 No-Build and 2032 Build conditions for the intersections within the study area. The results of the signalized capacity analyses are summarized in Table 9 and the unsignalized capacity analyses are summarized in Table 10. Detailed analysis sheets are presented in the Appendix.

TABLE 9
SIGNALIZED LEVEL-OF-SERVICE SUMMARY HAVERHILL STREET AND HIGH STREET

	2025 Existing				2032 No-Build				2032 Build			
Peak Hour/Lane Group	V/C[a]	Delay[b]	LOS[c]	Queue[d]	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
Weekday Morning												
Eastbound Lt/Th/Rt	0.63	14.0	B	193/300	0.65	14.3	B	198/323	0.66	14.4	B	198/325
Westbound Lt/Th/Rt	0.67	15.0	B	193/331	0.73	17.1	B	222/441	0.78	19.1	B	247/484
Northbound Lt/Th/Rt	0.37	23.1	C	52/75	0.29	22.0	C	37/83	0.32	22.5	C	46/97
Southbound Lt/Th/Rt	0.57	27.2	C	102/183	0.61	28.4	C	112/197	0.70	31.3	C	137/274
Overall	--	**17.6**	**B**	--	--	**18.5**	**B**	--	--	**20.1**	**C**	--
Weekday Evening												
Eastbound Lt/Th/Rt	0.84	23.8	C	251/491	>1.00	51.9	F	308/568	>1.00	67.3	F	316/572
Westbound Lt/Th/Rt	0.77	19.0	B	200/407	0.88	27.6	C	234/465	0.92	31.7	C	253/496
Northbound Lt/Th/Rt	0.74	33.2	C	150/222	0.68	30.3	C	131/248	0.70	31.1	C	140/269
Southbound Lt/Th/Rt	0.55	26.6	C	95/179	0.56	26.7	C	98/182	0.78	37.1	D	165/322
Overall	--	**24.5**	**C**	--	--	**36.9**	**D**	--	--	**44.8**	**D**	--

[a]Maximum volume-to-capacity ratio.
[b]Delay in seconds per vehicle.
[c]Level of service.
[d]Average Queue (ft)/95th %tile Queue (ft)
Lt = Left; Th = Through; Rt = Right.

Haverhill Street and High Street

Under 2025 Existing conditions, the intersection is projected to operate at LOS B during the weekday morning peak hour and at LOS C during the weekday evening peak hour. Under future 2032 No-Build conditions, the intersection is projected to operate at LOS B during the weekday morning peak hour and at LOS D during the weekday evening peak hour. Under future 2032 Build conditions, with the project, the intersection is projected to operate at LOS C during the weekday morning peak hour and at LOS D during the weekday evening peak hour. The UTIAS analyses show small increases in overall delay during the peak hours from No-Build to Build conditions. During the weekday morning peak hour, there is a 1.6 second increase in overall delay and during the weekday evening peak hour, there is a 7.9 second increase in overall delay. Overall, the intersection will be at LOS D or better during the peak hours.

TABLE 10
UNSIGNALIZED LEVEL-OF-SERVICE ANALYSIS SUMMARY

Critical Movement/ Peak Hour	2025 Existing					2032 No-Build					2032 Build				
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Queue[e]	Demand	V/C	Delay	LOS	Queue	Demand	V/C	Delay	LOS	Queue
Haverhill Street and Site Driveway															
All movements from driveway (SB):															
Weekday Morning	6	0.03	12.9	B	2.5	6	0.02	13.4	B	0	32	0.08	13.6	B	5.0
Weekday Evening	10	0.05	15.6	C	2.5	10	0.03	16.4	C	2.5	49	0.11	13.4	B	10.0
High Street and Site Driveway															
All movements from driveway (EB):															
Weekday Morning	4	0.02	10.8	B	2.5	4	0.01	10.8	B	0	54	0.09	11.3	B	7.5
Weekday Evening	24	0.06	12.5	B	5.0	24	0.05	12.6	B	5.0	106	0.21	13.2	B	20.0

[a]Demand of critical movements in vehicles per hour.
[b]Volume-to-capacity ratio.
[c]Delay in seconds per vehicle.
[d]Level of service.
[e]95th percentile queue in feet.
[f]Calculated delay and v/c not representative of actual conditions when v/c exceeds 1.0.

Haverhill Street and Site Driveway

Under 2025 Existing conditions, the critical movements (all movements from the site driveway) are projected to operate at LOS B during the weekday morning peak hour and at LOS C during the weekday evening peak hour. Under future 2032 No-Build conditions, these critical movements are projected to operate at LOS B during the weekday morning peak hour and at LOS C during the weekday evening peak hour. Under future 2032 Build conditions, with the project, these critical movements are projected to operate at LOS B during the weekday morning peak hour and LOS B during the weekday evening peak hour. The improved operation is due to the restriction of left turns out of the driveway during peak hours. The v/c ratio will be below 1.00 during each peak hour, indicating there will be capacity to accommodate the anticipated traffic volumes.

