TRAFFIC IMPACT AND ACCESS STUDY

PROPOSED AGE-RESTRICTED DEVELOPMENT

104 Coolidge Street
Sherborn, Massachusetts

Prepared for:
Pulte Homes of New England, LLC

September 2020
(Updated July 2021)

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

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104 Coolidge Street
Sherborn, Massachusetts

Prepared for:
Pulte Homes of New England, LLC
Westborough, Massachusetts

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September 2020
(Updated July 2021)

MDM

CONTENTS

FIGURES

TABLES

EXECUTIVE SUMMARY

MDM Transportation Consultants, Inc. (MDM) has prepared a Traffic Impact and Access Study (TIAS) for a proposed 67-unit age-restricted residential development to be located along the eastern side of Coolidge Street in Sherborn, Massachusetts. The location of the site relative to adjacent roadways is shown in **Figure 1**. This report documents existing operational and safety-related characteristics of roadways serving the development Site, estimates development-related trip generation and operational impacts, and identifies potential mitigation actions to support the development.

This TIAS has been developed in conformance with guidelines for preparation of traffic studies as jointly issued by the Commonwealth of Massachusetts Executive Office of Energy & Environmental Affairs/Massachusetts Department of Transportation (EEA/MassDOT).

E.1 PROJECT DESCRIPTION

The Site comprises approximately 25.2± acres located at 104 Coolidge Street in Sherborn, Massachusetts. The property is comprised of undeveloped/ wooded land.

Under the proposed age-restricted residential development program, the Site will be redeveloped to include 67± age-restricted residential homes. On-site parking will include approximately 278 parking spaces within driveways and garages. Site access/egress is proposed via a full access/egress driveway along Coolidge Street, a gated emergency connection to Grey Road onto Meadowbrook Road and a gated connection to the adjacent Villages at Sherborn to the east.

E.2 STUDY AREA

This TIAS evaluates transportation characteristics of roadways and intersections that provide a primary means of access to the Site, and that are likely to sustain a measurable level of traffic impact from the proposed development.

- Coolidge Street at Speen Street/Kendall Avenue
- Coolidge Street at North Main Street (Route 27)
- Coolidge Street at Site Driveway

E.3 SUMMARY OF ANALYSIS AND FINDINGS

Capacity analyses were conducted for each study area intersection to quantify baseline and future year traffic operations with and without the development for the weekday morning and weekday evening peak hours. These time periods represent the highest activity periods of the proposed project and the adjacent roadway system.

The analyses presented in this TIAS are based on industry-standard trip rates and methodology published by the Institute of Transportation Engineers (ITE). Based on industry-standard trip rates the proposed development is estimated to generate approximately 13 new trips during the weekday morning peak hour (5 entering and 8 exiting), 17 new trips during the weekday evening peak hour (9 entering and 8 exiting), and approximately 248 daily trips on a weekday. Journey to work data for the Town of Sherborn served as the primary basis for distribution for the home trips to/from the Site.

Capacity analyses indicate that project will not result in any consequential changes in intersection operations compared to No-Build conditions. The site driveway will operate at LOS C or better during the peak hours. Likewise, the Coolidge Street approaches Speen Street/Kendall Avenue will continue to operate at LOS C or better during the peak hours. The Coolidge Street approach to North Main Street will at times continue to operate with long delays; specifically, for the critical left turn movements onto North Main Street. Relative traffic increases for the proposed project represents an inconsequential change in area roadway volumes - a level of change that falls well within normal day-to-day fluctuations in traffic entering and exiting the study intersections and is immaterial to traffic operations along North Main Street and Speen Street/Kendall Avenue. The project will not have a material impact on operations these intersection under Build conditions and will result in three (3) or less additional critical left turns (1 vehicle every 20 minutes or less) onto North Main Street and Kendall Avenue during the critical weekday morning peak hour compared to No-Build conditions. Field observations indicate that the delay for the critical left turn movement from Coolidge Street onto North Main is somewhat overstated.

E.4 RECOMMENDATIONS

MDM finds Coolidge Street and roadways within the site vicinity can accommodate modest traffic increases of the project. Relative traffic increases for the proposed project represents an inconsequential change in area roadway volumes - a level of change that falls well within normal day-to-day fluctuations in traffic entering and exiting the study intersections and is immaterial to traffic operations along Coolidge Street. However, several mitigation actions are

identified to support the project to ensure that site access meets applicable safety criteria, to enhance neighborhood walking/bicycling and to reduce dependency on single-occupant auto use. These include (a) access-related improvements and (b) pedestrian and bicycle accommodations.

Access/Egress Improvements

- *Driveway Design*. The final driveway width and curb radii between the proposed Site Driveway and Coolidge Street should be designed to accommodate the Town's largest fire apparatus (ladder truck) and single unit delivery vehicles. Signs and pavement markings that are compliant with the Manual on Uniform Traffic Control Devices (MUTCD) should be installed on the approach to Coolidge Street including a STOP sign (R1-1) and STOP line pavement markings.

- *Sight Line Triangles.* With selective clearing and grading as part of the installation of the Site driveway the available sight lines will satisfy the recommended sight line requirements from AASHTO. Plantings (shrubs, bushes) and structures (walls, fences, etc.) shall be maintained at a height of 2 feet or less within the sight lines in vicinity of the Site Driveway intersections with Coolidge Street and at all internal intersections to provide unobstructed sight lines.

Pedestrian and Bicycle Accommodations

- *Pedestrian Connections*. The Site Plan incorporates sidewalks that connect the proposed building to the on-site surface parking areas.

- *Bicycle Amenities*. The Proponent will provide bicycle accommodations within the property including bike racks in the common areas to encourage and facilitate this mode of transportation within and to/from the Site.

E.5 CONCLUSIONS

In summary, the proposed residential development will be accommodated well within capacity of Coolidge Street with no discernable impact to traffic flow and at operating levels that are considered acceptable for suburban locations. The assessment indicates traffic increases for the proposed project represents a nominal increase in area roadway volumes. Accordingly, no roadway improvements are warranted to accommodate the project. Proposed access access/egress improvements and pedestrian and bicycle accommodations as outlined in the *Conclusions and Recommendations* section of this report will adequately mitigate the project impacts.

1.0 INTRODUCTION

MDM Transportation Consultants, Inc. (MDM) has prepared a Traffic Impact and Access Study (TIAS) for a proposed 67-unit age-restricted residential development to be located along the eastern side of Coolidge Street in Sherborn, Massachusetts. The location of the site relative to adjacent roadways is shown in **Figure 1**. This report documents existing operational and safety-related characteristics of roadways serving the development Site, estimates development-related trip generation and operational impacts, and identifies potential mitigation actions to support the development.

This TIAS has been developed in conformance with guidelines for preparation of traffic studies as jointly issued by the Commonwealth of Massachusetts Executive Office of Energy & Environmental Affairs/Massachusetts Department of Transportation (EEA/MassDOT).

1.1 PROPOSED DEVELOPMENT

The Site comprises approximately 25.2± acres located at 104 Coolidge Street in Sherborn, Massachusetts. The property is comprised of undeveloped/ wooded land.

Under the proposed age-restricted residential development program, the Site will be redeveloped to include 67± age-restricted residential homes. On-site parking will include approximately 278 parking spaces within driveway and garages Site access/egress is proposed via a full access/egress driveway along Coolidge Street, a gated emergency connection to Grey Road onto Meadowbrook Road and a gated connection to the adjacent Villages at Sherborn to the east. The preliminary Site layout plan prepared by Civil Design Group; LLC is presented in **Figure 2**.

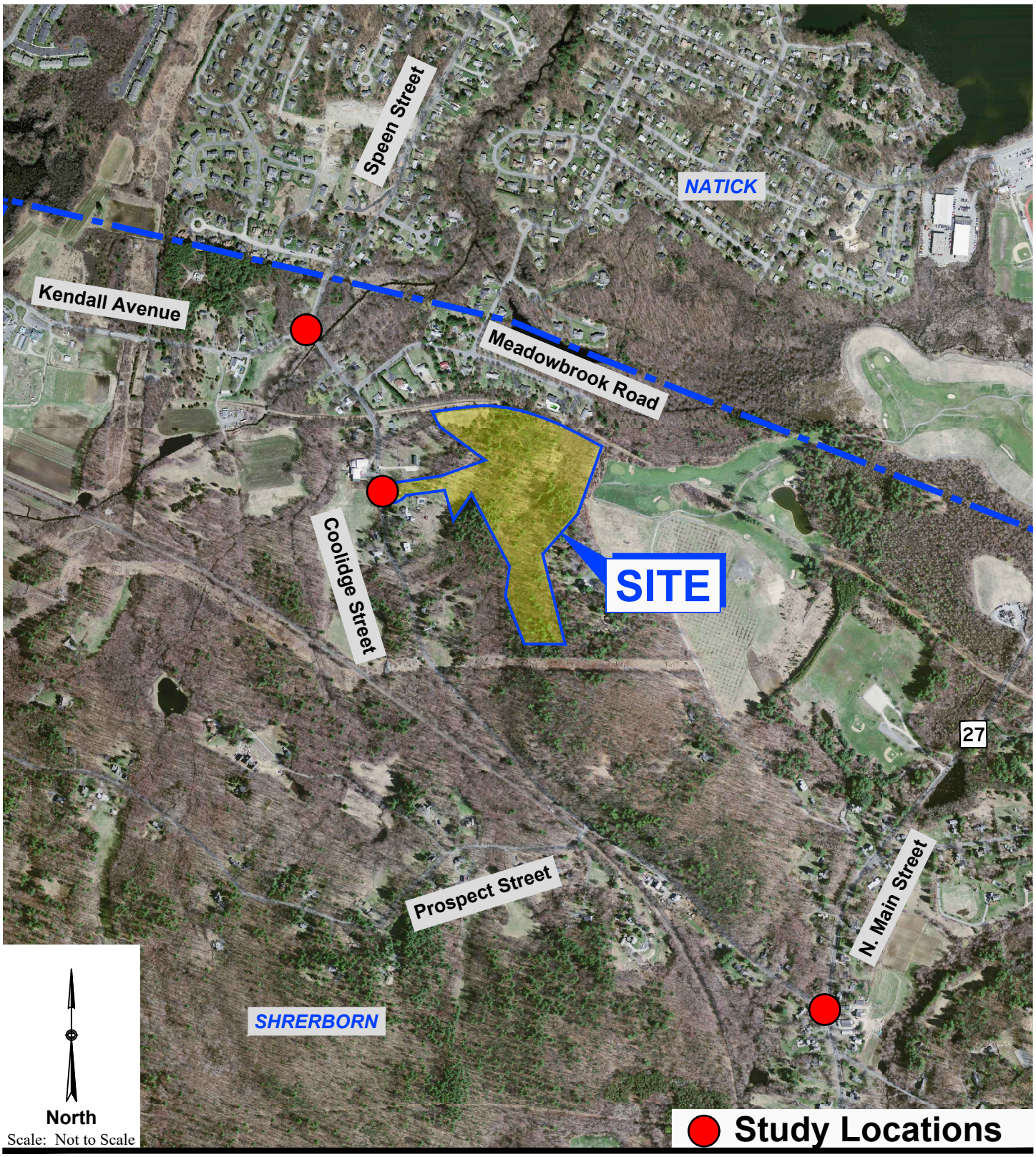

Figure 1

Site Location

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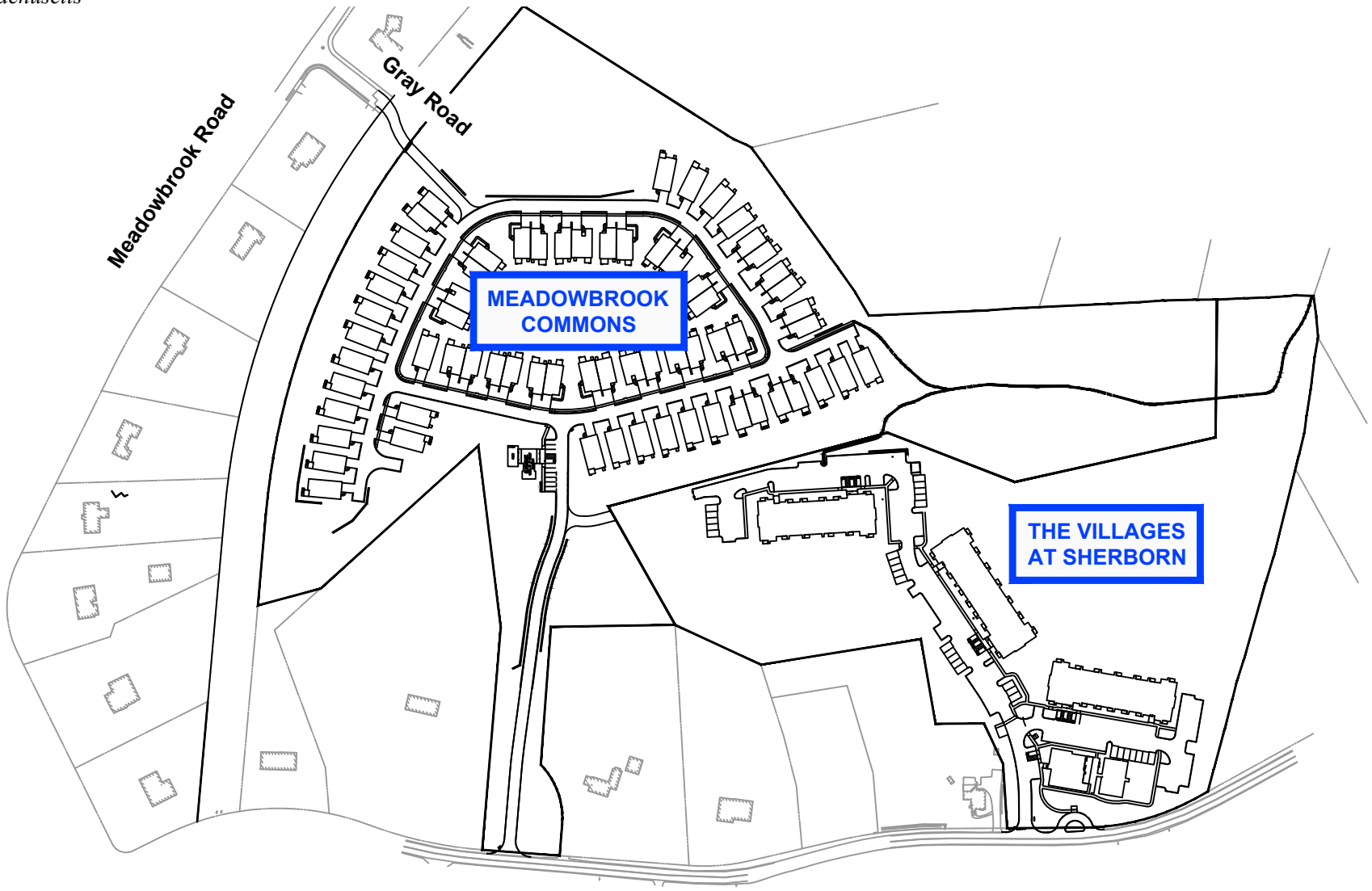
Date: July 2021
Dwg No. 1095 TIAS01.dwg



Scale: Not to Scale

Site Plan Source: Civil design Group, LLC

MDM TRANSPORTATION CONSULTANTS, INC.
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Figure 2

Preliminary Site Layout

Date: October 2020
Dwg No. 1095 Fig 2-Autoturn-Sight Dist (10-12-2020).dwg

1.2 STUDY METHODOLOGY

This transportation impact and access evaluation is conducted in accordance with EEA/MassDOT guidelines and consists of several steps. The first step documents existing conditions in the transportation study area including an inventory of roadway geometry, observed traffic volumes, public transportation, and safety characteristics. Next, future year traffic conditions are forecast that account for other planned area developments, normal area growth, and development-related traffic increases. The third step quantifies operating characteristics of the study intersection. Specific attention is given to the incremental impacts of the proposed development. Finally, improvements are identified to address specific development-related requirements as needed.

1.3 STUDY AREA

This TIAS evaluates transportation characteristics of roadways and intersections that provide a primary means of access to the Site, and that are likely to sustain a measurable level of traffic impact from the proposed development. The study area includes the following intersections, as shown on **Figure 1**:

- Coolidge Street at Speen Street/Kendall Avenue
- Coolidge Street at North Main Street (Route 27)
- Coolidge Street at Site Driveway

2.0 BASELINE CONDITIONS

In order to provide a basis for quantifying the transportation impacts of the development, the Baseline roadway system and the baseline traffic operations of study area roadways were reviewed. This section describes the existing traffic characteristics and operations of roadways and intersection within the study area. Specifically, this section presents an overview of baseline traffic volumes, an inventory of crash data and accounting of public transportation systems serving the area.

2.1 STUDY AREA ROADWAY NETWORK

The study area roadways, intersection, and pedestrian facilities are described briefly in this section along with area roadway commitments by others. A general description of the physical roadway, intersection features, and pedestrian accommodations is provided. The study area and intersection are depicted in **Figure 1**.

2.1.1 Roadways

Coolidge Street

Coolidge Street is generally an east-west roadway under local jurisdiction within the study area. Coolidge Street is classified by the MassDOT as an Urban Minor Arterial roadway, and it provides a connection between Speen Street and Kendall Avenue to the west and North Main Street to the east. Coolidge Street provides one travel lane in each direction within the study area with additional turn lanes provided at its major intersections and provides a double yellow centerline. The posted (regulatory) speed limit on Coolidge Street in the study area is 35 mph in both travel directions. Land uses along Coolidge Street in the study area are primarily residential uses and includes Sweet Meadow Farm.

Speen Street

Speen Street is generally northwest-southwest roadway under local jurisdiction within the study area and provides a connection between Route 9 to the north and Kendall Avenue and Coolidge Street to the south. Speen Street is classified as an Urban Principal Arterial Roadway, and it provides two travel lanes in each direction separated by a double yellow centerline. Land uses along Speen Street in the study area are primarily residential uses.

Kendall Avenue

Kendall Avenue is generally northeast-southwest roadway under local jurisdiction within the study and provides a connection between Waverly Street (Route 135) to the north to Speen Street and Coolidge Street to the south. Kendall Avenue is classified as an Urban Minor Arterial Roadway, and it provides a single travel lane in each direction separated by a double yellow centerline. Land uses along Kendall Avenue in the study area are primarily residential uses.

North Main Street

North Main Street is generally a north-south roadway under local jurisdiction within the study area that provides a connection from Route 135 and Natick Center to the north and Route 16 and Sherborn Center to the south. North Main Street is classified as a Rural Minor Arterial Roadway, and it provides one travel lane in each direction separated by a double yellow centerline. Sidewalks are provided along the eastern side of North main Street within the study area. Land uses along North Main Street are primarily residential uses.

2.1.2 Intersections

Coolidge Street at Speen Street/Kendall Avenue

Coolidge Street meets Speen Street and Kendall Avenue to form a three-legged, unsignalized intersection under local jurisdiction. The Coolidge Street approach provides a left-turn lane and a right-turn lane and operates under "STOP" sign control. The Speen Street and Kendal Avenue approaches to the intersection provide a single travel lane. Sidewalks and crosswalks are not provided at the intersection. Uses at the intersection include residential homes.

Coolidge Street at North Main Street

Coolidge Street meets North Main Street to form a three-legged, unsignalized intersection under local jurisdiction. The Coolidge Street approach provides a single turn lane and operates under "STOP" sign control. The North Main Street approaches to the intersection provide a single travel lane. Sidewalks are provided along the western said of North Main Street and a crosswalk is provided across the Coolidge Street approach. Uses at the intersection include residential homes.

2.2 BASELINE TRAFFIC VOLUMES

Traffic-volume data used in this study were obtained by mechanical and manual methods in May 2016[1] and September 2020. Automatic traffic recorder counts (ATRs) were conducted along Coolidge Street while manual turning movement counts (TMCs) were conducted at the study intersections. Traffic data were collected during the weekday morning (6:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak periods. These hours represent the combination of busiest activity periods of the adjacent roadway network.

2.2.1 Daily Traffic

In addition to TMC data described above, daily traffic volumes were obtained along Coolidge Street adjacent to in the Site. This data is summarized in **Table 1** and are discussed below.

TABLE 1
BASELINE TRAFFIC VOLUME SUMMARY
COOLIDGE STREET ADJACENT TO SITE

Time Period	Daily Volume (vpd)[1]	Percent Daily Traffic[2]	Peak Hour Volume (vph)[3]	Peak Flow Direction[4]	Peak Hour Directional Volume (vph)
Weekday Morning Peak Hour	10,570	9%	920	53% WB	486
Weekday Evening Peak Hour	10,570	9%	920	51% EB	468

[1]Two-way daily traffic expressed in vehicles per day adjusted to 2020 baseline conditions.
[2]The percent of daily traffic that occurs during the peak hour.
[3]Two-way peak-hour volume expressed in vehicles per hour.
[4]EB = Eastbound, WB = Westbound

As summarized in **Table 1**, the weekday daily traffic volume on Coolidge Street adjacent to the Site is approximately 10,570 vehicles per day (vpd) on a weekday with travel patterns slightly directional westbound during the weekday morning peak hour and direction eastbound during the weekday evening peak hour which is consistent with commuter traffic relative to major travel routes in the area. Peak hour traffic flow on Coolidge Street is approximately 920 vehicles per hour (vph) during the weekday morning and weekday evening peak hours representing 9 percent of daily traffic flow.

[1]These data represent the latest available counts prior to the Covid19 pandemic and are adjusted to reflect annualized growth to present a reasonable basis for analysis in this TIAS as described in more detail under Section 2.2.2

2.2.2 Peak-Hour Volumes

Peak-hour traffic volumes at the study area intersections were collected in May 2016 and September 2020. Review of historical traffic data indicates that peak hour traffic volumes collected in September 2020 remain well below normal average conditions due to the Covid-19 pandemic. Accordingly, a 0.5 percent annual growth rate was applied to the May 2016 the weekday morning and the weekday evening peak hours to represent 2020 Baseline traffic volume conditions. The weekday morning and weekday evening peak hour traffic volumes for the study intersections are shown in **Figure 3**. Traffic count data, and MassDOT permanent count station data are provided in the **Appendix.**

2.3 MEASURED TRAVEL SPEEDS

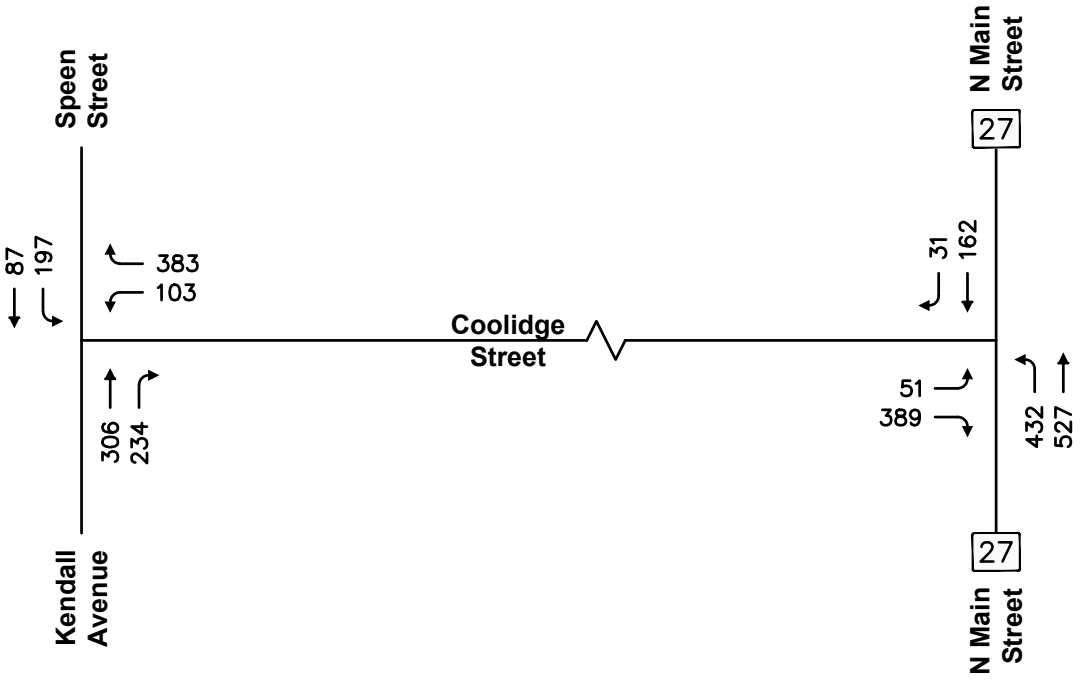
Vehicle speeds were obtained for Coolidge Street adjacent to the Site using a radar recorder device. These measured travel speeds provide a basis for determining sight line requirements at the proposed site driveway(s). **Table 2** presents a summary of the travel speed data collected for Coolidge Street adjacent to the Site. Collected speed data are provided in the **Attachments**.

TABLE 2
SPEED STUDY RESULTS – COOLIDGE STREET

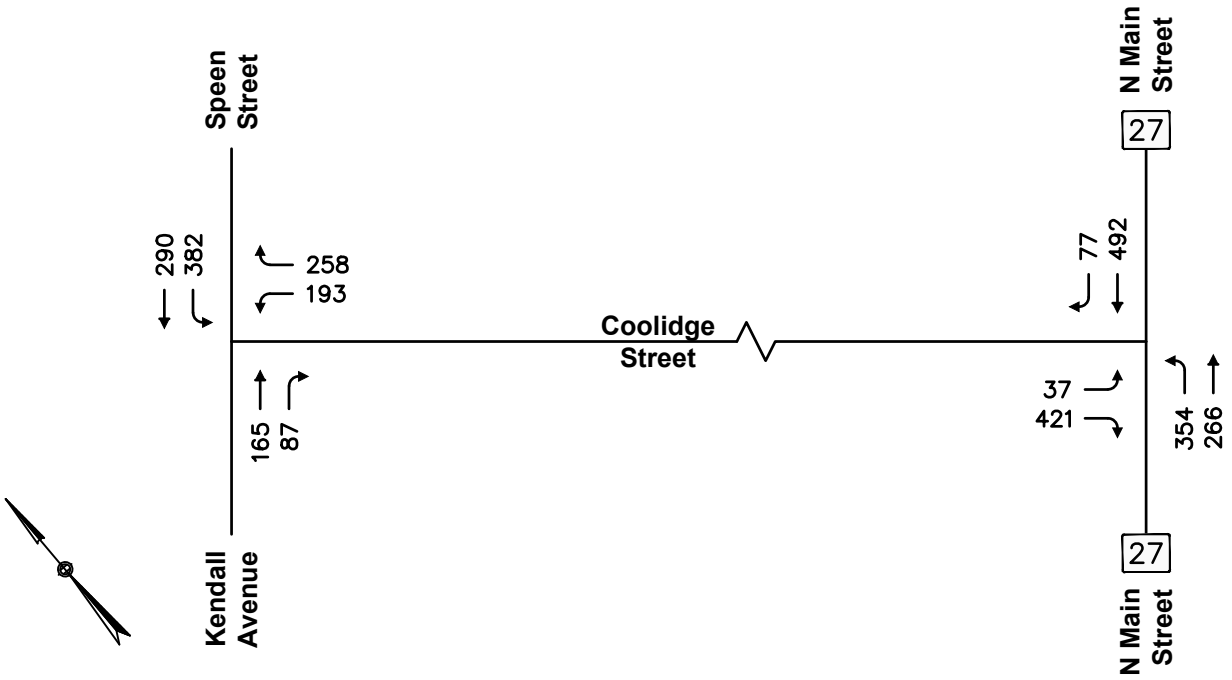
Travel Direction	Speed Limit[1]	Travel Speed	
		Mean[2]	85th Percentile[3]
Eastbound	35	40	44
Westbound	35	40	44

[1] Regulatory (Posted) Speed limit in miles per hour (mph)
[2] Arithmetic mean
[3] The speed at or below which 85 percent of the vehicles are traveling

As summarized in **Table 2**, the 85th percentile travel speed was observed to be 44 mph for the eastbound and westbound travel directions which are approximately 10 mph higher than the posted (regulatory) speed limit of 35 mph on Coolidge Street in the study area. The speed data sets the basis for the sight line review in the subsequent section of this report.



Weekday Morning Peak Hour



North
Scale: Not to Scale

Weekday Evening Peak Hour

Figure 3

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2020 Baseline Condition
Peak Hour Traffic Volumes

Date: September 2020
Dwg No. 1095 TIAS01.dwg

2.4 SAFETY

Crash data were obtained from the MassDOT Online Crash Portal for the five-year period 2015 through 2019 to identify crash trends and safety characteristics for study area intersections. In addition, review of the MassDOT high crash cluster mapping was conducted to determine locations listed as eligible for Highway Safety Improvement Program (HSIP) evaluation and funding. Crash data for the study intersections is summarized in **Table 3** with detailed data provided in the **Appendix.**

Crash rates were calculated for the study area intersections as reported in **Table 3**. This rate quantifies the number of crashes per million entering vehicles. MassDOT has determined the official District 3 (which includes the town of Sherborn) crash rate to be 0.61 for unsignalized intersections. This rate represents MassDOT's "average" crash experience for District 3 communities and serves as a basis for comparing reported crash rates for the study intersections. Where calculated crash rates notably exceed the District average, some form of safety countermeasures may be warranted.

TABLE 3
INTERSECTION CRASH SUMMARY – 2015 THROUGH 2019[1]

Data Category	INTERSECTIONS	
	Coolidge Street at Speen Street/Kendall Avenue	**Coolidge Street at North Main Street**
Traffic Control	Unsignalized	Unsignalized
Crash Rate[2]	**0.38**	**0.37**
MHD Dist. 3 Avg[3]	0.61	0.61
Year:		
2015	3	0
2016	1	4
2017	3	4
2018	4	2
2019	0	3
Total	**11**	**13**
Type:		
Angle	1	2
Rear-End	1	9
Head-On	1	0
Sideswipe	1	1
Single Vehicle	7	1
Unknown/Other	0	0
Severity:		
P. Damage Only	8	10
Personal Injury	3	3
Fatality	0	0
Not Reported	0	0
Conditions:		
Dry	5	9
Wet	2	3
Snow	4	0
Unknown	0	1
Time:		
7:00 to 9:00 AM	4	3
4:00 to 6:00 PM	2	2
Rest of Day	5	8

[1]Source: Local Police Records
[2]Crashes per million entering vehicles (MEV)
[3]District 3 Average Crash Rate

As summarized in **Table 3**:

- *Coolidge Street at Speen Street/Kendall Avenue:* Eleven (11) crashes were reported at or near the unsignalized intersection over the five-year study period resulting crash rate of 0.38. The reported crashes included seven (7) single vehicle type collisions, two (2) angle/sideswipe type collisions, one (1) head-on type collisions, and one (1) rear-end type vehicle crash. The majority (73%) resulted in property damage type collisions under wet/snowy (60%) roadway conditions. Sixty percent (60%) of the crashes occurred during the peak travel periods. No fatalities or pedestrian-related incidents were reported during the study period.

- *Coolidge Street at North Main Street.* Thirteen (13) crashes were reported at or near the unsignalized intersection over the five-year study period resulting crash rate of 0.37. The reported crashes included nine (9) rear-end type collisions, three (3) angle/sideswipe type collisions, and one (1) single vehicle crash. The majority (77%) resulted in property damage type collisions under dry (77%) roadway conditions. Thirty-eight percent (38%) of the crashes occurred during the peak travel periods. No fatalities or pedestrian-related incidents were reported during the study period.

In summary, based on extensive review of Local crash data and MassDOT crash data, the study intersections all experienced crash rates at or below the District 3 averages and none of the intersection are listed as HSIP locations; therefore, no immediate safety countermeasures are warranted based on the crash history at the study intersections.

2.5 SIGHT LINE ANALYSIS

The evaluation documents existing sight distances for vehicles exiting the proposed Site driveways onto Coolidge Street with comparison to American Association of State Highway and Transportation Officials' (AASHTO)[2] recommended guidelines for the regulatory (posted) speed limit and observed 85th percentile travel speeds.

The AASHTO standards reference two types of sight distance that are relevant at the proposed site driveway intersection with Coolidge Street: stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements at the Coolidge Street and site driveway intersection were compared to minimum SSD and ISD recommended for the posted and observed travel speeds along Coolidge Street. The sight lines are not applicable at the emergency driveways as they will be gated.

[2] *A policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2018.

Stopping Sight Distance

Sight distance is the length of roadway visible to the motorist to a fixed object. The minimum sight distance available on a roadway should be sufficiently long enough to enable a below-average operator, traveling at or near a regulatory speed limit, to stop safely before reaching a stationary object in its path, in this case, a vehicle exiting from the site driveway onto Coolidge Street or a vehicle on Coolidge Street slowing to turn into the site driveway. The SSD criteria are defined by AASHTO based on design and operating speeds, anticipated driver behavior and vehicle performance, as well as physical roadway conditions. SSD includes the length of roadway traveled during the perception and reaction time of a driver to an object, and the distance traveled during brake application on wet, level pavements. Adjustment factors are applied to account for roadway grades.

SSD was estimated in the field using AASHTO standards for driver's eye (3.5 feet) and object height equivalent to the taillight height of a passenger car (2.0 feet) for the eastbound and westbound Coolidge Street approaches to the proposed site driveway. **Table 4** presents a summary of the available SSD for the Coolidge Street segments approaching the proposed site driveway and AASHTO's recommended SSD for the regulatory (posted) speed limit and observed travel speeds.

TABLE 4
STOPPING SIGHT DISTANCE SUMMARY
COOLIDGE STREET APPROACHES TO SITE DRIVEWAY

Approach/ Travel Direction	Available SSD	AASHTO Recommended[1]	
		Regulatory Speed Limit[2]	Observed 85th Percentile Speed[3]
Eastbound	400± Feet	250 Feet	350 Feet
Westbound	>500 Feet	250 Feet	350 Feet

[1] Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet and adjustments for roadway grade were applicable.
[2] Regulatory Speed Limit is 35 mph EB and WB.
[3] 85th Percentile travel speed is 44 mph EB and WB.

As summarized in **Table 4,** analysis results indicate that the existing available sight lines at the approaches to the Site Driveway exceed AASHTO's recommended SSD criteria for the eastbound and westbound travel directions along Coolidge Street based on the regulatory (posted) speed limit and observed 85th percentile travel speeds.

Intersection Sight Distance

Clear sight lines provide sufficient sight distance for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. As stated under AASHTO's Intersection Sight Distance (ISD) considerations, "*…If the available sight distance for an entering …vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to avoid collisions…To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.*" AASHTO's ISD criteria are defined into several "cases". In this case, the Proposed Site Driveway approach to the intersection will be under "STOP" control and the ISD in question relates to the ability to turn left or right onto Coolidge Street.

Available ISD was estimated in the field using AASHTO standards for driver's eye (3.5 feet), object height (3.5 feet) and decision point (8 to 14.5 feet from edge of travel way) looking east and west from the proposed driveway onto Coolidge Street. **Table 5** presents a summary of the available ISD for the departures from the proposed site driveway and AASHTO's recommended ISD.

TABLE 5
INTERSECTION SIGHT DISTANCE SUMMARY
SITE DRIVEWAY DEPARTURE TO COOLIDGE STREET

Approach/ Travel Direction	Available ISD	AASHTO Minimum[1] Regulatory Speed Limit[2]	AASHTO Ideal[1] Regulatory Speed Limit[2]
Looking East	400± Feet	250 Feet	335 Feet
Looking West	>500 Feet	250 Feet	390 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet and an object height of 3.5 feet. Minimum value as noted represents SSD per AASHTO guidance. Adjustments for driveway grade have been made as needed.
[2]Regulatory (posted) speed limit is 35 mph.

The results of the ISD analysis presented in **Table 5** indicate that the with selective clearing and grading as part of the installation of the Site driveway the available sight lines will satisfy the recommended sight line requirements from AASHTO. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features to be located within driveway sight lines should also be maintained at a height of 2 feet or less above the adjacent existing roadway grade to ensure unobstructed lines of sight.

3.0 FUTURE CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. To be consistent with EEA/MassDOT guidelines, a seven-year planning horizon was selected.

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 a future year condition. Traffic volumes on the roadway network at that time, in the absence of the development (that is, the No-Build condition), would include existing traffic, new traffic due to general background traffic growth, and traffic related to specific development by others that is currently under review at the local and/or state level. Consideration of these factors resulted in the development of No-Build traffic volumes. Anticipated Site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop future Build conditions.

The following sections provide an overview of future No-Build traffic volumes, and projected Build traffic volumes.

3.1 BACKGROUND TRAFFIC GROWTH

Background traffic includes demand generated by other planned developments in the area as well as demand increases caused by external factors. External factors are general increases in traffic not attributable to a specific development and are determined using historical data.

3.1.1 Historical Area Growth

Nearby permanent count station data published by MassDOT indicates a 0.5 percent per year growth rate. For purposes of this evaluation, a 0.5 percent compounded annual growth rate was used (3.6 percent increase over a 7-year horizon). This growth rate is consistent with historic rates and is also expected to account for any small fluctuation in hourly traffic as may occur from time to time in the study area and traffic associated with other potential small developments or vacancies in the area. MassDOT permanent count station data and background growth calculations are provided in the **Appendix.**

3.1.2 Background Development-Related Growth

Development of future No-Build traffic volumes considers traffic generated through the study area from other specific area developments. A review of the areas projects and the MEPA project database indicates that there is one development project in the area that may increase baseline traffic at the study intersections that is described below:

- *Villages at Sherborne (84-86 Coolidge Street).* A 120 Unit residential development is permitted at 84-86 Coolidge Street in Sherborn. Access/egress for the development will be provided via full access driveway along Coolidge Street and a gated emergency driveway to the west of the main driveway. Trip associated with this development will be added based on industry standard rates for Land Use Code (LUC) 221 – Multifamily Housing (Mid-Rise) applied to 120 Units and distribution patterns-based Journey to Work Census Data. Trip tracings for the vacancy are provided in the **Appendix**.

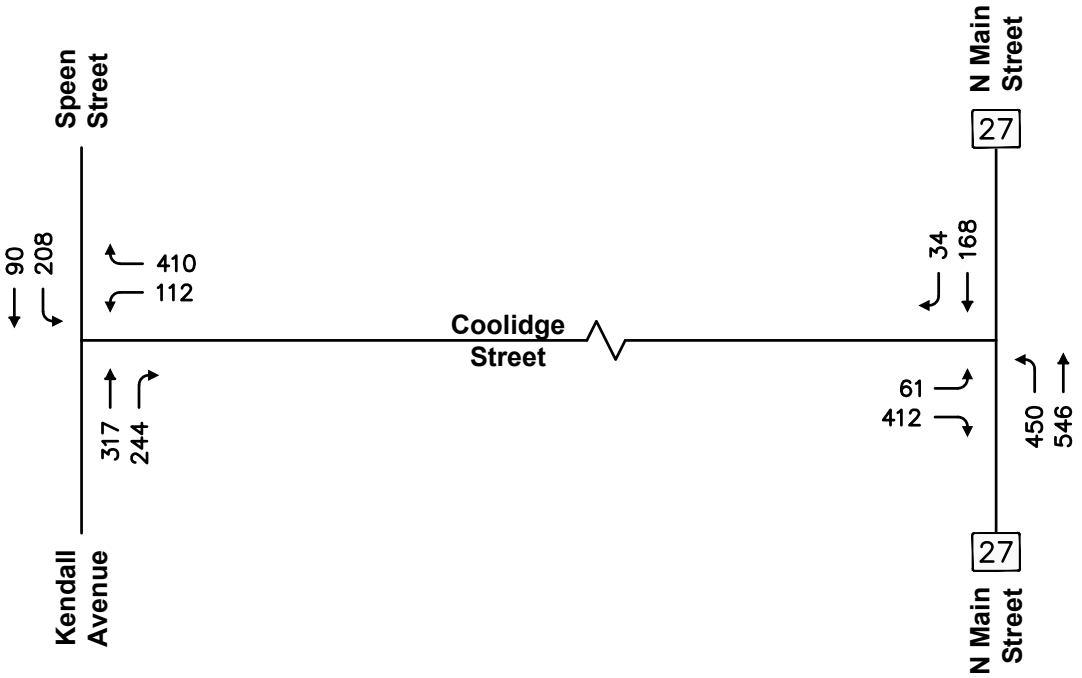
3.2 NO-BUILD TRAFFIC VOLUMES

To account for future traffic growth along the corridor, the 0.5 percent annual growth rate was applied to Baseline traffic volumes over a seven-year period as well as traffic associated with Meadowbrook Commons site-specific project. Future 2027 No-Build traffic volumes are displayed in **Figure 4**.

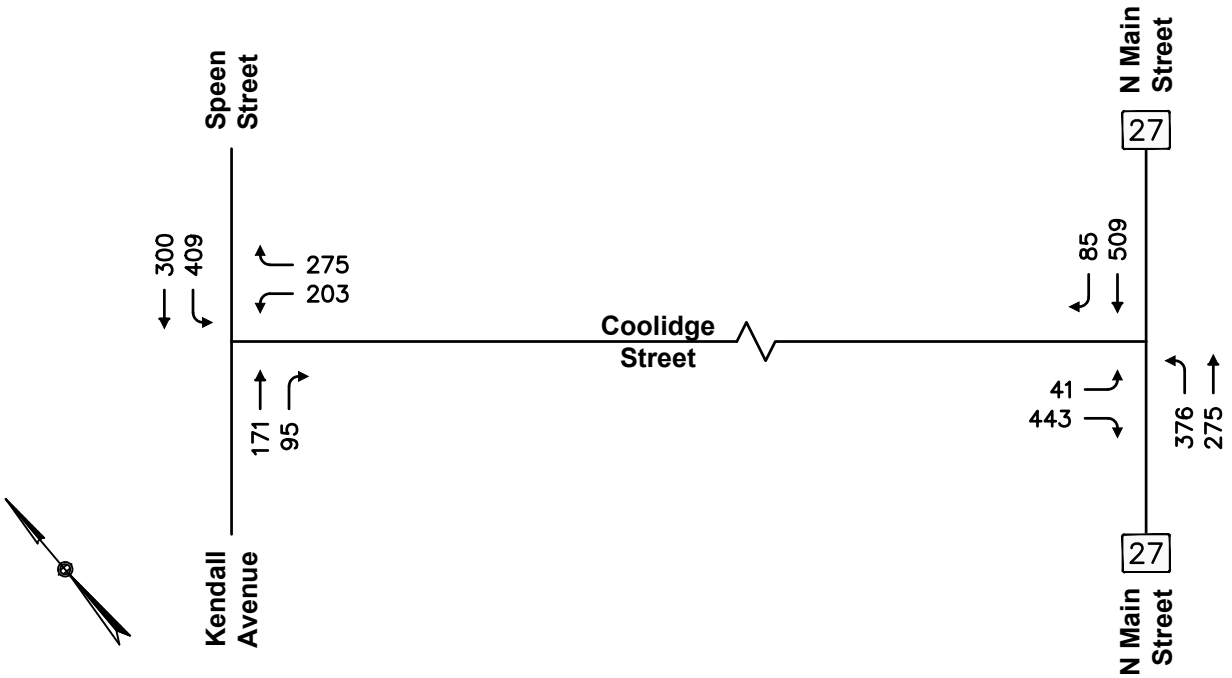
3.3 SITE-GENERATED TRAFFIC – ITE BASIS

Future Build condition traffic volumes were developed by estimating the number of peak-hour trips expected to be generated by the proposed development and distributing this additional traffic onto the local roadway network. These future development-related trips were added to future No-Build traffic volumes to evaluate future traffic operations with the proposed residential development in place. The methodology utilized to estimate the future trip-generation characteristics of the proposed development are summarized below.