High Street and Site Driveway

Under 2025 Existing conditions, the critical movements (all movements from the site driveway) are projected to operate at LOS B during the weekday morning peak hour and at LOS B during the weekday evening peak hour. Under future 2032 No-Build conditions, these critical movements are projected to operate at LOS B during the weekday morning peak hour and at LOS B during the weekday evening peak hour. Under future 2032 Build conditions, with the project, these critical movements are projected to continue to operate at LOS B during the weekday morning peak hour and at LOS B during the weekday evening peak hour. The v/c ratio will be below 1.00 during each peak hour, indicating there will be capacity to accommodate the anticipated traffic volumes.

4.3 Sight Distance Assessment

Sight distance measurements were performed at the proposed site driveway intersection with Bridge Street in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO) standards. Stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. Intersection sight distance (ISD) or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway, to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with on-coming traffic. Table 11 presents the measured SSD and ISD at the intersection of the site driveways with Haverhill Street and with High Street. The sight distance calculations are included in the Appendix.

TABLE 11
SIGHT DISTANCE SUMMARY

	Required Minimum (Feet)[a]	Measured (Feet)
Haverhill Street and Site Driveway		
Stopping Sight Distance:		
Haverhill Street approaching from the East	289	400+
Haverhill Street approaching from the West	289	300
Intersection Sight Distance:		
Site Driveway looking to the East	373[b]/470[c]	400+
Site Driveway looking to the West	373[b]/470[c]	250
High Street and Site Driveway		
Stopping Sight Distance:		
Haverhill Street approaching from the North	236	400
Haverhill Street approaching from the South	246	400
Intersection Sight Distance:		
Site Driveway looking to the North	334[b]/386[c]	300
Site Driveway looking to the South	334[b]/386[c]	300

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*; American Association of State Highway and Transportation Officials (AASHTO); 2010 and based on 85th percentile speed for Haverhill Street and for High Street.
[b]Recommended minimum value for vehicles turning right exiting a roadway under STOP-sign control.
[c]Recommended minimum value for vehicles turning left exiting a roadway under STOP-sign control.

As can be seen in Table 11, the SSD measurements performed at the site driveway intersections indicate that the intersections exceed the recommended minimum requirements based on an 85th percentile speed. In accordance with the AASHTO manual, *"If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road."* Accordingly, the ISD should be at least equal to the SSD, which would allow a driver approaching the minor road to safely stop. It is recommended that any proposed landscaping be less than three (3) feet in height and maintained for sightlines. It is also recommended that no plantings occur within ten (10) feet of the Haverhill Street or High Street travelled ways to maintain sight lines and that the vegetation within the layout be maintained at a height that will not impact sight distances.

4.4 Parking

A parking analysis was performed to determine the parking demand for the site with the two buildings fully occupied. This assessment was based on Town zoning requirements, ITE parking data and empirical parking data.

Medical Office Building

Based on the Andover Zoning Bylaw, one (1) parking space is required for every 200 square feet of net floor area. The net floor area is 14,902 sf, yielding a demand of 75 parking spaces. Additionally, four (4) spaces are required per doctor. Eight (8) doctors yields 32 parking spaces. Based on zoning, the medical office building would require 107 parking spaces, or 5.57 spaces per 1,000 square feet of space.

Currently, 107 parking spaces are provided on the site plans for the medical office building.

Daycare Center

A summary of the operational characteristics for the Andover location is outlined below:

- Building size is 17,688 sq. ft. of gross floor area
- Total parking supply is 42 spaces
- Maximum enrollment is currently 195 students
- Maximum of 32 staff are typically onsite Monday through Friday
- Morning drop-off activity is staggered between 7:00AM and 9:30AM
- Afternoon pick-up activity occurs between 3:30PM and 6:00PM

Based on the Andover Zoning Bylaw, one (1) parking space is required for every ten (10) students for twenty (20) parking spaces and one space for every employee which yields an additional 32 parking spaces. The total required spaces based on zoning would be 52 parking spaces, or 2.94 spaces per 1,000 square feet of space.

The ITE *Parking Generation* manual[5] was reviewed to compare the parking requirements. Based on the compiled ITE data, the average rate was found to be 2.27 spaces per 1,000 square feet, with an 85th percentile rate of 3.39 spaces per 1,000 square feet of space.

The Gardner School commissioned a study of one of their sites in Northbrook, Illinois. This site is similar to the proposed Andover site. The study is included in the Appendix.