In accordance with EEA/MassDOT guidelines, the traffic generated by the proposed development was estimated using trip rates published in ITE's *Trip Generation* for the Land Use Code (LUC) based on trip rates for Senior Adult Housing – Attached (LUC 252). **Table 6** presents the trip-generation estimates for the proposed development based on ITE methodology with appropriate adjustments to reflect net new trip activity. Detailed trip generation calculations are provided in the **Appendix**.



Weekday Morning Peak Hour



Scale: Not to Scale

Weekday Evening Peak Hour

Figure 4

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2027 No-Build Condition
Peak Hour Traffic Volumes

Date: September 2020
Dwg No. 1095 TIAS01.dwg

TABLE 6
TRIP-GENERATION SUMMARY

Peak Hour/Direction	Site Trips (67 Units)[1]
Weekday Morning Peak Hour:	
Entering	5
Exiting	8
Total	13
Weekday Evening Peak Hour:	
Entering	9
Exiting	8
Total	17
Daily (24 Hours):	248

Source: ITE *Trip Generation*, Tenth Edition; 2017.
[1]ITE LUC 252 – Senior Adult Housing (Attached) applied to 67± Units.

As summarized in **Table 6**, based on industry-standard trip rates for the proposed development is estimated to generate approximately 13 new trips during the weekday morning peak hour (5 entering and 8 exiting), 17 net new trips during the weekday evening peak hour (9 entering and 8 exiting), and approximately 248 daily trips on a weekday.

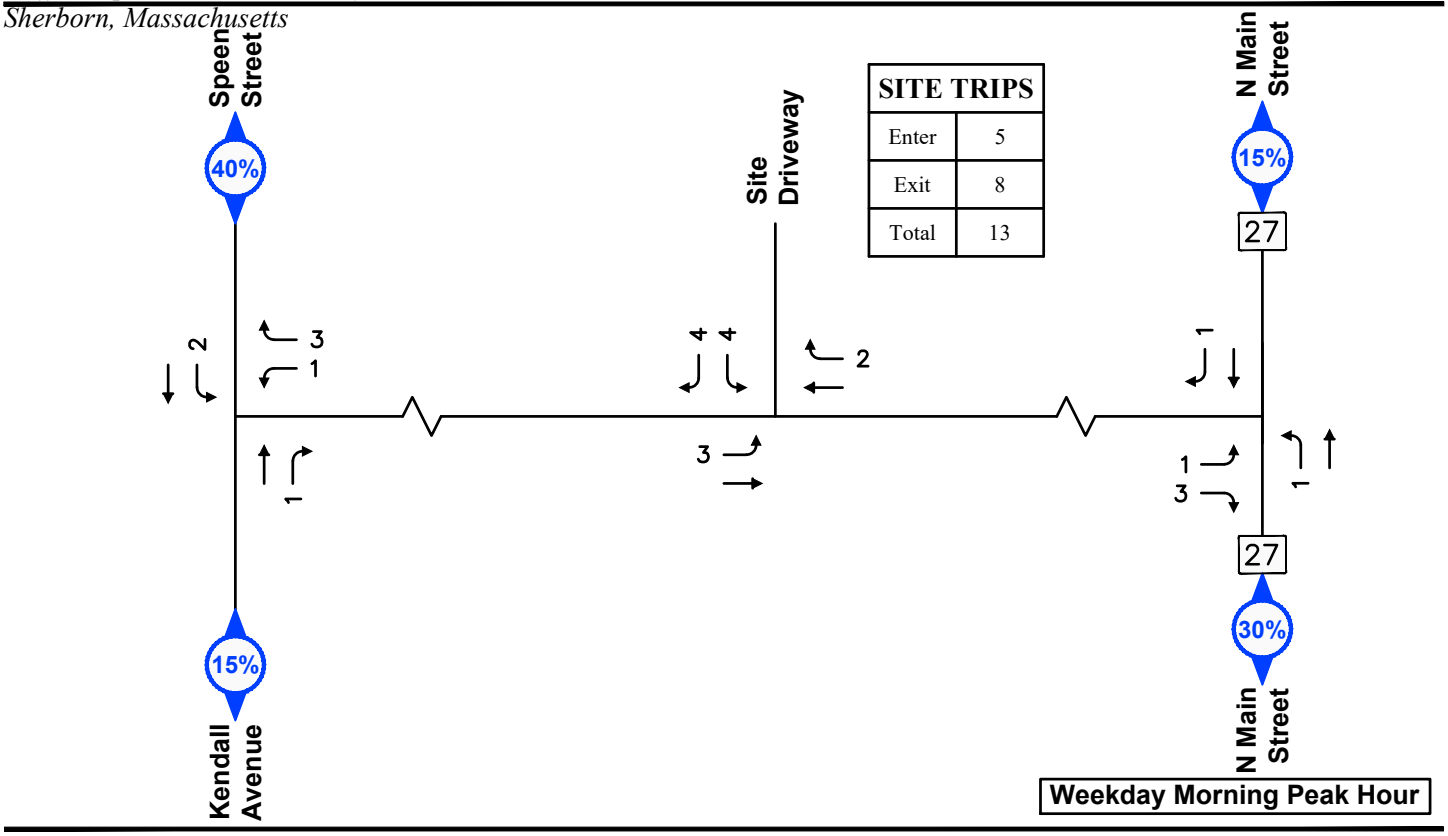
3.4 TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of development-generated trips on the roadway network is a function of a number of variables including local area populations and the efficiency of the roadways leading to the Site. Journey to work census data served as the primary basis for determining the trip distribution pattern for the proposed development. Trip distribution calculations are provided in the **Appendix.**

Development-related trips for the proposed Site are assigned to the roadway network using the ITE trip-generation estimates shown in **Table 6** and the distribution patterns for the Site. Development-related trip tracings at each intersection approach for the weekday morning and weekday evening peak hours are quantified in **Figure 5.**

3.5 BUILD TRAFFIC VOLUMES

Future Build condition traffic volumes were arrived at by adding development-specific traffic volumes to the 2027 No-Build conditions. The resulting 2027 Build condition traffic-volume networks for the weekday morning and weekday evening peak hours are displayed in **Figure 6**.



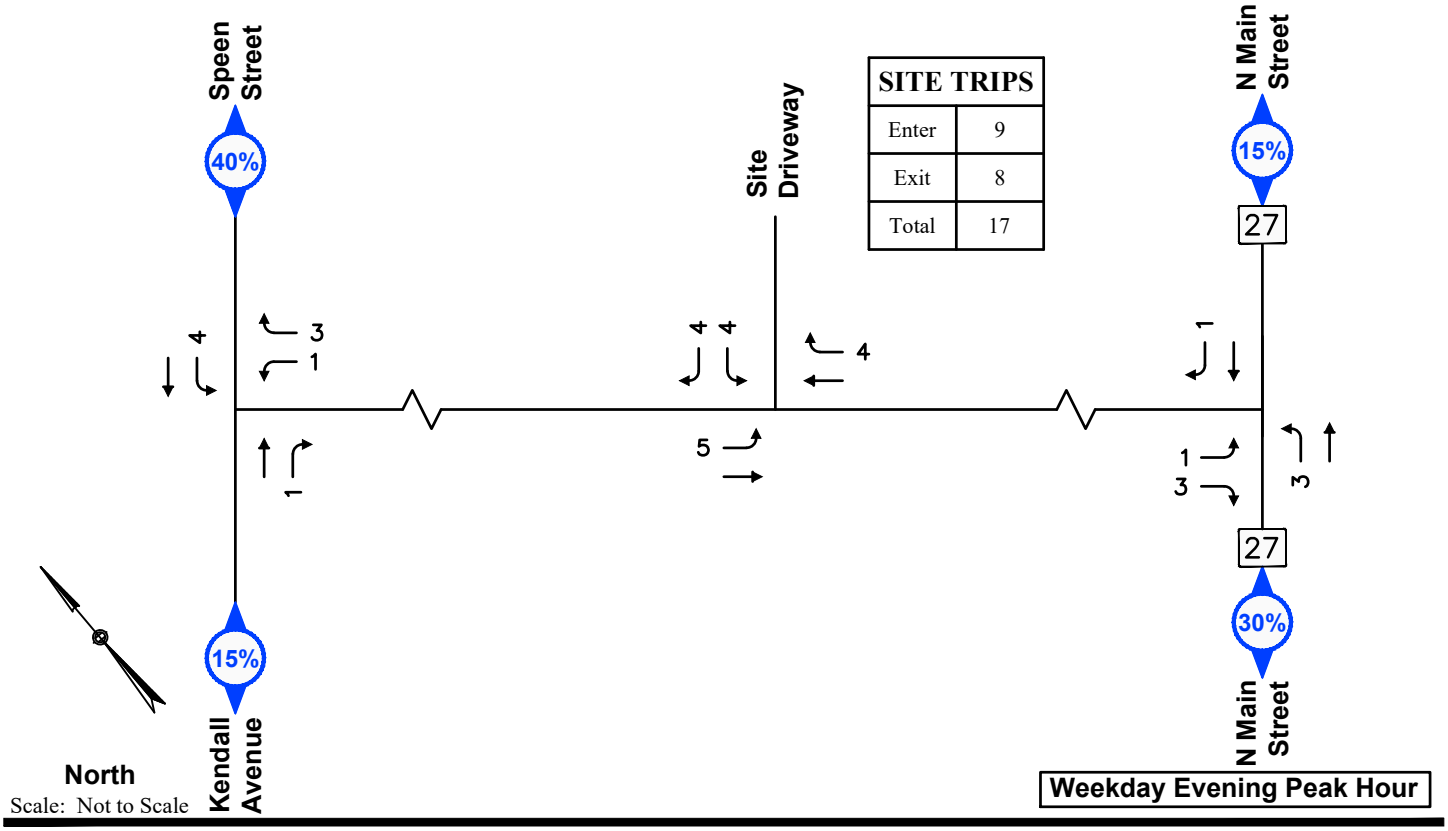


Figure 5

Site Generated Trips
Peak Hour Traffic Volumes

MDM TRANSPORTATION CONSULTANTS, INC.
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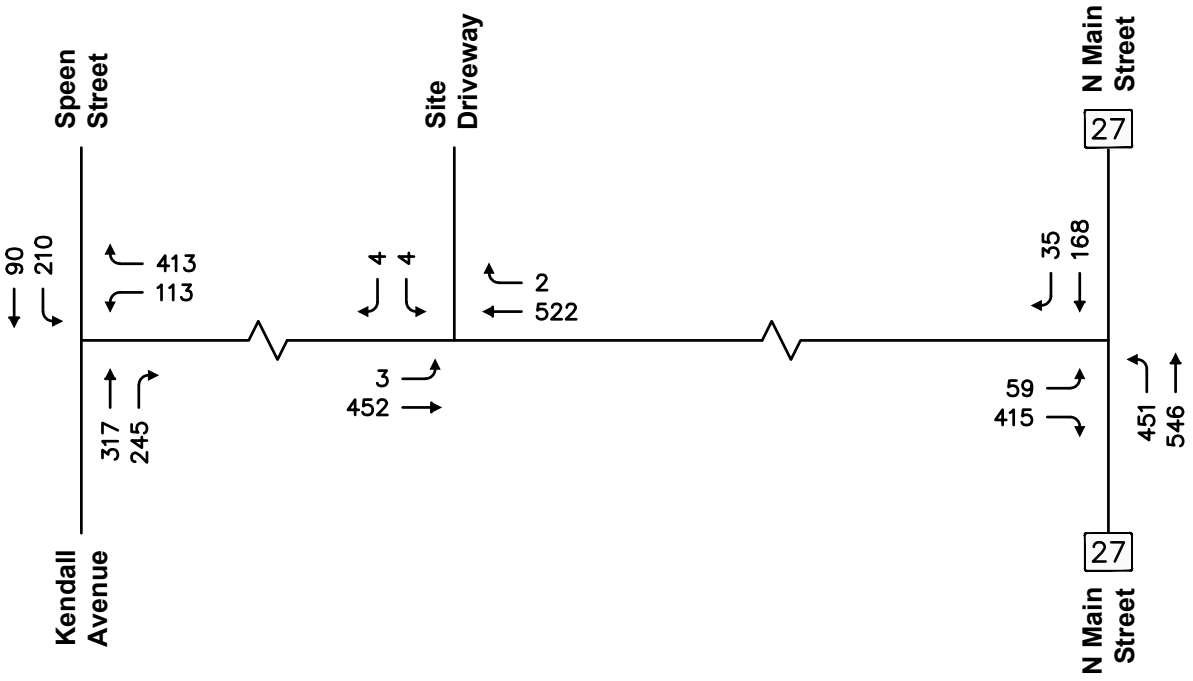
Date: September 2020
Dwg No. 1095 TIAS01.dwg



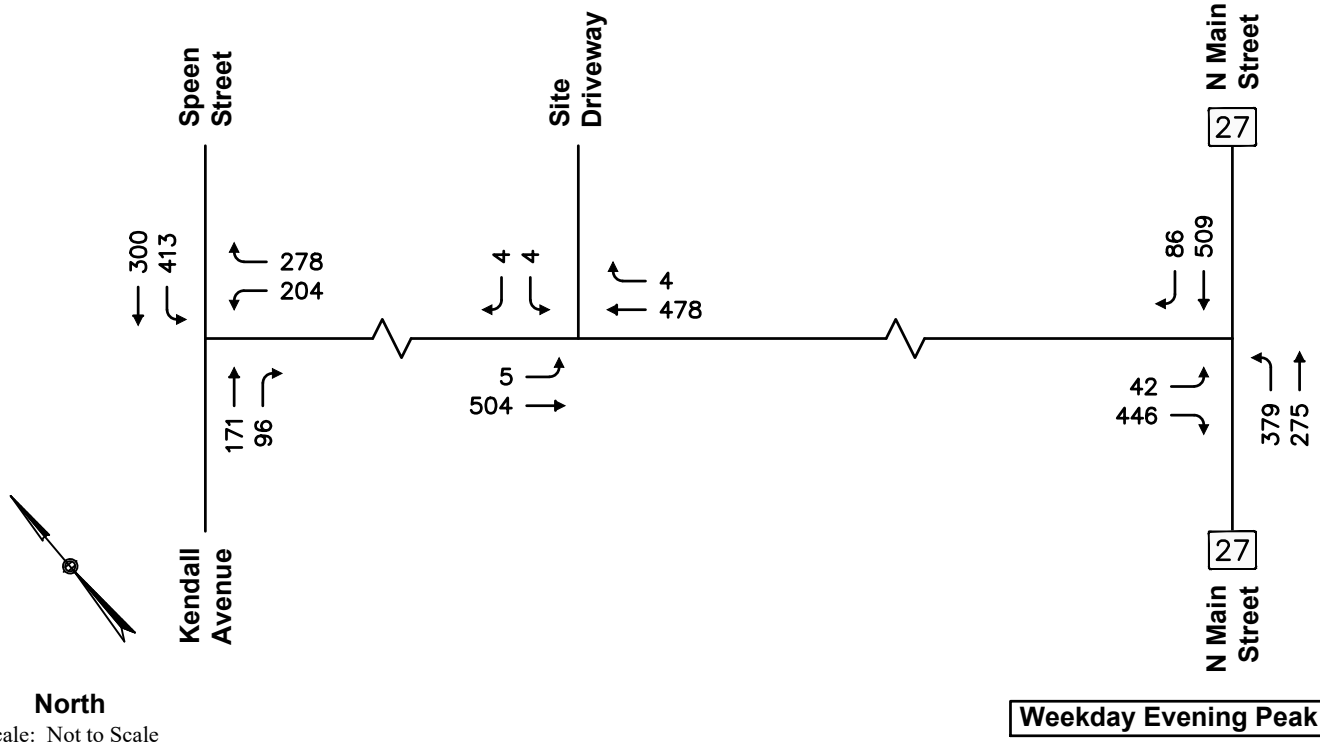


Figure 6

2027 Build Condition
Peak Hour Traffic Volumes

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Date: September 2020
Dwg No. 1095 TIAS01.dwg

4.0 TRAFFIC OPERATIONS ANALYSIS

Intersection capacity analyses for the primary study intersections are presented in this section for the Baseline, No-Build, and Build traffic-volume conditions. Capacity analyses, conducted in accordance with EEA/MassDOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

4.1 CAPACITY ANALYSIS PROCEDURES

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the Highway Capacity Manual 6th Edition (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements). The specific control delays and associated LOS designations are presented in the **Appendix.**

4.2 INTERSECTION CAPACITY ANALYSIS RESULTS

Capacity analysis results for the weekday morning and weekday evening peak hours for the study intersections are described below, with detailed analysis results presented in the **Appendix**.

4.2.1 Level of Service Analysis

The capacity analysis results for the intersections in the study area are summarized in **Table 7** and **Table 8** for the weekday morning and weekday evening peak hours, respectively.

TABLE 7
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY MORNING PEAK HOUR

		2020 Baseline			2027 No-Build			2027 Build		
Period	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Coolidge Street at	Northbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
Speen Street/	Southbound	0.22	7	A	0.24	7	A	0.34	7	A
Kendall Avenue	WB Left[5]	0.17	12	B	0.19	12	B	0.19	12	B
	WB Right[5]	0.26	8	A	0.28	8	A	0.28	8	A
Coolidge Street at	Northbound	0.33	<5	A	0.34	<5	A	0.35	<5	A
North Main Street	Southbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
(Route 27)	EB Left	0.90	>50	F	>1.0	>50	F	>1.0	>50	F
	EB Right	0.47	13	B	0.50	14	B	0.51	14	A
Coolidge Street at	SB Exit	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.03	16	C
Site Driveway	Eastbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
	Westbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable
[5]Calibrated Baseline Analysis based on delay study conducted for the weekday evening peak hour.

TABLE 8
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY EVENING PEAK HOUR

		2020 Baseline			2027 No-Build			2027 Build		
Period	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Coolidge Street at	Northbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
Speen Street/	Southbound	0.30	5	A	0.33	5	A	0.33	5	A
Kendall Avenue	WB Left[5]	0.42	18	C	0.48	21	C	0.49	21	C
	WB Right[5]	0.16	8	A	0.17	8	A	0.33	8	A
Coolidge Street at	Northbound	0.37	6	A	0.40	6	A	0.40	7	A
North Main Street	Southbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
(Route 27)	EB Left	0.54	>50	F	0.72	>50	F	0.75	>50	F
	EB Right	0.80	33	D	0.87	42	E	0.88	43	E
Coolidge Street at	SB Exit	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.03	16	C
Site Driveway	Eastbound	n/a	n/a	n/a	n/a	n/a	n/a	0.01	<5	A
	Westbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable
[5]Calibrated Baseline Analysis based on delay study conducted for the weekday evening peak hour.

As summarized in **Table 7** and **Table 8**:

- *Coolidge Street at Speen Street/Kendall Avenue.* Under future No-Build conditions, left turn movements from Coolidge Street onto Kendall Avenue have been calculated to operate at LOS C or better with right turns operating with minimal delay (LOS A). The project will have a nominal impact on operations this intersection under Build condition. Mainline movement along Kendall Avenue and Speen Street will continue to operate unimpeded at LOS A during the weekday morning and evening peak hours.

- *Coolidge Street at North Main Street (Route 27).* Under future No-Build conditions, the Coolidge Street approach to Route 27 has been calculated to operate with long delays (LOS F); specifically, for left turn movements onto North Main Street during the weekday morning and weekday evening peak hours. The project will have a nominal impact on operations this intersection under Build conditions and will result in three (3) additional left turns or less (1 vehicle every 20 minutes or less) onto North Main Street during the peak hours compared to No-Build conditions. Field observations indicate that the delay for the Coolidge Street approach onto Route 27 is somewhat overstated. Mainline movement along North Main Street will continue to operate unimpeded at LOS A during the weekday morning and evening peak hours.