Based on the study, it was determined that the average demand parking rate for the Gardner School would be 1.44 spaces per 1,000 square feet of space, with a peak demand of 1.87 spaces per 1,000 square feet of space. Using the peak rate yields a parking supply of thirty-three (33) parking spaces. As forty-two (42) spaces are provided on the site plans, the parking supply for the Gardner School will be adequate.

[5] *Parking Generation,* Sixth Edition; Institute of Transportation Engineers; Washington, DC; 2023.

5 Recommendations and Conclusion

5.1 Recommendations

The final phase of the analysis process is to identify the mitigation measures necessary to minimize the impact of the project on the transportation system. The proponent has made a commitment to implement the mitigation measures listed below.

The capacity analyses performed for the 2025 Existing and 2032 future No-Build and Build conditions indicate that the proposed project will generally not result in a significant impact on traffic operations at the study area intersections during the weekday morning or weekday evening peak hours.

The site driveways should continue to provide one entering and one exiting lane and be under STOP-sign control. During the peak hours (7:00 to 9:00 AM and 3:00 PM to 6:00 PM), left turns will be prohibited out of the Haverhill Street driveway.

To maintain sight distances for the measured 85th percentile speeds, it is recommended that a sight triangle be established along the site frontage, in both directions from a point fifteen (15) feet back at Haverhill Street and at High Street and extending to each of the corners of the site along Haverhill Street and High Street. Within this triangle, any existing vegetation should be cut-back, and any plantings and site signage should be designed to be low to not impede sight distances.

Off-Site Mitigation

Haverhill Street and High Street

Independent of the Project, the intersection of Haverhill Street and High Street is projected to operate at LOS D under future No-Build conditions with the eastbound Haverhill Street approach operating at LOS F with a volume to capacity (v/c) ratio over 1.0. In order to improve future operating conditions at the intersection and to off-set the predicted impact of the Project, the Project proponent will monitor the intersection upon substantial Project occupancy. The Applicant offers to contribute $10,000 to a Town transportation fund, or similar, for any future signal improvements the Town feels are necessary.

Transportation Demand Management

Public transportation services are provided within the study area by the Merrimack Valley Regional Transit Authority (MEVA). The MEVA operates fixed route bus service along High Street by way of Route 3, which stops in the Doctors Park. In addition, the MEVA provides two other bus routes in the site vicinity (Route 2 and Route 9) which are a short walk from the Project site.

In an effort to encourage the use of alternative modes of transportation to SOVs, and as a

condition of approval, the Applicant will prepare a formal Transportation Demand Management (TDM) plan, which will include, but not be limited to the following measures:

- The Project proponent will become a member of the Merrimack Valley Transportation Management Association (MVTMA) who will manage and coordinate the TDM program for the Project,
- A transportation coordinator will be assigned for the Project to coordinate the TDM program and serve as a point of contact with the MVTMA,
- The transportation coordinator will facilitate a rideshare matching program for employees through the TMA to encourage carpooling,
- A "welcome packet" will be provided to new employees detailing available public transportation services, bicycle and walking alternatives, and other commuter options,
- A "guaranteed-ride-home" program will be offered through the MVTMA to employees that use public transportation, carpool, vanpool, walk or bicycle to the Project site, and that register with the transportation coordinator and the MVTMA,
- Specific amenities will be provided to discourage off-site trips by employees, which may include one or more of the following: providing a breakroom equipped with a microwave and refrigerator; offering direct deposit of paychecks; and other such measures to reduce overall traffic volumes and travel during peak traffic volume periods,
- Pedestrian accommodations will be incorporated within the Project site to encourage walking, and
- Secure bicycle parking will be provided at an appropriate location within the Project site.

5.2 Conclusion

The proposed medical office building and day care building are to be located at 140 Haverhill Street. On a typical weekday, the Project is expected to generate a total of 1,516 vehicle trips (758 vehicles entering and 758 vehicles exiting). During the weekday morning peak hour, a total of 192 vehicle trips (116 vehicles entering and 76 vehicles exiting) would be expected. During the weekday evening peak hour, a total of 206 vehicle trips (85 vehicles entering and 121 vehicles exiting) would be expected.

Capacity analyses were performed for each of the study area intersections for 2025 Existing, 2032 No-Build and 2032 Build conditions. Based on the analyses performed, there is no significant change in level of service from No-Build to Build conditions at the study area intersections.

Review of the proposed development and access plan shows that in relation to roadway capacity, traffic safety, and traffic impacts upon the surrounding roadway network, the proposed project will meet safety standards and have a minimal impact on existing traffic conditions. With the proposed access, in conjunction with the mitigation measures described above and maintaining sight distances from Haverhill Street and High Street

(clear sight lines along frontage), safe and efficient access can be provided to the clienteles of the proposed facility and to the motoring public in the area.