- *Coolidge Street at Site Driveway.* Under Build conditions, the proposed Site Driveway approach to Coolidge Street will operate below capacity at LOS C or better during the peak hours. Mainline movement along Coolidge Street will continue to operate unimpeded at LOS A during the weekday morning and evening peak hours.

In summary, the proposed development is not expected to materially impact study area intersections and will not result in any material changes in traffic operations in the study area between future No-Build and Build conditions. Relative traffic increases for the proposed project represents an inconsequential change in area roadway volumes - a level of change that falls well within normal day-to-day fluctuations in traffic entering and exiting the study intersections and is immaterial to traffic operations along Coolidge Street. Accordingly, no roadway improvements are warranted to accommodate the project. Access/ egress improvement and pedestrian-oriented improvement are proposed to enhance non-motorized connections to adjoining land uses. These improvements are described in more detail under *Conclusions and Recommendations*.

5.0 RECOMMENDATIONS AND CONCLUSIONS

5.1 RECOMMENDATIONS

MDM finds Coolidge Street and roadways within the site vicinity can accommodate modest traffic increases of the project. Relative traffic increases for the proposed project represents an inconsequential change in area roadway volumes - a level of change that falls well within normal day-to-day fluctuations in traffic entering and exiting the study intersections and is immaterial to traffic operations along Coolidge Street. However, several mitigation actions are identified to support the project to ensure that site access meets applicable safety criteria, to enhance neighborhood walking/bicycling and to reduce dependency on single-occupant auto use. These include (a) access-related improvements and (b) pedestrian and bicycle accommodations as summarized below.

Access/Egress Improvements

- *Driveway Design*. The final driveway width and curb radii between the proposed Site Driveway and Coolidge Street should be designed to accommodate the Town's largest fire apparatus (ladder truck) and single unit delivery vehicles. Signs and pavement markings that are compliant with the Manual on Uniform Traffic Control Devices (MUTCD) should be installed on the approach to Coolidge Street including a STOP sign (R1-1) and STOP line pavement markings.

- *Sight Line Triangles.* With selective clearing and grading as part of the installation of the Site driveway the available sight lines will satisfy the recommended sight line requirements from AASHTO. Plantings (shrubs, bushes) and structures (walls, fences, etc.) shall be maintained at a height of 2 feet or less within the sight lines in vicinity of the Site Driveway intersections with Coolidge Street and at all internal intersections to provide unobstructed sight lines.

Pedestrian and Bicycle Accommodations

- *Pedestrian Connections*. The Site Plan incorporates sidewalks that connect the proposed buildings to the on-site surface parking areas.

- *Bicycle Amenities*. The Proponent will provide bicycle accommodations within the property including bike racks in the common areas to encourage and facilitate this mode of transportation within and to/from the Site.

5.2 CONCLUSIONS

In summary, the proposed residential development will be accommodated well within capacity of Coolidge Street with no discernable impact to traffic flow and at operating levels that are considered acceptable for suburban locations. The assessment indicates traffic increases for the proposed project represents a nominal increase in area roadway volumes. Accordingly, no roadway improvements are warranted to accommodate the project. Proposed access access/egress improvements and pedestrian and bicycle accommodations as outlined in the *Conclusions and Recommendations* section of this report will adequately mitigate the project impacts.

APPENDIX

- Traffic Volume Data
- Speed Data
- Crash Data
- Sight Distance Calculations
- Seasonal/Yearly Growth Data
- Background Projects
- Trip Generation
- Trip Distribution
- Capacity Analysis
- AutoTURN® Analysis

- Traffic Volume Data

2020 Count Data

E/W: Coolidge Street
Near Site Driveway
Sherborn, MA

28 Lord Road, Suite 280
Marlborough, MA 01752

Site Code: 1095

Start Time	01-Sep-20 Tue	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		4	74			11	88				
12:15		1	93			3	87				
12:30		2	75			2	83				
12:45		3	65	10	307	1	79	17	337	27	644
01:00		0	87			1	83				
01:15		2	78			1	72				
01:30		1	73			1	82				
01:45		2	90	5	328	1	84	4	321	9	649
02:00		1	81			1	78				
02:15		0	78			0	98				
02:30		1	84			2	108				
02:45		1	92	3	335	1	76	4	360	7	695
03:00		4	100			0	101				
03:15		0	88			2	71				
03:30		1	85			0	91				
03:45		4	89	9	362	1	111	3	374	12	736
04:00		2	92			1	90				
04:15		3	78			0	82				
04:30		2	84			4	98				
04:45		7	97	14	351	2	108	7	378	21	729
05:00		9	95			4	104				
05:15		14	82			7	102				
05:30		30	96			9	89				
05:45		37	87	90	360	11	106	31	401	121	761
06:00		32	72			14	94				
06:15		41	58			24	62				
06:30		56	61			55	83				
06:45		52	47	181	238	67	65	160	304	341	542
07:00		56	49			53	57				
07:15		57	39			78	73				
07:30		95	46			84	60				
07:45		90	35	298	169	76	52	291	242	589	411
08:00		58	34			68	55				
08:15		67	25			63	40				
08:30		95	21			64	28				
08:45		82	18	302	98	70	19	265	142	567	240
09:00		76	11			77	21				
09:15		64	20			44	18				
09:30		48	15			48	14				
09:45		75	12	263	58	53	12	222	65	485	123
10:00		56	16			53	17				
10:15		76	15			55	13				
10:30		77	7			53	18				
10:45		72	4	281	42	62	8	223	56	504	98
11:00		70	11			69	8				
11:15		93	4			69	4				
11:30		70	4			91	7				
11:45		102	3	335	22	64	4	293	23	628	45
Total		1791	2670			1520	3003			3311	5673
Percent		40.1%	59.9%			33.6%	66.4%			36.9%	63.1%
Total		1791	2670			1520	3003			3311	5673
Percent		40.1%	59.9%			33.6%	66.4%			36.9%	63.1%
Combined Total		4461				4523				8984	

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28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main Street
E/W: Coolidge Street
Sherborn, MA

File Name : 1096 N Main at Coolidge 09-01-2020
Site Code : 1095
Start Date : 9/1/2020

Groups Printed- Lights - Mediums - Articulated Trucks

	N Main Street From North				N Main Street From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
07:00 AM	1	18	0	19	62	56	0	118	54	5	0	59	196
07:15 AM	2	28	0	30	42	50	0	92	65	4	0	69	191
07:30 AM	3	31	0	34	96	94	0	190	75	5	0	80	304
07:45 AM	6	23	0	29	68	86	0	154	75	2	0	77	260
Total	12	100	0	112	268	286	0	554	269	16	0	285	951
08:00 AM	4	38	0	42	60	54	0	114	74	7	0	81	237
08:15 AM	6	27	0	33	67	66	0	133	58	5	0	63	229
08:30 AM	8	36	0	44	59	80	0	139	60	4	0	64	247
08:45 AM	2	26	0	28	65	84	0	149	66	9	0	75	252
Total	20	127	0	147	251	284	0	535	258	25	0	283	965
04:00 PM	9	82	0	91	39	84	0	123	82	5	0	87	301
04:15 PM	10	65	0	75	40	76	0	116	78	4	0	82	273
04:30 PM	6	73	0	79	52	89	0	141	86	4	0	90	310
04:45 PM	9	69	0	78	49	86	0	135	87	11	0	98	311
Total	34	289	0	323	180	335	0	515	333	24	0	357	1195
05:00 PM	12	88	0	100	38	86	0	124	103	5	0	108	332
05:15 PM	6	83	0	89	40	79	0	119	95	9	0	104	312
05:30 PM	9	73	0	82	48	90	0	138	77	7	0	84	304
05:45 PM	6	69	0	75	46	83	0	129	96	10	0	106	310
Total	33	313	0	346	172	338	0	510	371	31	0	402	1258
Grand Total	99	829	0	928	871	1243	0	2114	1231	96	0	1327	4369
Apprch %	10.7	89.3	0		41.2	58.8	0		92.8	7.2	0		
Total %	2.3	19	0	21.2	19.9	28.5	0	48.4	28.2	2.2	0	30.4	
Lights	96	794	0	890	825	1210	0	2035	1196	94	0	1290	4215
% Lights	97	95.8	0	95.9	94.7	97.3	0	96.3	97.2	97.9	0	97.2	96.5
Mediums	2	32	0	34	41	24	0	65	30	2	0	32	131
% Mediums	2	3.9	0	3.7	4.7	1.9	0	3.1	2.4	2.1	0	2.4	3
Articulated Trucks	1	3	0	4	5	9	0	14	5	0	0	5	23
% Articulated Trucks	1	0.4	0	0.4	0.6	0.7	0	0.7	0.4	0	0	0.4	0.5

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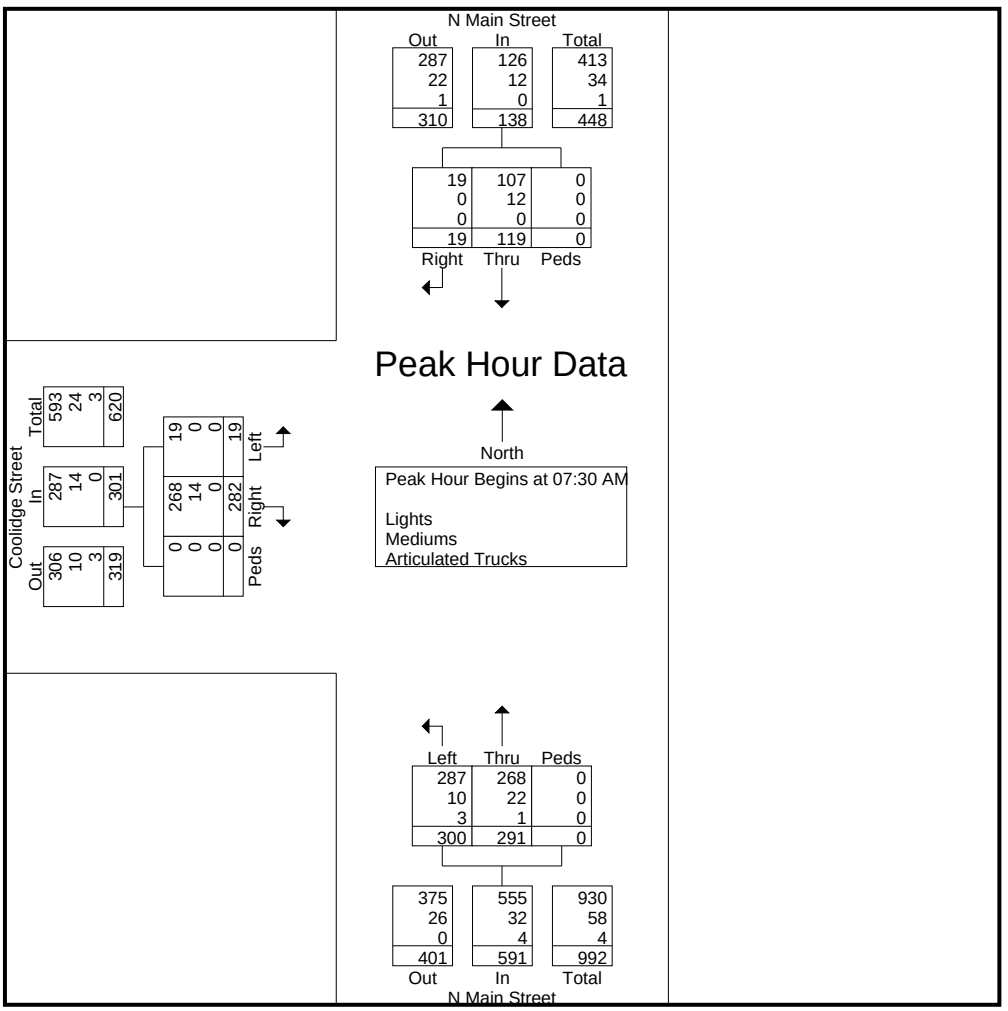
28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main Street
E/W: Coolidge Street
Sherborn, MA

File Name : 1096 N Main at Coolidge 09-01-2020
Site Code : 1095
Start Date : 9/1/2020
Page No : 2

	N Main Street From North				N Main Street From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	3	31	0	34	**96**	**94**	0	**190**	**75**	5	0	80	**304**
07:45 AM	**6**	23	0	29	68	86	0	154	75	2	0	77	260
08:00 AM	4	**38**	0	**42**	60	54	0	114	74	**7**	0	**81**	237
08:15 AM	6	27	0	33	67	66	0	133	58	5	0	63	229
Total Volume	19	119	0	138	291	300	0	591	282	19	0	301	1030
% App. Total	13.8	86.2	0		49.2	50.8	0		93.7	6.3	0		
PHF	.792	.783	.000	.821	.758	.798	.000	.778	.940	.679	.000	.929	.847
Lights	19	107	0	126	268	287	0	555	268	19	0	287	968
% Lights	100	89.9	0	91.3	92.1	95.7	0	93.9	95.0	100	0	95.3	94.0
Mediums	0	12	0	12	22	10	0	32	14	0	0	14	58
% Mediums	0	10.1	0	8.7	7.6	3.3	0	5.4	5.0	0	0	4.7	5.6
Articulated Trucks	0	0	0	0	1	3	0	4	0	0	0	0	4
% Articulated Trucks	0	0	0	0	0.3	1.0	0	0.7	0	0	0	0	0.4



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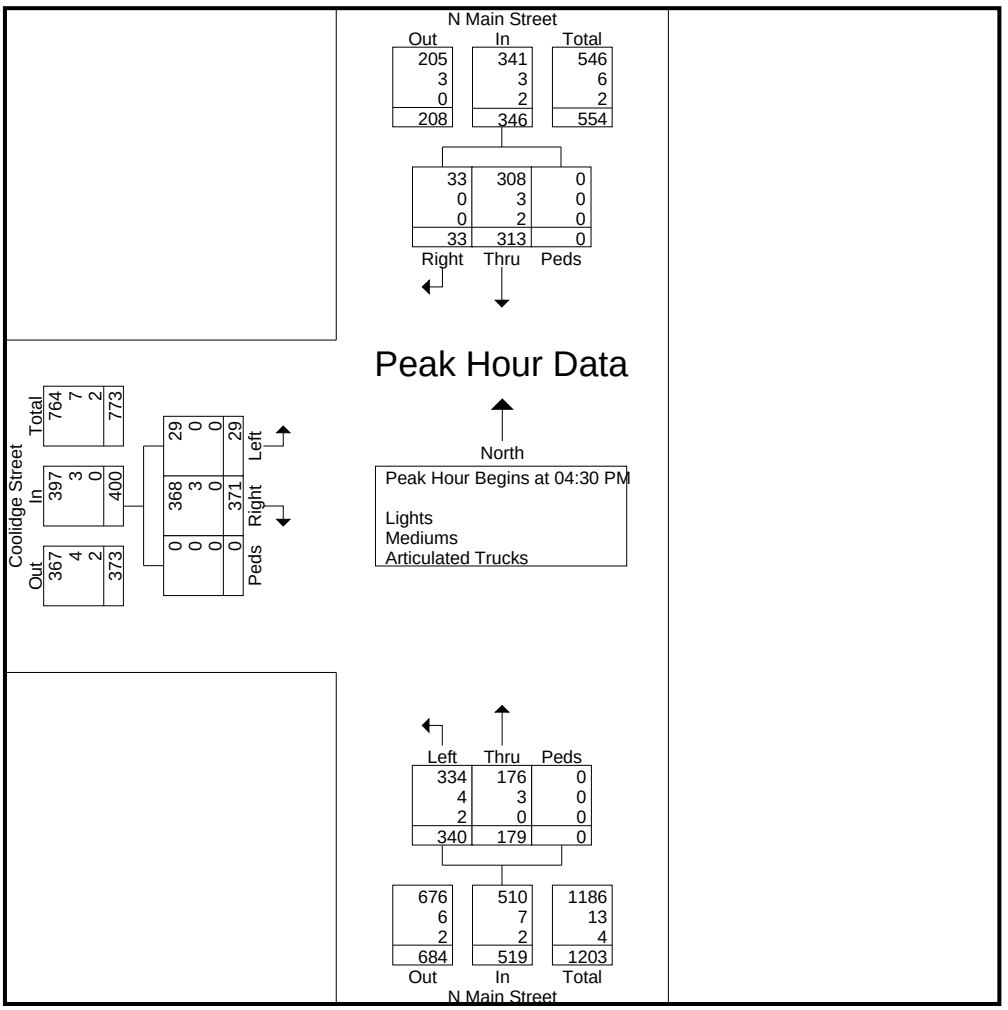
28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main Street
E/W: Coolidge Street
Sherborn, MA

File Name : 1096 N Main at Coolidge 09-01-2020
Site Code : 1095
Start Date : 9/1/2020
Page No : 3

	N Main Street From North				N Main Street From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	6	73	0	79	**52**	**89**	0	**141**	86	4	0	90	310
04:45 PM	9	69	0	78	49	86	0	135	87	**11**	0	98	311
05:00 PM	**12**	**88**	0	**100**	38	86	0	124	**103**	5	0	**108**	**332**
05:15 PM	6	83	0	89	40	79	0	119	95	9	0	104	312
Total Volume	33	313	0	346	179	340	0	519	371	29	0	400	1265
% App. Total	9.5	90.5	0		34.5	65.5	0		92.8	7.2	0		
PHF	.688	.889	.000	.865	.861	.955	.000	.920	.900	.659	.000	.926	.953
Lights	33	308	0	341	176	334	0	510	368	29	0	397	1248
% Lights	100	98.4	0	98.6	98.3	98.2	0	98.3	99.2	100	0	99.3	98.7
Mediums	0	3	0	3	3	4	0	7	3	0	0	3	13
% Mediums	0	1.0	0	0.9	1.7	1.2	0	1.3	0.8	0	0	0.8	1.0
Articulated Trucks	0	2	0	2	0	2	0	2	0	0	0	0	4
% Articulated Trucks	0	0.6	0	0.6	0	0.6	0	0.4	0	0	0	0	0.3



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Planners & Engineers

28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street
E/W: Coolidge Street/Kendall Street
Sherborn, MA

File Name : 1096 Speen at Coolidge 09-01-2020
Site Code : 1095
Start Date : 9/1/2020
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

	Speen Street From North				Coolidge Street From East				Kendall Avenue From West				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	8	38	0	46	45	10	0	55	22	48	0	70	171
07:15 AM	14	45	0	59	53	14	0	67	33	46	0	79	205
07:30 AM	11	41	0	52	73	11	0	84	41	51	0	92	228
07:45 AM	20	45	0	65	79	11	0	90	36	53	0	89	244
Total	53	169	0	222	250	46	0	296	132	198	0	330	848
08:00 AM	17	46	0	63	52	10	0	62	25	41	0	66	191
08:15 AM	15	39	0	54	49	12	0	61	16	46	0	62	177
08:30 AM	11	49	0	60	82	13	0	95	17	31	0	48	203
08:45 AM	18	56	0	74	79	14	0	93	30	31	0	61	228
Total	61	190	0	251	262	49	0	311	88	149	0	237	799
04:00 PM	50	81	0	131	65	21	0	86	16	28	0	44	261
04:15 PM	46	65	0	111	63	22	0	85	13	27	0	40	236
04:30 PM	44	82	0	126	52	29	0	81	19	28	0	47	254
04:45 PM	33	91	0	124	55	35	0	90	18	29	0	47	261
Total	173	319	0	492	235	107	0	342	66	112	0	178	1012
05:00 PM	55	80	0	135	67	32	0	99	17	19	0	36	270
05:15 PM	44	81	0	125	50	31	0	81	16	31	0	47	253
05:30 PM	47	74	0	121	53	46	0	99	14	23	0	37	257
05:45 PM	42	91	0	133	55	28	0	83	12	26	0	38	254
Total	188	326	0	514	225	137	0	362	59	99	0	158	1034
Grand Total	475	1004	0	1479	972	339	0	1311	345	558	0	903	3693
Apprch %	32.1	67.9	0		74.1	25.9	0		38.2	61.8	0		
Total %	12.9	27.2	0	40	26.3	9.2	0	35.5	9.3	15.1	0	24.5	
Lights	441	966	0	1407	948	320	0	1268	334	513	0	847	3522
% Lights	92.8	96.2	0	95.1	97.5	94.4	0	96.7	96.8	91.9	0	93.8	95.4
Mediums	26	37	0	63	21	16	0	37	10	36	0	46	146
% Mediums	5.5	3.7	0	4.3	2.2	4.7	0	2.8	2.9	6.5	0	5.1	4
Articulated Trucks	8	1	0	9	3	3	0	6	1	9	0	10	25
% Articulated Trucks	1.7	0.1	0	0.6	0.3	0.9	0	0.5	0.3	1.6	0	1.1	0.7

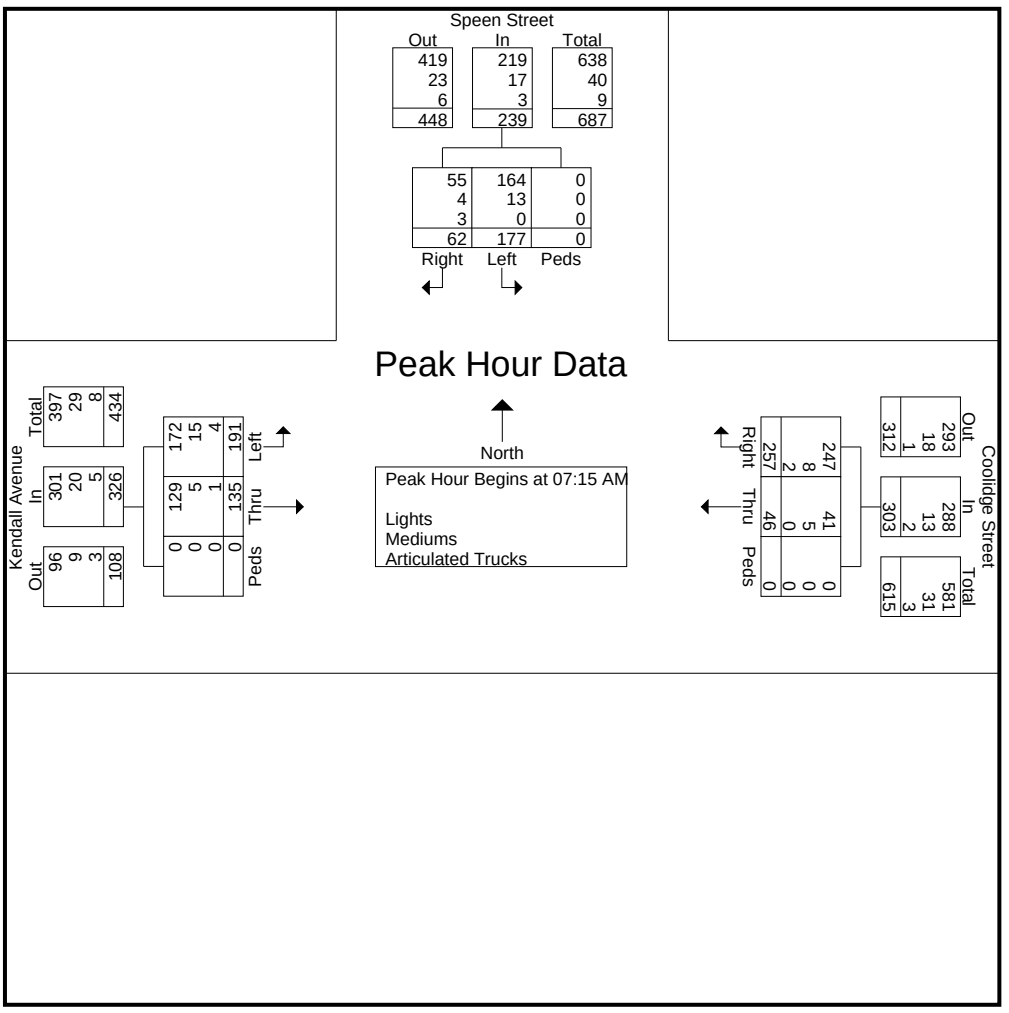
MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street
E/W: Coolidge Street/Kendall Street
Sherborn, MA

File Name : 1096 Speen at Coolidge 09-01-2020
Site Code : 1095
Start Date : 9/1/2020
Page No : 2

	Speen Street From North				Coolidge Street From East				Kendall Avenue From West				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	14	45	0	59	53	**14**	0	67	33	46	0	79	205
07:30 AM	11	41	0	52	73	11	0	84	**41**	51	0	**92**	228
07:45 AM	**20**	45	0	**65**	**79**	11	0	**90**	36	**53**	0	89	**244**
08:00 AM	17	**46**	0	63	52	10	0	62	25	41	0	66	191
Total Volume	62	177	0	239	257	46	0	303	135	191	0	326	868
% App. Total	25.9	74.1	0		84.8	15.2	0		41.4	58.6	0		
PHF	.775	.962	.000	.919	.813	.821	.000	.842	.823	.901	.000	.886	.889
Lights	55	164	0	219	247	41	0	288	129	172	0	301	808
% Lights	88.7	92.7	0	91.6	96.1	89.1	0	95.0	95.6	90.1	0	92.3	93.1
Mediums	4	13	0	17	8	5	0	13	5	15	0	20	50
% Mediums	6.5	7.3	0	7.1	3.1	10.9	0	4.3	3.7	7.9	0	6.1	5.8
Articulated Trucks	3	0	0	3	2	0	0	2	1	4	0	5	10
% Articulated Trucks	4.8	0	0	1.3	0.8	0	0	0.7	0.7	2.1	0	1.5	1.2



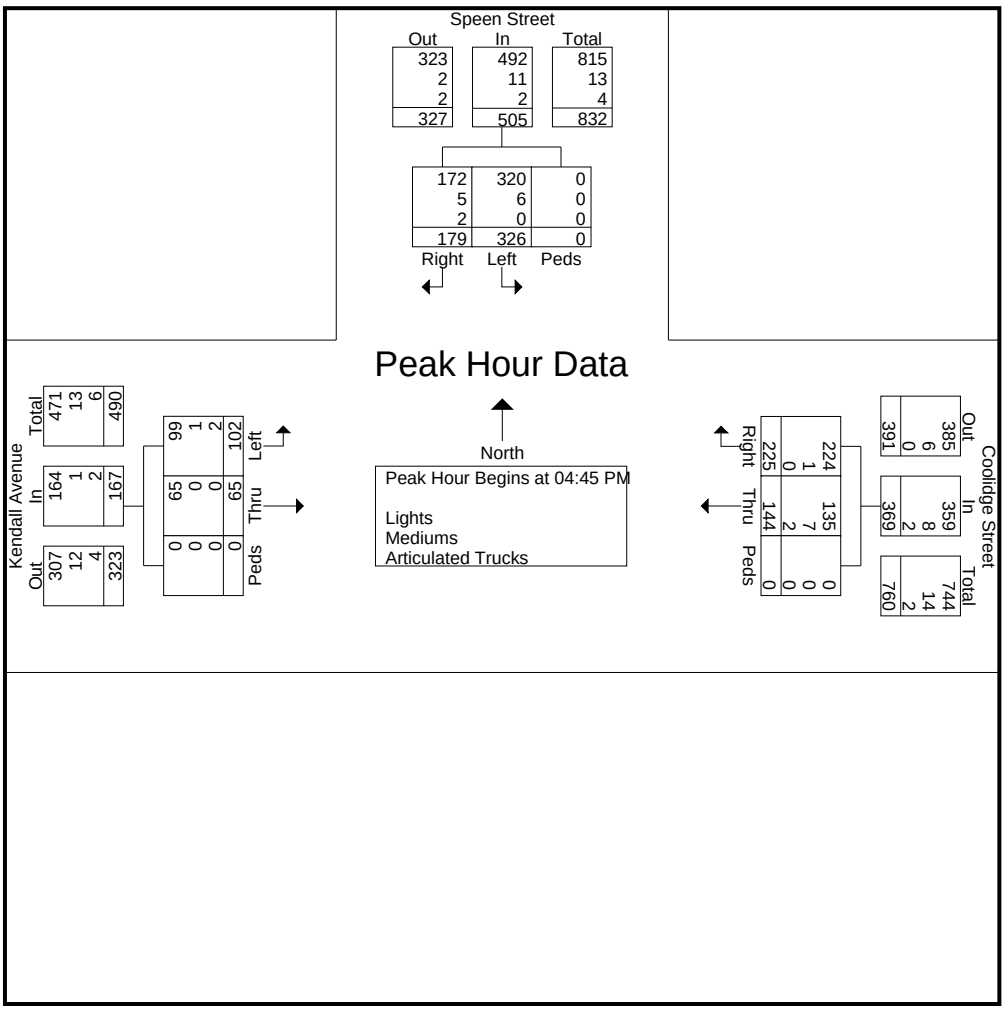
MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street
E/W: Coolidge Street/Kendall Street
Sherborn, MA

File Name : 1096 Speen at Coolidge 09-01-2020
Site Code : 1095
Start Date : 9/1/2020
Page No : 3

	Speen Street From North				Coolidge Street From East				Kendall Avenue From West				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	33	**91**	0	124	55	35	0	90	**18**	29	0	**47**	261
05:00 PM	**55**	80	0	**135**	**67**	32	0	**99**	17	19	0	36	**270**
05:15 PM	44	81	0	125	50	31	0	81	16	**31**	0	47	253
05:30 PM	47	74	0	121	53	**46**	0	99	14	23	0	37	257
Total Volume	179	326	0	505	225	144	0	369	65	102	0	167	1041
% App. Total	35.4	64.6	0		61	39	0		38.9	61.1	0		
PHF	.814	.896	.000	.935	.840	.783	.000	.932	.903	.823	.000	.888	.964
Lights	172	320	0	492	224	135	0	359	65	99	0	164	1015
% Lights	96.1	98.2	0	97.4	99.6	93.8	0	97.3	100	97.1	0	98.2	97.5
Mediums	5	6	0	11	1	7	0	8	0	1	0	1	20
% Mediums	2.8	1.8	0	2.2	0.4	4.9	0	2.2	0	1.0	0	0.6	1.9
Articulated Trucks	2	0	0	2	0	2	0	2	0	2	0	2	6
% Articulated Trucks	1.1	0	0	0.4	0	1.4	0	0.5	0	2.0	0	1.2	0.6



2016 Count Data

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA 01752
508-303-0370
www.mdmtrans.com

Coolidge Street
South of Site Driveway
Sherborn, MA

Site Code: 875

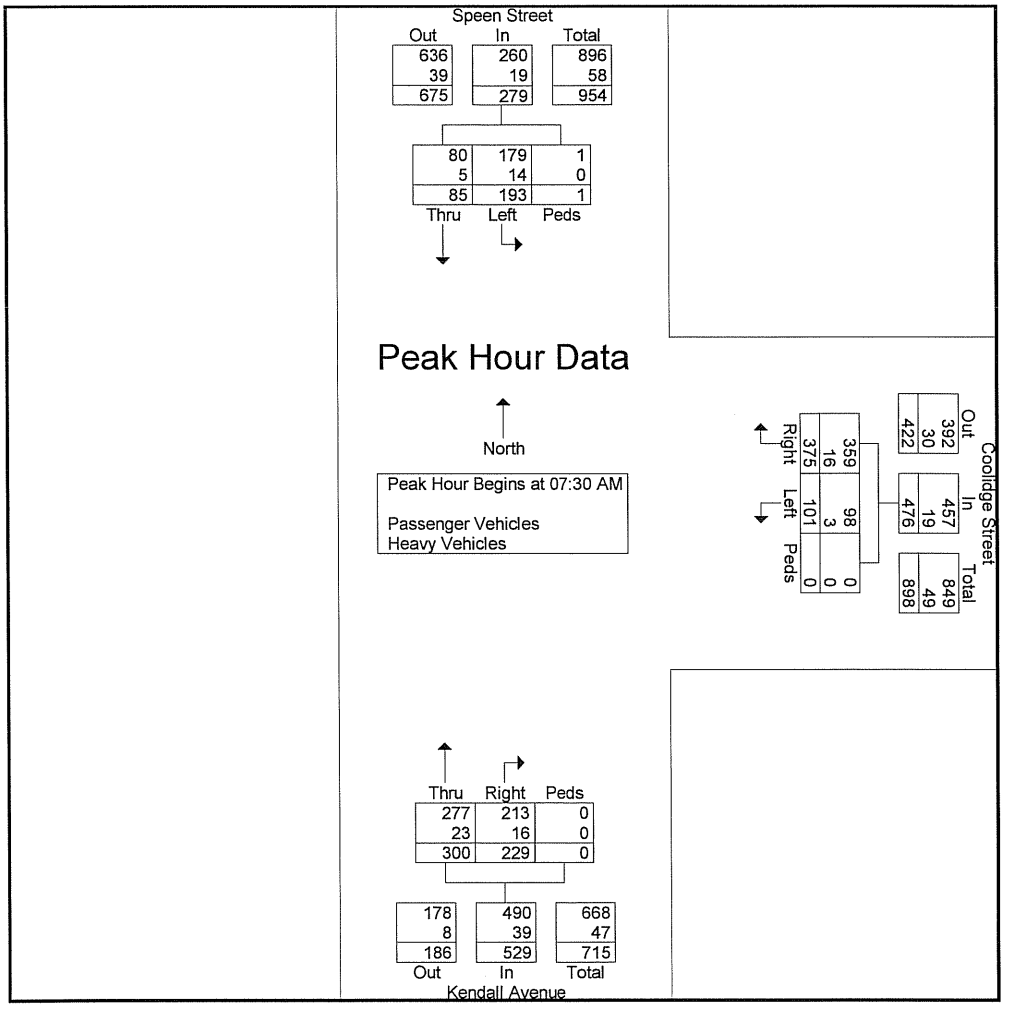
Start Time	04-May-16 Wed	Northbound Morning	Northbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Southbound Morning	Southbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		5	66			6	69				
12:15		0	87			6	86				
12:30		1	65			0	86				
12:45		0	89	6	307	5	84	17	325	23	632
01:00		2	66			6	59				
01:15		1	82			1	79				
01:30		1	74			2	82				
01:45		3	72	7	294	2	69	11	289	18	583
02:00		1	68			2	100				
02:15		0	70			1	99				
02:30		0	96			0	103				
02:45		3	74	4	308	0	99	3	401	7	709
03:00		2	81			1	120				
03:15		5	112			1	99				
03:30		2	93			0	103				
03:45		1	85	10	371	1	111	3	433	13	804
04:00		2	79			3	149				
04:15		3	94			3	119				
04:30		13	94			2	120				
04:45		7	78	25	345	4	94	12	482	37	827
05:00		7	103			4	110				
05:15		23	112			9	109				
05:30		23	82			18	91				
05:45		30	106	83	403	12	109	43	419	126	822
06:00		28	97			37	76				
06:15		52	97			40	99				
06:30		70	72			59	89				
06:45		106	66	256	332	90	77	226	341	482	673
07:00		77	55			81	94				
07:15		90	45			103	78				
07:30		89	49			111	57				
07:45		105	39	361	188	115	81	410	310	771	498
08:00		115	28			94	74				
08:15		129	31			92	57				
08:30		125	20			77	48				
08:45		115	24	484	103	60	31	323	210	807	313
09:00		108	25			58	48				
09:15		106	17			63	53				
09:30		92	30			43	41				
09:45		71	13	377	85	52	27	216	169	593	254
10:00		79	9			40	27				
10:15		73	15			59	28				
10:30		85	11			76	21				
10:45		72	7	309	42	59	19	234	95	543	137
11:00		75	9			59	14				
11:15		85	8			68	19				
11:30		77	8			67	6				
11:45		91	4	328	29	93	8	287	47	615	76
Total		2250	2807			1785	3521			4035	6328
Percent		44.5%	55.5%			33.6%	66.4%			38.9%	61.1%

MDM Transportation Consultants, INC.
28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street/Kendall Avenue
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at Speen 7-9
Site Code : 875
Start Date : 5/5/2016

	Speen Street From North				Coolidge Street From East				Kendall Avenue From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	**22**	**56**	0	**78**	79	**27**	0	106	**85**	77	0	**162**	**346**
07:45 AM	21	42	0	63	96	25	0	121	53	**97**	0	150	334
08:00 AM	20	47	**1**	68	91	22	0	113	43	59	0	102	283
08:15 AM	22	48	0	70	**109**	27	0	**136**	48	67	0	115	321
Total Volume	85	193	1	279	375	101	0	476	229	300	0	529	1284
% App. Total	30.5	69.2	0.4		78.8	21.2	0		43.3	56.7	0		
PHF	.966	.862	.250	.894	.860	.935	.000	.875	.674	.773	.000	.816	.928
Passenger Vehicles	80	179	1	260	359	98	0	457	213	277	0	490	1207
% Passenger Vehicles	94.1	92.7	100	93.2	95.7	97.0	0	96.0	93.0	92.3	0	92.6	94.0
Heavy Vehicles	5	14	0	19	16	3	0	19	16	23	0	39	77
% Heavy Vehicles	5.9	7.3	0	6.8	4.3	3.0	0	4.0	7.0	7.7	0	7.4	6.0



MDM Transportation Consultants, INC.
28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street/Kendall Avenue
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at Speen 7-9
Site Code : 875
Start Date : 5/5/2016
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

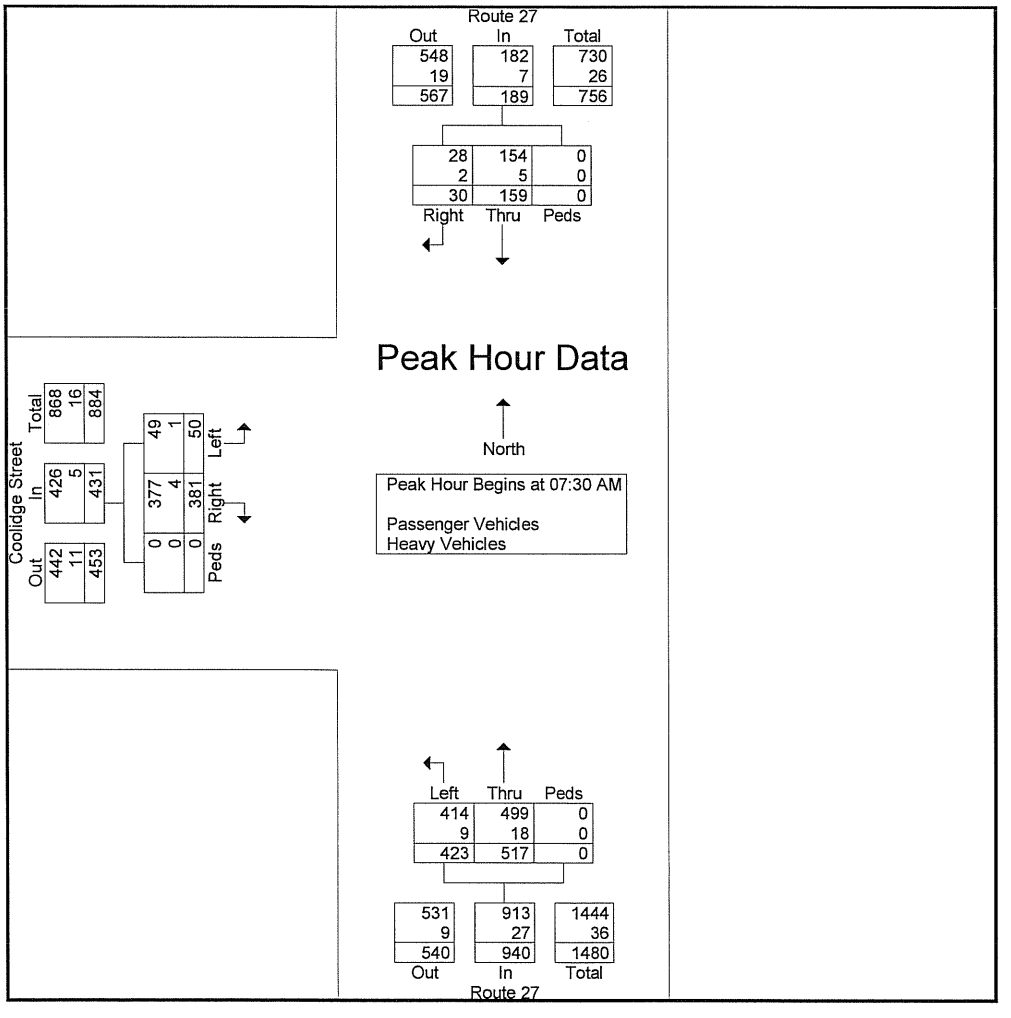
	Speen Street From North				Coolidge Street From East				Kendall Avenue From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	29	28	0	57	71	24	0	95	47	82	0	129	281
07:15 AM	19	51	0	70	81	16	0	97	54	80	0	134	301
07:30 AM	22	56	0	78	79	27	0	106	85	77	0	162	346
07:45 AM	21	42	0	63	96	25	0	121	53	97	0	150	334
Total	91	177	0	268	327	92	0	419	239	336	0	575	1262
08:00 AM	20	47	1	68	91	22	0	113	43	59	0	102	283
08:15 AM	22	48	0	70	109	27	0	136	48	67	0	115	321
08:30 AM	27	33	0	60	112	19	0	131	40	54	0	94	285
08:45 AM	15	42	0	57	107	32	0	139	32	60	0	92	288
Total	84	170	1	255	419	100	0	519	163	240	0	403	1177
Grand Total	175	347	1	523	746	192	0	938	402	576	0	978	2439
Apprch %	33.5	66.3	0.2		79.5	20.5	0		41.1	58.9	0		
Total %	7.2	14.2	0	21.4	30.6	7.9	0	38.5	16.5	23.6	0	40.1	
Passenger Vehicles	164	325	1	490	717	186	0	903	377	530	0	907	2300
% Passenger Vehicles	93.7	93.7	100	93.7	96.1	96.9	0	96.3	93.8	92	0	92.7	94.3
Heavy Vehicles	11	22	0	33	29	6	0	35	25	46	0	71	139
% Heavy Vehicles	6.3	6.3	0	6.3	3.9	3.1	0	3.7	6.2	8	0	7.3	5.7

MDM Transportation Consultants, INC.
28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main St (Route 27)
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at 27 7-9
Site Code : 875
Start Date : 5/5/2016
Page No : 2

	Route 27 From North				Route 27 From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	8	39	0	47	128	91	0	219	**127**	**13**	0	**140**	**406**
07:45 AM	3	37	0	40	**134**	107	0	241	82	13	0	95	376
08:00 AM	**12**	33	0	45	123	111	0	234	81	13	0	94	373
08:15 AM	7	**50**	0	**57**	132	**114**	0	**246**	91	11	0	102	405
Total Volume	30	159	0	189	517	423	0	940	381	50	0	431	1560
% App. Total	15.9	84.1	0		55	45	0		88.4	11.6	0		
PHF	.625	.795	.000	.829	.965	.928	.000	.955	.750	.962	.000	.770	.961
Passenger Vehicles	28	154	0	182	499	414	0	913	377	49	0	426	1521
% Passenger Vehicles	93.3	96.9	0	96.3	96.5	97.9	0	97.1	99.0	98.0	0	98.8	97.5
Heavy Vehicles	2	5	0	7	18	9	0	27	4	1	0	5	39
% Heavy Vehicles	6.7	3.1	0	3.7	3.5	2.1	0	2.9	1.0	2.0	0	1.2	2.5



MDM Transportation Consultants, INC.

28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main St (Route 27)
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at 27 7-9
Site Code : 875
Start Date : 5/5/2016
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

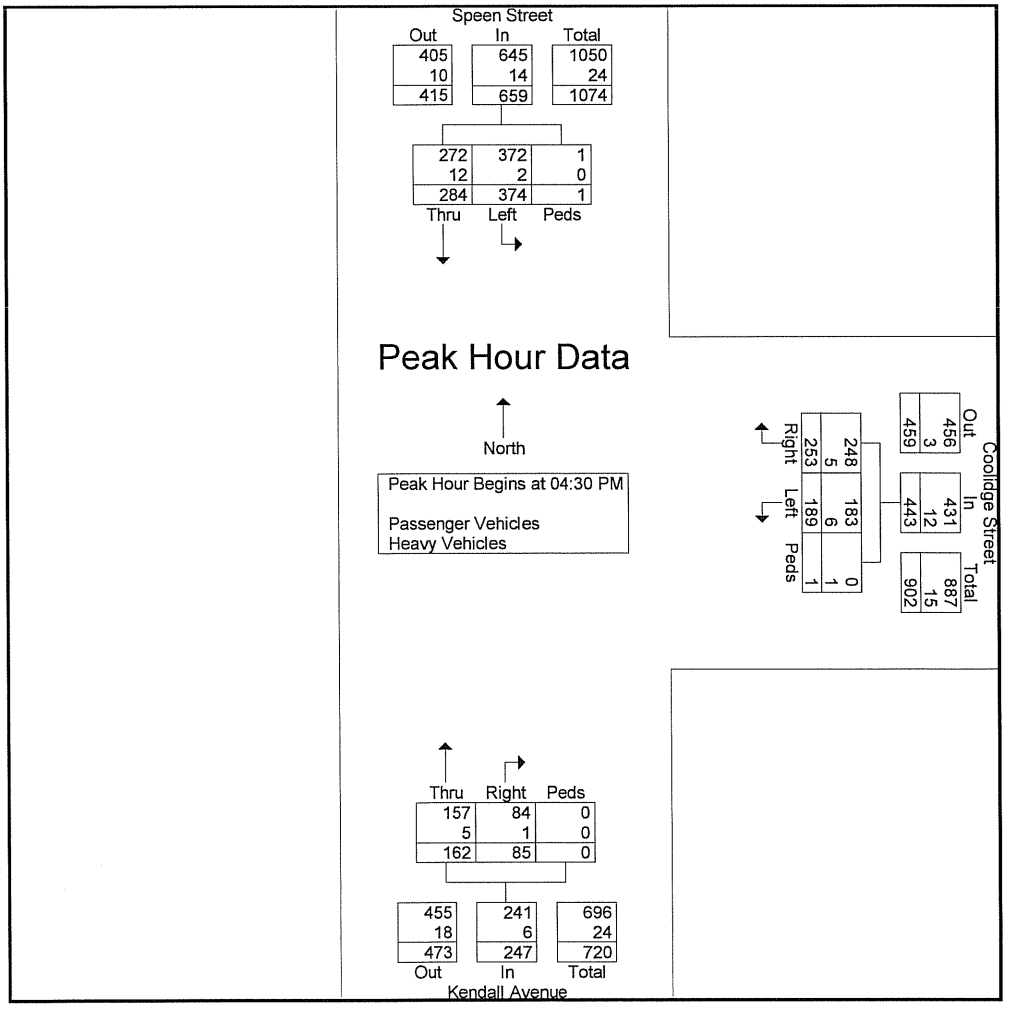
	Route 27 From North				Route 27 From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
07:00 AM	11	50	0	61	129	81	0	210	71	7	0	78	349
07:15 AM	9	57	0	66	132	88	0	220	102	14	0	116	402
07:30 AM	8	39	0	47	128	91	0	219	127	13	0	140	406
07:45 AM	3	37	0	40	134	107	0	241	82	13	0	95	376
Total	31	183	0	214	523	367	0	890	382	47	0	429	1533
08:00 AM	12	33	0	45	123	111	0	234	81	13	0	94	373
08:15 AM	7	50	0	57	132	114	0	246	91	11	0	102	405
08:30 AM	5	56	0	61	122	136	0	258	66	6	0	72	391
08:45 AM	7	35	0	42	125	127	0	252	78	6	0	84	378
Total	31	174	0	205	502	488	0	990	316	36	0	352	1547
Grand Total	62	357	0	419	1025	855	0	1880	698	83	0	781	3080
Apprch %	14.8	85.2	0		54.5	45.5	0		89.4	10.6	0		
Total %	2	11.6	0	13.6	33.3	27.8	0	61	22.7	2.7	0	25.4	
Passenger Vehicles	56	352	0	408	987	840	0	1827	692	81	0	773	3008
% Passenger Vehicles	90.3	98.6	0	97.4	96.3	98.2	0	97.2	99.1	97.6	0	99	97.7
Heavy Vehicles	6	5	0	11	38	15	0	53	6	2	0	8	72
% Heavy Vehicles	9.7	1.4	0	2.6	3.7	1.8	0	2.8	0.9	2.4	0	1	2.3

MDM Transportation Consultants, INC.
28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street/Kendall Avenue
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at Speen 4-6
Site Code : 875
Start Date : 5/5/2016

	Speen Street From North				Coolidge Street From East				Kendall Avenue From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	66	83	0	149	66	**62**	0	**128**	17	41	0	58	335
04:45 PM	67	**117**	0	**184**	61	40	**1**	102	**25**	38	0	63	**349**
05:00 PM	75	79	**1**	155	57	46	0	103	24	**49**	0	**73**	331
05:15 PM	**76**	95	0	171	**69**	41	0	110	19	34	0	53	334
Total Volume	284	374	1	659	253	189	1	443	85	162	0	247	1349
% App. Total	43.1	56.8	0.2		57.1	42.7	0.2		34.4	65.6	0		
PHF	.934	.799	.250	.895	.917	.762	.250	.865	.850	.827	.000	.846	.966
Passenger Vehicles	272	372	1	645	248	183	0	431	84	157	0	241	1317
% Passenger Vehicles	95.8	99.5	100	97.9	98.0	96.8	0	97.3	98.8	96.9	0	97.6	97.6
Heavy Vehicles	12	2	0	14	5	6	1	12	1	5	0	6	32
% Heavy Vehicles	4.2	0.5	0	2.1	2.0	3.2	100	2.7	1.2	3.1	0	2.4	2.4



MDM Transportation Consultants, INC.
28 Lord Road, Suite 280
Marlborough, MA

N/S: Speen Street/Kendall Avenue
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at Speen 4-6
Site Code : 875
Start Date : 5/5/2016
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

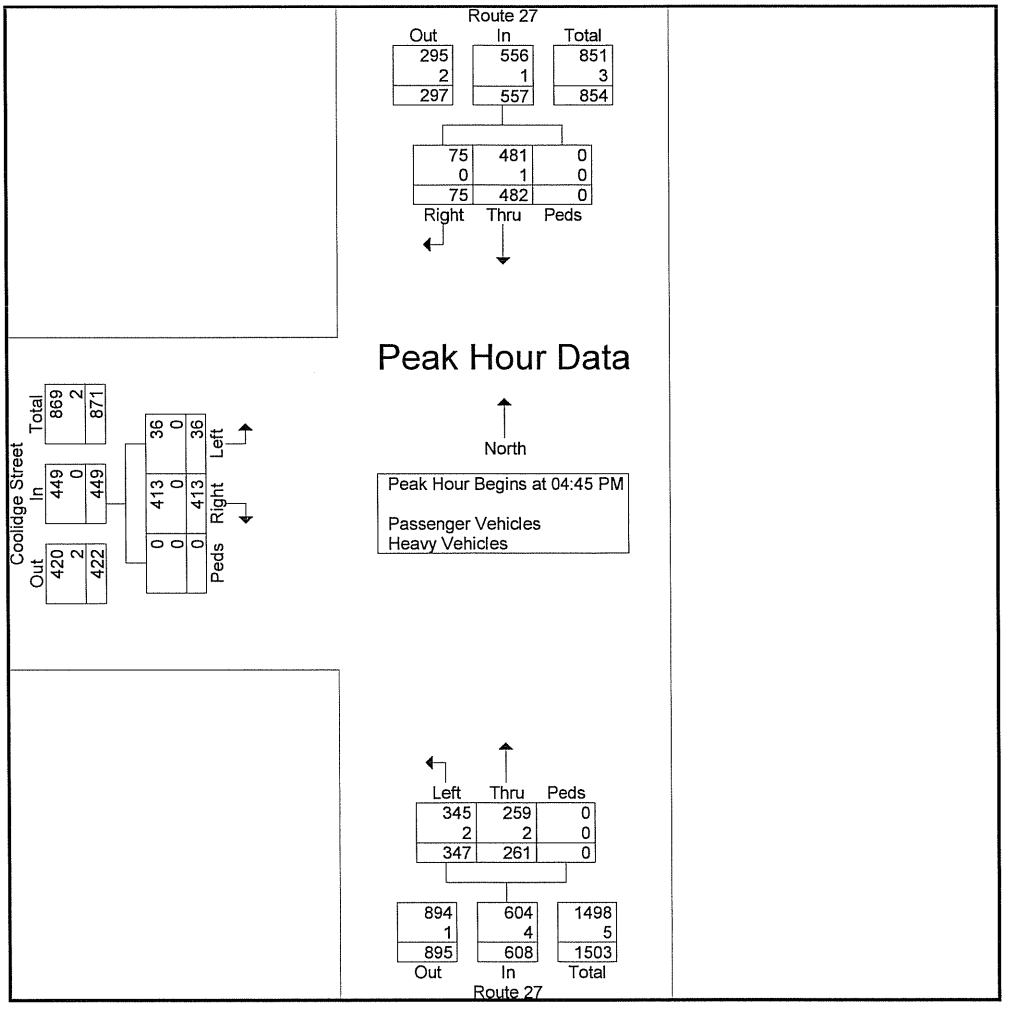
	Speen Street From North				Coolidge Street From East				Kendall Avenue From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
04:00 PM	73	81	0	154	45	33	0	78	20	40	0	60	292
04:15 PM	57	101	0	158	65	50	0	115	26	31	0	57	330
04:30 PM	66	83	0	149	66	62	0	128	17	41	0	58	335
04:45 PM	67	117	0	184	61	40	1	102	25	38	0	63	349
Total	263	382	0	645	237	185	1	423	88	150	0	238	1306
05:00 PM	75	79	1	155	57	46	0	103	24	49	0	73	331
05:15 PM	76	95	0	171	69	41	0	110	19	34	0	53	334
05:30 PM	62	79	0	141	50	48	0	98	25	48	0	73	312
05:45 PM	63	82	0	145	53	40	0	93	17	30	0	47	285
Total	276	335	1	612	229	175	0	404	85	161	0	246	1262
Grand Total	539	717	1	1257	466	360	1	827	173	311	0	484	2568
Apprch %	42.9	57	0.1		56.3	43.5	0.1		35.7	64.3	0		
Total %	21	27.9	0	48.9	18.1	14	0	32.2	6.7	12.1	0	18.8	
Passenger Vehicles	511	711	1	1223	457	338	0	795	171	302	0	473	2491
% Passenger Vehicles	94.8	99.2	100	97.3	98.1	93.9	0	96.1	98.8	97.1	0	97.7	97
Heavy Vehicles	28	6	0	34	9	22	1	32	2	9	0	11	77
% Heavy Vehicles	5.2	0.8	0	2.7	1.9	6.1	100	3.9	1.2	2.9	0	2.3	3

MDM Transportation Consultants, INC.
28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main Street (Route 27)
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at 27 4-6
Site Code : 875
Start Date : 5/5/2016
Page No : 2

	Route 27 From North				Route 27 From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	**21**	**127**	0	**148**	54	**91**	0	145	104	9	0	113	406
05:00 PM	17	115	0	132	**80**	91	0	**171**	105	9	0	114	**417**
05:15 PM	17	123	0	140	62	86	0	148	**107**	**15**	0	**122**	410
05:30 PM	20	117	0	137	65	79	0	144	97	3	0	100	381
Total Volume	75	482	0	557	261	347	0	608	413	36	0	449	1614
% App. Total	13.5	86.5	0		42.9	57.1	0		92	8	0		
PHF	.893	.949	.000	.941	.816	.953	.000	.889	.965	.600	.000	.920	.968
Passenger Vehicles	75	481	0	556	259	345	0	604	413	36	0	449	1609
% Passenger Vehicles	100	99.8	0	99.8	99.2	99.4	0	99.3	100	100	0	100	99.7
Heavy Vehicles	0	1	0	1	2	2	0	4	0	0	0	0	5
% Heavy Vehicles	0	0.2	0	0.2	0.8	0.6	0	0.7	0	0	0	0	0.3



MDM Transportation Consultants, INC.
28 Lord Road, Suite 280
Marlborough, MA

N/S: N Main Street (Route 27)
E/W: Coolidge Street
Sherborn, MA

File Name : 875 Coolidge at 27 4-6
Site Code : 875
Start Date : 5/5/2016
Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

	Route 27 From North				Route 27 From South				Coolidge Street From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
04:00 PM	13	135	0	148	56	78	0	134	99	3	0	102	384
04:15 PM	13	115	0	128	52	109	0	161	100	6	0	106	395
04:30 PM	18	111	0	129	40	93	0	133	89	6	0	95	357
04:45 PM	21	127	0	148	54	91	0	145	104	9	0	113	406
Total	65	488	0	553	202	371	0	573	392	24	0	416	1542
05:00 PM	17	115	0	132	80	91	0	171	105	9	0	114	417
05:15 PM	17	123	0	140	62	86	0	148	107	15	0	122	410
05:30 PM	20	117	0	137	65	79	0	144	97	3	0	100	381
05:45 PM	8	104	0	112	52	96	0	148	92	8	0	100	360
Total	62	459	0	521	259	352	0	611	401	35	0	436	1568
Grand Total	127	947	0	1074	461	723	0	1184	793	59	0	852	3110
Apprch %	11.8	88.2	0		38.9	61.1	0		93.1	6.9	0		
Total %	4.1	30.5	0	34.5	14.8	23.2	0	38.1	25.5	1.9	0	27.4	
Passenger Vehicles	127	942	0	1069	456	716	0	1172	791	58	0	849	3090
% Passenger Vehicles	100	99.5	0	99.5	98.9	99	0	99	99.7	98.3	0	99.6	99.4
Heavy Vehicles	0	5	0	5	5	7	0	12	2	1	0	3	20
% Heavy Vehicles	0	0.5	0	0.5	1.1	1	0	1	0.3	1.7	0	0.4	0.6

- □ Speed Data

E/W: Coolidge Street
Near Site Driveway
Sherborn, MA

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

28 Lord Road, Suite 280
Marlborough, MA 01752

Site Code: 1095

Westbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
09/01/20	0	0	0	0	1	5	1	3	0	0	0	0	0	0	10	47
01:00	0	0	0	0	0	1	3	1	0	0	0	0	0	0	5	46
02:00	0	0	0	0	2	0	0	0	1	0	0	0	0	0	3	52
03:00	0	0	0	0	1	4	2	2	0	0	0	0	0	0	9	46
04:00	0	0	0	0	1	6	3	2	1	1	0	0	0	0	14	49
05:00	0	0	0	1	8	42	33	6	0	0	0	0	0	0	90	43
06:00	0	0	0	0	14	66	74	19	7	1	0	0	0	0	181	44
07:00	0	0	0	1	19	94	138	43	2	0	1	0	0	0	298	45
08:00	0	0	0	0	27	113	128	32	2	0	0	0	0	0	302	44
09:00	3	5	8	9	36	96	81	23	1	0	1	0	0	0	263	44
10:00	0	0	0	6	22	128	111	13	1	0	0	0	0	0	281	43
11:00	0	0	1	1	39	149	117	24	2	2	0	0	0	0	335	44
12 PM	0	0	1	10	27	128	128	11	2	0	0	0	0	0	307	43
13:00	0	1	2	5	38	138	112	27	5	0	0	0	0	0	328	44
14:00	0	0	0	3	40	174	101	17	0	0	0	0	0	0	335	43
15:00	0	0	0	1	29	155	149	25	3	0	0	0	0	0	362	44
16:00	0	0	0	0	51	159	118	21	1	1	0	0	0	0	351	43
17:00	0	0	0	2	36	187	113	22	0	0	0	0	0	0	360	43
18:00	0	0	0	0	16	95	96	29	2	0	0	0	0	0	238	44
19:00	0	0	1	2	17	75	60	13	1	0	0	0	0	0	169	44
20:00	0	0	0	2	14	40	35	6	0	0	1	0	0	0	98	43
21:00	0	0	0	1	5	23	20	8	0	1	0	0	0	0	58	45
22:00	0	0	0	1	9	13	10	7	1	0	0	1	0	0	42	46
23:00	0	0	0	0	2	5	9	4	1	0	1	0	0	0	22	48
Total	3	6	13	45	454	1896	1642	358	33	6	4	1	0	0	4461	

	15th Percentile :	35 MPH
	50th Percentile :	39 MPH
	85th Percentile :	44 MPH
	95th Percentile :	47 MPH
Statistics	10 MPH Pace Speed :	36-45 MPH
	Number in Pace :	3538
	Percent in Pace :	79.3%
	Number of Vehicles > 35 MPH :	3940
	Percent of Vehicles > 35 MPH :	88.3%
	Mean Speed(Average) :	40 MPH

E/W: Coolidge Street
Near Site Driveway
Sherborn, MA

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers
28 Lord Road, Suite 280
Marlborough, MA 01752

Site Code: 1095

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
09/01/20	0	0	0	0	0	9	5	2	1	0	0	0	0	0	17	46
01:00	0	0	0	0	1	1	0	1	1	0	0	0	0	0	4	52
02:00	0	0	0	1	1	0	1	1	0	0	0	0	0	0	4	47
03:00	0	0	0	0	0	0	1	1	1	0	0	0	0	0	3	52
04:00	0	0	0	0	0	3	2	2	0	0	0	0	0	0	7	47
05:00	0	0	0	0	1	15	8	5	1	1	0	0	0	0	31	47
06:00	0	1	3	1	12	72	58	11	2	0	0	0	0	0	160	44
07:00	1	0	0	5	35	134	94	20	2	0	0	0	0	0	291	43
08:00	0	1	0	5	39	111	95	13	0	1	0	0	0	0	265	43
09:00	0	1	1	7	46	93	66	6	2	0	0	0	0	0	222	43
10:00	0	0	0	8	34	110	62	8	1	0	0	0	0	0	223	43
11:00	0	1	7	7	36	125	92	20	4	1	0	0	0	0	293	43
12 PM	0	0	1	6	44	130	137	17	2	0	0	0	0	0	337	43
13:00	2	5	3	12	54	133	97	12	3	0	0	0	0	0	321	43
14:00	0	0	2	4	54	170	113	15	2	0	0	0	0	0	360	43
15:00	0	0	0	10	40	158	128	35	3	0	0	0	0	0	374	44
16:00	0	0	0	3	27	133	164	46	5	0	0	0	0	0	378	44
17:00	0	0	0	2	28	175	164	28	4	0	0	0	0	0	401	44
18:00	0	0	0	1	10	102	143	45	3	0	0	0	0	0	304	45
19:00	0	0	0	0	29	106	81	24	2	0	0	0	0	0	242	44
20:00	0	0	0	1	15	62	50	12	1	1	0	0	0	0	142	44
21:00	0	0	0	1	5	25	23	8	3	0	0	0	0	0	65	45
22:00	0	0	0	0	3	19	24	8	2	0	0	0	0	0	56	46
23:00	0	0	0	1	4	9	6	2	1	0	0	0	0	0	23	44
Total	3	9	17	75	518	1895	1614	342	46	4	0	0	0	0	4523	

	15th Percentile :	35 MPH
	50th Percentile :	39 MPH
	85th Percentile :	44 MPH
	95th Percentile :	47 MPH
Statistics	10 MPH Pace Speed :	36-45 MPH
	Number in Pace :	3509
	Percent in Pace :	77.6%
	Number of Vehicles > 35 MPH :	3901
	Percent of Vehicles > 35 MPH :	86.2%
	Mean Speed(Average) :	40 MPH

- Crash Data

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Sherborn, MA COUNT DATE : Sep-20

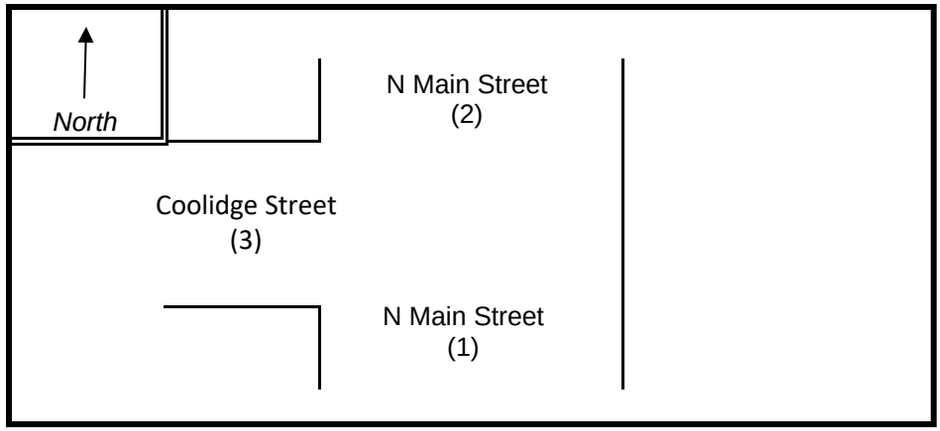
DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : North Main Street

MINOR STREET(S) : Coolidge Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	685	457	528			**1,670**

" K " FACTOR : **0.086** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **19,419**

TOTAL # OF CRASHES : 13 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **2.60**

CRASH RATE CALCULATION : **0.37** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : MassDOT District 3 Avg: Signalized = 0.89; Unsignalized = 0.61

Project Title & Date: 1096 - Sherborn

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Sherborn, MA COUNT DATE : Sep-20

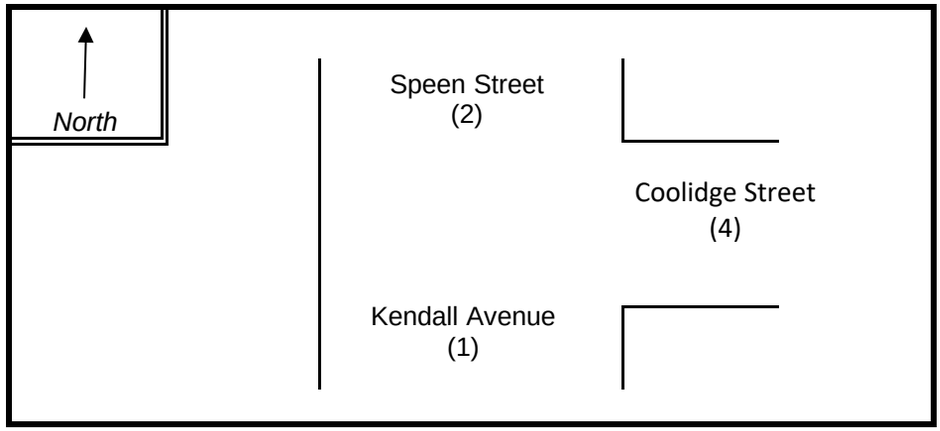
DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Speen Street/Kendall Avenue

MINOR STREET(S) : Coolidge Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	221	666		487		**1,374**

" K " FACTOR : **0.086** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **15,977**

TOTAL # OF CRASHES : 11 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **2.20**

CRASH RATE CALCULATION : **0.38** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : MassDOT District 3 Avg: Signalized = 0.89; Unsignalized = 0.61

Project Title & Date: 1096 - Sherborn

Coolidge Street at Speen Street/Kendall Avenue

Crash Number	City Town Name	Crash Date	Crash Severity	Crash Time	Number of Vehicles	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Most Harmful Event (All Vehicles)	X	Y	Roadway
3999066	SHERBORN	01/15/2015	Non-fatal injury	8:29 AM	3	Daylight	Rear-end	Ice	0	1	V1: Travelling straight ahead / V2: Travelling straight ahead / V3: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car) / V3:(Passenger car)	V1: S / V2: N / V3: N	Clear	V1:(Collision with other movable object) / V2:(Collision with motor vehicle in traffic) / V3:(Collision with motor vehicle in traffic)	209682.3554	890981.8469	KENDALL AVE
4006956	SHERBORN	02/05/2015	Property damage only (none injured)	7:04 AM	1	Daylight	Single vehicle crash	Wet	0	0	V1: Travelling straight ahead	V1:(Passenger car)	V1: E	Snow/Cloudy	V1:(Overturn/rollover)	209699.0381	890990.0458	/ / KENDALL AVENUE
4109585	SHERBORN	11/11/2015	Property damage only (none injured)	1:03 PM	2	Daylight	Single vehicle crash	Wet	0	0	V1: Turning left / V2: Turning left	V1:(Single-unit truck (3-or-more axles)) / V2:(Truck/trailer)	V1: S / V2: S	Rain/Cloudy	V1:(Cargo/equipment loss or shift) / V2:(Cargo/equipment loss or shift)	209712.2339	890999.8292	SPEEN STREET / COOLIDGE STREET
4207932	SHERBORN	06/17/2016	Property damage only (none injured)	1:18 AM	1	Dark - lighted roadway	Single vehicle crash	Dry	0	0	V1: Travelling straight ahead	V1:(Passenger car)	V1: N	Clear	V1:(Collision with utility pole)	209682.3554	890981.8469	KENDALL AVE
4327529	SHERBORN	02/12/2017	Non-fatal injury	4:19 PM	1	Dusk	Single vehicle crash	Snow	0	4	V1: Travelling straight ahead	V1:(Passenger car)	V1: N	Snow/Sleet, hail (freezing rain or drizzle)	V1:(Collision with utility pole)	209712.2339	890999.8292	COOLIDGE ST / SPEEN ST
4377619	SHERBORN	06/10/2017	Property damage only (none injured)	7:23 AM	1	Daylight	Single vehicle crash	Dry	0	0	V1: Turning left	V1:(Passenger car)	V1: E	Clear	V1:(Collision with highway traffic sign post)	209712.2339	890999.8292	COOLIDGE ST / SPEEN ST
4444200	SHERBORN	10/17/2017	Property damage only (none injured)	5:53 PM	2	Daylight	Sideswipe, same direction	Dry	0	0	V1: Turning left / V2: Turning right	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Passenger car)	V1: S / V2: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	209712.2339	890999.8292	COOLIDGE ST / KENDALL AVE
4486119	SHERBORN	01/17/2018	Non-fatal injury	7:38 AM	2	Daylight	Head-on	Snow	0	1	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: W	Snow	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	209712.2339	890999.8292	COOLIDGE ST / KENDALL AVE
4494027	SHERBORN	01/30/2018	Property damage only (none injured)	6:36 AM	1	Dawn	Single vehicle crash	Snow	0	0	V1: Travelling straight ahead	V1:(Passenger car)	V1: N	Snow/Cloudy	V1:(Collision with embankment)	209712.2339	890999.8292	SPEEN ST / COOLIDGE ST
4608124	SHERBORN	10/05/2018	Property damage only (none injured)	1:06 AM	1	Dark - lighted roadway	Single vehicle crash	Dry	0	0	V1: Turning left	V1:(Passenger car)	V1: W	Clear	V1:(Collision with ditch)	209704.7628	890993.2551	COOLIDGE ST / KENDALL AVE
4613203	SHERBORN	10/23/2018	Property damage only (none injured)	3:30 PM	2	Daylight	Angle	Dry	0	0	V1: Turning left / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: W	Cloudy	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	209704.7628	890993.2551	COOLIDGE ST / KENDALL AVE

Data Level: CRASH
Query Type Spatial
Criteria: If you conducted an Advanced Query your SQL statement will be listed here

Coolidge Street at North Main Street

Crash Number	City Town Name	Crash Date	Crash Severity	Crash Time	Number of Vehicles	Light Conditions	Manner of Collision	Road Surface Condition	Roadway Junction Type	Total Fatalities	Total Non-Fatal Injuries	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Most Harmful Event (All Vehicles)	X	Y	Roadway
4211228	SHERBORN	06/28/2016	Non-fatal injury	3:37 PM	2	1 Daylight	Sideswipe, same direction	Dry	Not at junction	0	0	V1: Travelling straight ahead	V1:(Passenger car)	V1: N	Clear	V1:(Collision with cyclist (bicycle, tricycle, unicycle, pedal car))	210863.5067	889486.7626	NORTH MAIN ST
4230628	SHERBORN	08/02/2016	Property damage only (none injured)	8:11 AM	2	2 Daylight	Rear-end	Wet	T-intersection	0	0	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Rain	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	210864.3123	889469.75	NORTH MAIN ST Rte 27 N / COOLIDGE ST Rte 27 N
4240777	SHERBORN	08/26/2016	Non-fatal injury	8:48 AM	2	2 Daylight	Angle	Dry	Driveway	0	0	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: N	Cloudy	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	210864.2553	889469.8856	NORTH MAIN ST
4299435	SHERBORN	12/15/2016	Property damage only (none injured)	4:56 PM	2	2 Dark - lighted roadway	Rear-end	Dry	Not at junction	0	0	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	210863.5067	889486.7626	NORTH MAIN ST
4333235	SHERBORN	02/26/2017	Property damage only (none injured)	2:10 PM	2	2 Daylight	Rear-end	Dry	T-intersection	0	0	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	210864.3123	889469.75	NORTH MAIN ST / COOLIDGE ST
4342878	SHERBORN	03/24/2017	Property damage only (none injured)	6:33 PM	2	2 Dusk	Angle	Dry	T-intersection	0	0	V1: Turning left / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	210864.3123	889469.75	COOLIDGE ST / NORTH MAIN ST
4449425	SHERBORN	10/25/2017	Property damage only (none injured)	8:20 AM	2	2 Daylight	Rear-end	Wet	T-intersection	0	0	V1: Turning left / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Rain	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	210864.3123	889469.75	COOLIDGE ST / NORTH MAIN ST
4461123	SHERBORN	11/27/2017	Property damage only (none injured)	4:12 AM	1	Dark - roadway not lighted	Single vehicle crash	Dry	T-intersection	0	0	V1: Travelling straight ahead	V1:(Passenger car)	V1: S	Clear	V1:(Collision with animal - deer)	210864.3123	889469.75	COOLIDGE ST / NORTH MAIN ST
4528710	SHERBORN	04/13/2018	Property damage only (none injured)	6:45 AM	2	2 Daylight	Rear-end	Dry	T-intersection	0	0	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	210863.5067	889486.7626	NORTH MAIN ST
4583066	SHERBORN	08/09/2018	Property damage only (none injured)	3:39 PM	2	2 Daylight	Rear-end	Dry	Not at junction	0	0	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	210809.5081	889514.1554	COOLIDGE ST
4659314	SHERBORN	02/01/2019	Non-fatal injury	5:36 PM	3	Dark - roadway not lighted	Rear-end	Sand, mud, dirt, oil, gravel	Not at junction	0	1	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic / V3: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car) / V3:(Passenger car)	V1: E / V2: E / V3: E	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic) / V3:(Collision with motor vehicle in traffic)	210809.5081	889514.1554	COOLIDGE ST
4746919	SHERBORN	08/21/2019	Property damage only (none injured)	3:30 PM	3	2 Daylight	Front to Rear	Wet	T-intersection	0	0	V1: Travelling straight ahead / V2: Slowing or stopped in traffic / V3: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car) / V3:(Passenger car)	V1: E / V2: E / V3: E	Rain	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic) / V3:(Collision with motor vehicle in traffic)	210864.3123	889469.7501	COOLIDGE ST / NORTH MAIN ST

Data Level: CRASH
Query Type: Spatial
Criteria: If you conducted an Advanced Query your SQL statement will be listed here

□ Sight Distance Calculations

Intersection Sight Distance Calculations

Source: *A Policy on Geometric Design of Highways and Street, 6th Edition;* AASHTO; 2011.

Passenger Car
ISD = 1.47 * V * t

V = speed
t = time gap

t = 7.5 s for a passenger car for Left Turn from a Stop
t = 6.5 s for a passenger car for Right Turn from a Stop

Posted (Regulatory) Speed Limit

Proposed Site Driveway ISD = 1.47 * 35 * 7.5 = 386 ft **SAY 390 ft**
(left-turn from a stop)

Proposed Site Driveway ISD = 1.47 * 35 * 6.5 = 335 ft **SAY 335 ft**
(right-turn from a stop)

Stopping Sight Distance - Posted

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	35	128.625	117.4	246.0
Direction 2	SB	35	128.625	117.4	246.0

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	35	35
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Average

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	40	147	153.3	300.3
Direction 2	SB	40	147	153.3	300.3

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	40	40
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - 85th Percentile

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	44	161.7	185.5	347.2
Direction 2	WB	44	161.7	185.5	347.2

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	44	44
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

□ Seasonal/Yearly Growth Data

STATION 307 - WESTBOROUGH - RTE.9 - EAST OF NORTHBOROUGH T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
06	44,301	44,854	50,326	51,170	51,729	52,438	48,052	50,270	50,998	50,194	50,043	*50,032*	49,534
	7%	5%	-2%	-4%	-3%	-1%	10%	4%	-4%	1%	-1%	-6%	0%
07	47,505	47,283	49,268	49,136	*50,000*	*52,000*	*53,000*	52,322	49,031	50,571	49,662	47,007	49,732
	-4%	-2%	-3%	1%	1%	-4%	-8%	-7%	-1%	-3%	-4%	-1%	-3%
08	45,614	46,112	47,829	49,816	*50,518*	*49,936*	*48,629*	48,759	48,531	49,009	47,490	46,696	48,245
	-3%	1%	-3%	-2%	-2%	0%	-2%	-3%	-2%	-1%	0%	2%	-1%
09	44,103	46,434	46,455	49,049	*49,474*	*49,934*	*47,638*	47,056	47,762	48,663	47,379	47,564	47,626
	-1%	0%	2%	0%	0%	1%	-1%	1%	1%	1%	2%	2%	1%
11	43,244	46,150	48,016	48,943	*49,781*	*50,525*	*46,812*	48,234	48,825	49,198	49,151	49,888	48,231
	7%	2%	1%	-1%	1%	-1%	3%	4%	0%	2%	2%	-5%	1%
12	46,381	46,883	48,608	48,662	*50,126*	*49,961*	*48,380*	49,941	48,882	50,056	50,015	47,600	48,791
	0%	-1%	-2%	1%	1%	-9%	3%	-1%	2%	0%	-1%	2%	0%
13	46,393	46,220	47,421	49,359	*50,657*	*45,623*	*49,797*	49,223	49,935	50,021	49,651	48,441	48,562
	1%	1%	2%	1%	1%	6%	0%	1%	0%	1%	1%	1%	1%
16	47,447	47,570	50,342	50,977	*52,259*	*53,476*	*49,724*	50,789	50,057	51,035	51,749	50,442	50,489
Seasonal Adjustment Factor	1.07	1.05	1.01	0.99	0.97	0.97	1.00	0.99	0.99	0.98	0.99	1.01	
(to average month)												**Growth**	**-0.2%**

STATION 3180 - MILFORD - RTE.I-495 - AT MEDWAY T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
06	72,492	71,145	76,347	78,305	80,480	85,728	84,957	89,595	83,740	80,518	79,468	76,386	79,930
	-2%	-1%	-4%	-2%	6%	3%	4%	2%	-1%	2%	-2%	-5%	0%
07	70,749	70,432	73,596	76,751	85,024	88,000	88,401	91,080	83,309	82,221	77,941	72,362	79,989
	-2%	-3%	3%	-1%	-7%	-8%	-4%	-5%	-5%	-3%	-5%	-2%	-4%
08	69,200	68,456	76,000	75,934	79,352	81,166	84,701	86,189	78,778	79,645	73,861	70,747	77,002
	-5%	1%	-8%	1%	-1%	-1%	-1%	1%	6%	0%	2%	3%	0%
09	65,444	69,136	69,739	76,913	78,876	80,700	84,000	86,829	83,273	79,419	75,486	73,169	76,915
	3%	-1%	5%	1%	-1%	7%	4%	4%	0%	4%	3%	3%	3%
10	67,428	68,595	73,544	77,906	77,940	*86,167*	87,728	90,295	83,483	82,244	77,516	75,273	79,010
	-3%	2%	1%	-1%	3%	1%	-1%	-4%	1%	-2%	3%	2%	0%
11	*65,217*	69,804	73,992	77,115	80,458	87,344	86,859	87,108	84,288	80,223	*79,773*	76,729	79,076
	8%	2%	1%	1%	2%	0%	-1%	4%	-1%	3%	0%	-2%	1%
12	70,333	71,280	74,372	78,117	81,707	87,015	85,909	90,589	83,100	82,647	*79,570*	*74,989*	79,969
	-1%	1%	2%	2%	2%	2%	2%	1%	2%	2%	2%	2%	2%
17	66,101	76,457	80,500	85,524	91,188	96,164	93,860	97,247	92,026	92,357	*87,401*	*81,383*	86,684
Seasonal Adjustment Factor	1.17	1.13	1.07	1.02	0.98	0.92	0.92	0.89	0.95	0.97	1.01	1.06	
												Growth	**0.3%**

STATION 6647 - PLAINVILLE - RTE.1 - SOUTH OF RTE.152

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
06	16,136	16,177	16,793	16,635	16,763	17,137	16,432	16,995	17,013	17,067	17,113	*17,769*	16,836
	-1%	-2%	3%	2%	7%	4%	3%	2%	-2%	0%	1%	-5%	1%
07	15,944	15,859	17,304	17,030	17,864	17,901	16,906	17,416	16,727	17,138	17,324	16,879	17,024
	-1%	-1%	-3%	-1%	-4%	-4%	-1%	0%	3%	4%	-1%	5%	0%
08	15,821	15,698	16,800	16,942	17,171	17,178	16,746	17,340	17,202	17,760	17,072	17,679	16,951
	1%	4%	2%	4%	5%	7%	7%	5%	5%	3%	7%	8%	5%
09	16,043	16,380	17,174	17,667	17,999	18,392	17,996	18,129	18,133	18,217	18,190	19,022	17,779
	6%	-3%	1%	4%	6%	6%	1%	3%	2%	3%	0%	-9%	2%
13	16,927	15,836	17,405	18,408	19,117	19,419	18,199	18,723	18,472	18,737	18,205	17,328	18,065
	-7%	3%	2%	0%	2%	2%	1%	1%	2%	1%	0%	11%	1%
14	15,736	16,233	17,681	18,472	19,522	19,772.00	18,390	18,870	18,813	18,862	18,248	19,311	18,326
	5%	-6%	-1%	2%	-1%	0%	2%	0%	0%	0%	1%	3%	0%
15	16,524	15,242	17,452	18,866	19,424	19,678.00	18,842	18,863	18,782	18,894	18,426	19,907	18,408
	4%	9%	1%	0%	1%	0%	-1%	0%	-1%	0%	1%	-4%	1%
17	17,706	17,890	17,915	19,029	20,003	19,636.00	18,552	18,745	18,579	18,970	18,705	18,257	18,666
Seasonal Adjustment Factor	*1.09*	*1.10*	*1.03*	*0.99*	*0.96*	*0.95*	*1.00*	*0.98*	*0.99*	*0.98*	*0.99*	*0.97*	
(to average month)												**Growth**	**1.4%**

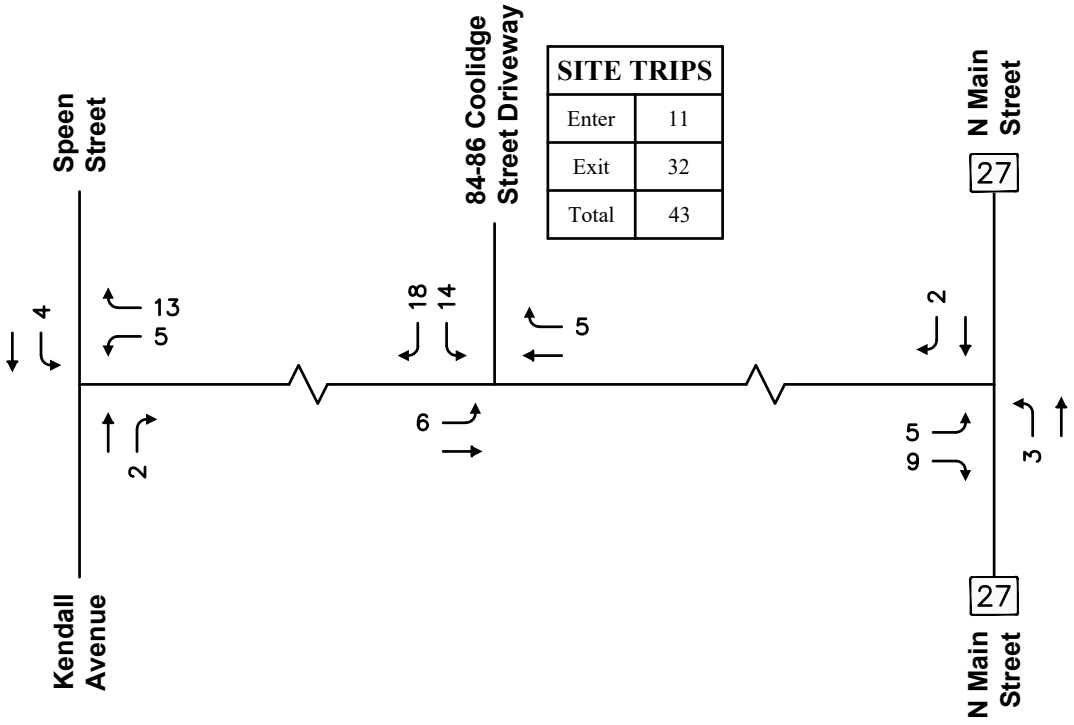
Average	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Seasonal Adjustment Factor	*1.11*	*1.09*	*1.03*	*1.00*	*0.97*	*0.95*	*0.97*	*0.95*	*0.98*	*0.98*	*1.00*	*1.02*
(to average month)												

Average Growth Rate 0.5%

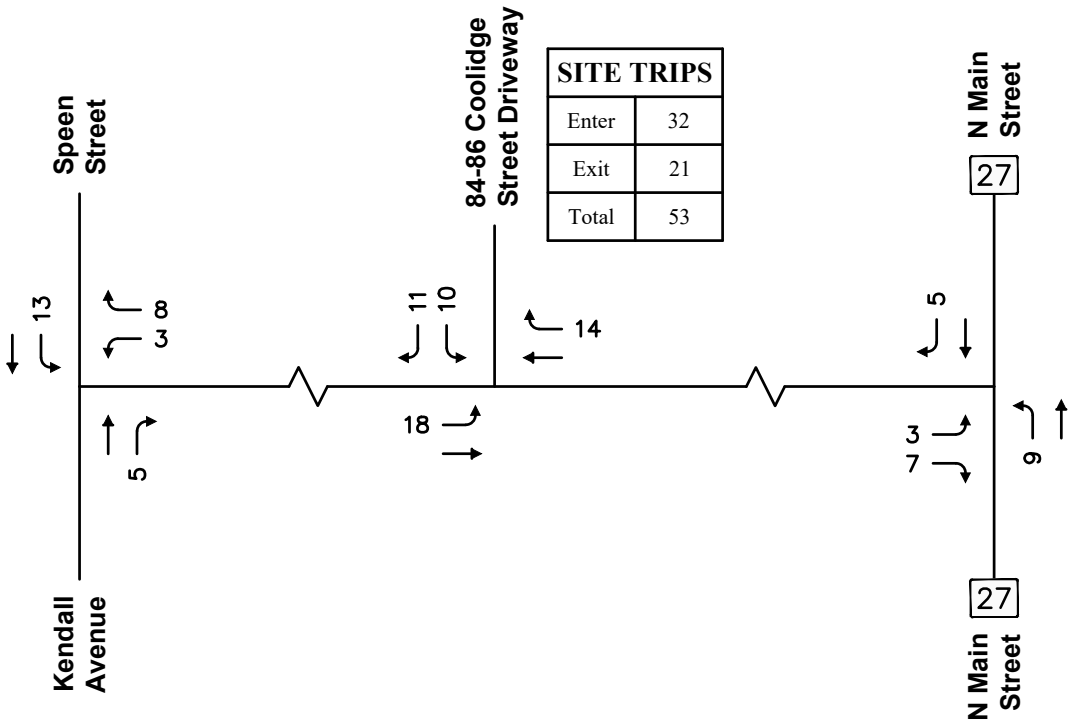
ITALICS = ESTIMATED DATA

MADT

- [ ] Background Projects



Weekday Morning Peak Hour



Weekday Evening Peak Hour

Attachment

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

84-86 Coolidge Street Trips
Peak Hour Traffic Volumes

Date: September 2020
Dwg No. 1095 TIAS01.dwg

- Trip Generation

Institute of Transportation Engineers (ITE) 10th Edition
Land Use Code (LUC) 252 - Senior Adult Housing - Attached

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 67

AVERAGE WEEKDAY DAILY

T = 3.70*(X) (Small Sample Size - Use with Caution)
T = 3.70* 67
T = 247.90 vehicle trips
T= 248
with 50% (124 vpd) entering and 50% (124 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.2*(X)
T = 0.20* 67
T = 13.00 vehicle trips
T = 13
with 35% (5 vph) entering and 65%(8 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.26*(X)
T = 0.26* 67
T = 17.00
T = 17
with 55% (9 vph) entering and 45%(8 vph) exiting.

SATURDAY DAILY

T = 3.23 * (X) (Small Sample Size - Use with Caution)
T = 3.23 * 67
T = 216.41
T = 216 vehicle trips
with 50% (108 vpd) entering and 50% (108 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 0.33 * (X)
T = 0.33 * 67
T = 22.11
T = 22 vehicle trips
with 62% (14 vph) entering and 38%(8 vph) exiting.

- Trip Distribution

Journey-to-Work Distribution

US Census Journey-to-Work Data

Residence Town Name	Workplace Town Name	All Workers	% of Total Rounded
Sherborn town Middlesex Co. MA	Sherborn town	408	21%
Sherborn town Middlesex Co. MA	Boston city	333	17%
Sherborn town Middlesex Co. MA	Framingham town	178	9%
Sherborn town Middlesex Co. MA	Natick town	172	9%
Sherborn town Middlesex Co. MA	Newton city	114	6%
Sherborn town Middlesex Co. MA	Wellesley town	97	5%
Sherborn town Middlesex Co. MA	Waltham city	67	3%
Sherborn town Middlesex Co. MA	Holliston town	59	3%
Sherborn town Middlesex Co. MA	Cambridge city	50	3%
Sherborn town Middlesex Co. MA	Marlborough city	41	2%
Sherborn town Middlesex Co. MA	Ashland town	39	2%
Sherborn town Middlesex Co. MA	Chelmsford town	34	2%
Sherborn town Middlesex Co. MA	Needham town	31	2%
Sherborn town Middlesex Co. MA	Woburn city	27	1%
Sherborn town Middlesex Co. MA	Lexington town	21	1%
Sherborn town Middlesex Co. MA	Westford town	19	1%
	Sub-Total	**1,690**	**86%**
	Other	272	14%
	Total	**1,962**	**100%**

Workplace	To/From Routes							
	Speen Street (To/From North)		Kendall Avenue (To/From West)		Route 27 (To/From North)		Route 27 (To/From South)		Total
Sherborn town		0.0%		0.0%		0.0%	100%	20.8%	20.8%
Boston city	100%	17.0%		0.0%		0.0%		0.0%	17.0%
Framingham town		0.0%	100%	9.1%		0.0%		0.0%	9.1%
Natick town	50%	4.4%		0.0%	50%	4.4%		0.0%	8.8%
Newton city	50%	2.9%		0.0%	50%	2.9%		0.0%	5.8%
Wellesley town		0.0%		0.0%	50%	2.5%	50%	2.5%	4.9%
Waltham city	100%	3.4%		0.0%		0.0%		0.0%	3.4%
Holliston town		0.0%		0.0%		0.0%	100%	3.0%	3.0%
Cambridge city	100%	2.5%		0.0%		0.0%		0.0%	2.5%
Marlborough city	50%	1.0%	50%	1.0%		0.0%		0.0%	2.1%
Ashland town		0.0%	50%	1.0%		0.0%	50%	1.0%	2.0%
Chelmsford town	100%	1.7%		0.0%		0.0%		0.0%	1.7%
Needham town		0.0%		0.0%	100%	1.6%		0.0%	1.6%
Woburn city	100%	1.4%		0.0%		0.0%		0.0%	1.4%
Lexington town	100%	1.1%		0.0%		0.0%		0.0%	1.1%
Westford town	100%	1.0%		0.0%		0.0%		0.0%	1.0%
Sub-Total		36.4%		11.1%		11.3%		27.3%	86.1%
Other		5.9%		1.8%		1.8%		4.4%	13.9%
Total		42.3%		12.9%		13.2%		31.7%	100.0%
	SAY	40%		15%		15%		30%	100%

- [ ] Capacity Analysis

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	103	383	306	234	197	87
Future Vol, veh/h	103	383	306	234	197	87
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	4	8	7	7	6
Mvmt Flow	111	412	329	252	212	94

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	973	455	0	0	581	0
Stage 1	455	-	-	-	-	-
Stage 2	518	-	-	-	-	-
Critical Hdwy	2.8	2	-	-	4.17	-
Critical Hdwy Stg 1	2.8	-	-	-	-	-
Critical Hdwy Stg 2	2.8	-	-	-	-	-
Follow-up Hdwy	2.8	2	-	-	2.263	-
Pot Cap-1 Maneuver	860	1582	-	-	969	-
Stage 1	1072	-	-	-	-	-
Stage 2	1044	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	661	1582	-	-	969	-
Mov Cap-2 Maneuver	661	-	-	-	-	-
Stage 1	1072	-	-	-	-	-
Stage 2	803	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	6.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	661	1582	969	-
HCM Lane V/C Ratio	-	-	0.168	0.26	0.219	-
HCM Control Delay (s)	-	-	11.5	8.1	9.8	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.6	1	0.8	-

Intersection	
Int Delay, s/veh	12.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	51	389	432	527	162	31
Future Vol, veh/h	51	389	432	527	162	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	1	2	4	3	7
Mvmt Flow	53	405	450	549	169	32

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1634	185	201	0	-	0
Stage 1	185	-	-	-	-	-
Stage 2	1449	-	-	-	-	-
Critical Hdwy	6.42	6.21	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.309	2.218	-	-	-
Pot Cap-1 Maneuver	111	860	1371	-	-	-
Stage 1	847	-	-	-	-	-
Stage 2	216	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	59	860	1371	-	-	-
Mov Cap-2 Maneuver	59	-	-	-	-	-
Stage 1	447	-	-	-	-	-
Stage 2	216	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	34.9	4	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1371	-	59	860	-	-
HCM Lane V/C Ratio	0.328	-	0.9	0.471	-	-
HCM Control Delay (s)	8.9	0	202.4	12.9	-	-
HCM Lane LOS	A	A	F	B	-	-
HCM 95th %tile Q(veh)	1.4	-	4.1	2.6	-	-

Intersection	
Int Delay, s/veh	6.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	193	258	165	87	382	290
Future Vol, veh/h	193	258	165	87	382	290
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	3	2	3	1	1	4
Mvmt Flow	199	266	170	90	394	299

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1302	215	0	0	260	0
Stage 1	215	-	-	-	-	-
Stage 2	1087	-	-	-	-	-
Critical Hdwy	2.8	2	-	-	4.11	-
Critical Hdwy Stg 1	2.8	-	-	-	-	-
Critical Hdwy Stg 2	2.8	-	-	-	-	-
Follow-up Hdwy	2.8	2	-	-	2.209	-
Pot Cap-1 Maneuver	743	1695	-	-	1310	-
Stage 1	1181	-	-	-	-	-
Stage 2	818	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	475	1695	-	-	1310	-
Mov Cap-2 Maneuver	475	-	-	-	-	-
Stage 1	1181	-	-	-	-	-
Stage 2	523	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	0	5.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	475	1695	1310	-
HCM Lane V/C Ratio	-	-	0.419	0.157	0.301	-
HCM Control Delay (s)	-	-	17.9	7.5	8.9	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	2	0.6	1.3	-

Intersection	
Int Delay, s/veh	13.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	37	421	354	266	492	77
Future Vol, veh/h	37	421	354	266	492	77
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	38	434	365	274	507	79

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1551	547	586	0	-	0
Stage 1	547	-	-	-	-	-
Stage 2	1004	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.11	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.209	-	-	-
Pot Cap-1 Maneuver	126	541	994	-	-	-
Stage 1	584	-	-	-	-	-
Stage 2	357	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	71	541	994	-	-	-
Mov Cap-2 Maneuver	71	-	-	-	-	-
Stage 1	331	-	-	-	-	-
Stage 2	357	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	39.1	6.1	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	994	-	71	541	-	-
HCM Lane V/C Ratio	0.367	-	0.537	0.802	-	-
HCM Control Delay (s)	10.7	0	103.6	33.4	-	-
HCM Lane LOS	B	A	F	D	-	-
HCM 95th %tile Q(veh)	1.7	-	2.2	7.7	-	-

Intersection	
Int Delay, s/veh	4.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	112	410	317	244	208	90
Future Vol, veh/h	112	410	317	244	208	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	4	8	7	7	6
Mvmt Flow	120	441	341	262	224	97

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1017	472	0	0	603	0
Stage 1	472	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Critical Hdwy	2.8	2	-	-	4.17	-
Critical Hdwy Stg 1	2.8	-	-	-	-	-
Critical Hdwy Stg 2	2.8	-	-	-	-	-
Follow-up Hdwy	2.8	2	-	-	2.263	-
Pot Cap-1 Maneuver	844	1574	-	-	951	-
Stage 1	1064	-	-	-	-	-
Stage 2	1032	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	634	1574	-	-	951	-
Mov Cap-2 Maneuver	634	-	-	-	-	-
Stage 1	1064	-	-	-	-	-
Stage 2	775	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	6.9
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	634	1574	951	-
HCM Lane V/C Ratio	-	-	0.19	0.28	0.235	-
HCM Control Delay (s)	-	-	12	8.2	9.9	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.7	1.2	0.9	-

Intersection	
Int Delay, s/veh	18.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	61	412	450	546	168	34
Future Vol, veh/h	61	412	450	546	168	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	1	2	4	3	7
Mvmt Flow	64	429	469	569	175	35

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1700	193	210	0	-	0
Stage 1	193	-	-	-	-	-
Stage 2	1507	-	-	-	-	-
Critical Hdwy	6.42	6.21	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.309	2.218	-	-	-
Pot Cap-1 Maneuver	101	851	1361	-	-	-
Stage 1	840	-	-	-	-	-
Stage 2	202	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 50	851	1361	-	-	-
Mov Cap-2 Maneuver	~ 50	-	-	-	-	-
Stage 1	417	-	-	-	-	-
Stage 2	202	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	56.9	4.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1361	-	50	851	-	-
HCM Lane V/C Ratio	0.344	-	1.271	0.504	-	-
HCM Control Delay (s)	9	0	$ 349.8	13.5	-	-
HCM Lane LOS	A	A	F	B	-	-
HCM 95th %tile Q(veh)	1.6	-	5.8	2.9	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	6.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	203	275	171	95	409	300
Future Vol, veh/h	203	275	171	95	409	300
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	3	2	3	1	1	4
Mvmt Flow	209	284	176	98	422	309

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1378	225	0	0	274	0
Stage 1	225	-	-	-	-	-
Stage 2	1153	-	-	-	-	-
Critical Hdwy	2.8	2	-	-	4.11	-
Critical Hdwy Stg 1	2.8	-	-	-	-	-
Critical Hdwy Stg 2	2.8	-	-	-	-	-
Follow-up Hdwy	2.8	2	-	-	2.209	-
Pot Cap-1 Maneuver	717	1690	-	-	1295	-
Stage 1	1176	-	-	-	-	-
Stage 2	794	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	435	1690	-	-	1295	-
Mov Cap-2 Maneuver	435	-	-	-	-	-
Stage 1	1176	-	-	-	-	-
Stage 2	482	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	5.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	435	1690	1295	-
HCM Lane V/C Ratio	-	-	0.481	0.168	0.326	-
HCM Control Delay (s)	-	-	20.7	7.6	9.1	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	2.6	0.6	1.4	-

Intersection	
Int Delay, s/veh	16.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	41	443	376	275	509	85
Future Vol, veh/h	41	443	376	275	509	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	42	457	388	284	525	88

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1629	569	613	0	-	0
Stage 1	569	-	-	-	-	-
Stage 2	1060	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.11	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.209	-	-	-
Pot Cap-1 Maneuver	113	525	971	-	-	-
Stage 1	570	-	-	-	-	-
Stage 2	336	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	59	525	971	-	-	-
Mov Cap-2 Maneuver	59	-	-	-	-	-
Stage 1	300	-	-	-	-	-
Stage 2	336	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	51.8	6.4	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	971	-	59	525	-	-
HCM Lane V/C Ratio	0.399	-	0.716	0.87	-	-
HCM Control Delay (s)	11.1	0	156.3	42.1	-	-
HCM Lane LOS	B	A	F	E	-	-
HCM 95th %tile Q(veh)	1.9	-	3.1	9.5	-	-

Intersection	
Int Delay, s/veh	4.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	113	413	317	245	210	90
Future Vol, veh/h	113	413	317	245	210	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	4	8	7	7	6
Mvmt Flow	122	444	341	263	226	97

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1022	473	0	0	604	0
Stage 1	473	-	-	-	-	-
Stage 2	549	-	-	-	-	-
Critical Hdwy	2.8	2	-	-	4.17	-
Critical Hdwy Stg 1	2.8	-	-	-	-	-
Critical Hdwy Stg 2	2.8	-	-	-	-	-
Follow-up Hdwy	2.8	2	-	-	2.263	-
Pot Cap-1 Maneuver	842	1574	-	-	950	-
Stage 1	1064	-	-	-	-	-
Stage 2	1031	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	631	1574	-	-	950	-
Mov Cap-2 Maneuver	631	-	-	-	-	-
Stage 1	1064	-	-	-	-	-
Stage 2	772	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	631	1574	950	-
HCM Lane V/C Ratio	-	-	0.193	0.282	0.238	-
HCM Control Delay (s)	-	-	12.1	8.2	10	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.7	1.2	0.9	-

Intersection	
Int Delay, s/veh	17.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	59	415	451	546	168	35
Future Vol, veh/h	59	415	451	546	168	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	1	2	4	3	7
Mvmt Flow	61	432	470	569	175	36

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1702	193	211	0	-	0
Stage 1	193	-	-	-	-	-
Stage 2	1509	-	-	-	-	-
Critical Hdwy	6.42	6.21	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.309	2.218	-	-	-
Pot Cap-1 Maneuver	101	851	1360	-	-	-
Stage 1	840	-	-	-	-	-
Stage 2	202	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 50	851	1360	-	-	-
Mov Cap-2 Maneuver	~ 50	-	-	-	-	-
Stage 1	416	-	-	-	-	-
Stage 2	202	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	53.5	4.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1360	-	50	851	-	-
HCM Lane V/C Ratio	0.345	-	1.229	0.508	-	-
HCM Control Delay (s)	9	0	$ 334.7	13.5	-	-
HCM Lane LOS	A	A	F	B	-	-
HCM 95th %tile Q(veh)	1.6	-	5.6	2.9	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	452	522	2	4	4
Future Vol, veh/h	3	452	522	2	4	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	491	567	2	4	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	569	0	-	0	1065	568
Stage 1	-	-	-	-	568	-
Stage 2	-	-	-	-	497	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1003	-	-	-	246	522
Stage 1	-	-	-	-	567	-
Stage 2	-	-	-	-	611	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1003	-	-	-	245	522
Mov Cap-2 Maneuver	-	-	-	-	245	-
Stage 1	-	-	-	-	565	-
Stage 2	-	-	-	-	611	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	16.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1003	-	-	-	333
HCM Lane V/C Ratio	0.003	-	-	-	0.026
HCM Control Delay (s)	8.6	0	-	-	16.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	204	278	171	96	413	300
Future Vol, veh/h	204	278	171	96	413	300
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	3	2	3	1	1	4
Mvmt Flow	210	287	176	99	426	309

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1387	226	0	0	275	0
Stage 1	226	-	-	-	-	-
Stage 2	1161	-	-	-	-	-
Critical Hdwy	2.8	2	-	-	4.11	-
Critical Hdwy Stg 1	2.8	-	-	-	-	-
Critical Hdwy Stg 2	2.8	-	-	-	-	-
Follow-up Hdwy	2.8	2	-	-	2.209	-
Pot Cap-1 Maneuver	715	1689	-	-	1294	-
Stage 1	1176	-	-	-	-	-
Stage 2	791	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	430	1689	-	-	1294	-
Mov Cap-2 Maneuver	430	-	-	-	-	-
Stage 1	1176	-	-	-	-	-
Stage 2	476	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.3	0	5.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	430	1689	1294	-
HCM Lane V/C Ratio	-	-	0.489	0.17	0.329	-
HCM Control Delay (s)	-	-	21.1	7.6	9.1	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	2.6	0.6	1.5	-

Intersection	
Int Delay, s/veh	17.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	42	446	379	275	509	86
Future Vol, veh/h	42	446	379	275	509	86
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	0	1	1	0	0
Mvmt Flow	43	460	391	284	525	89

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1636	570	614	0	-	0
Stage 1	570	-	-	-	-	-
Stage 2	1066	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.11	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.209	-	-	-
Pot Cap-1 Maneuver	112	525	970	-	-	-
Stage 1	570	-	-	-	-	-
Stage 2	334	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	58	525	970	-	-	-
Mov Cap-2 Maneuver	58	-	-	-	-	-
Stage 1	298	-	-	-	-	-
Stage 2	334	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	53.4	6.5	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	970	-	58	525	-	-
HCM Lane V/C Ratio	0.403	-	0.747	0.876	-	-
HCM Control Delay (s)	11.2	0	165.3	42.9	-	-
HCM Lane LOS	B	A	F	E	-	-
HCM 95th %tile Q(veh)	2	-	3.2	9.7	-	-

Intersection	
Int Delay, s/veh	0.2

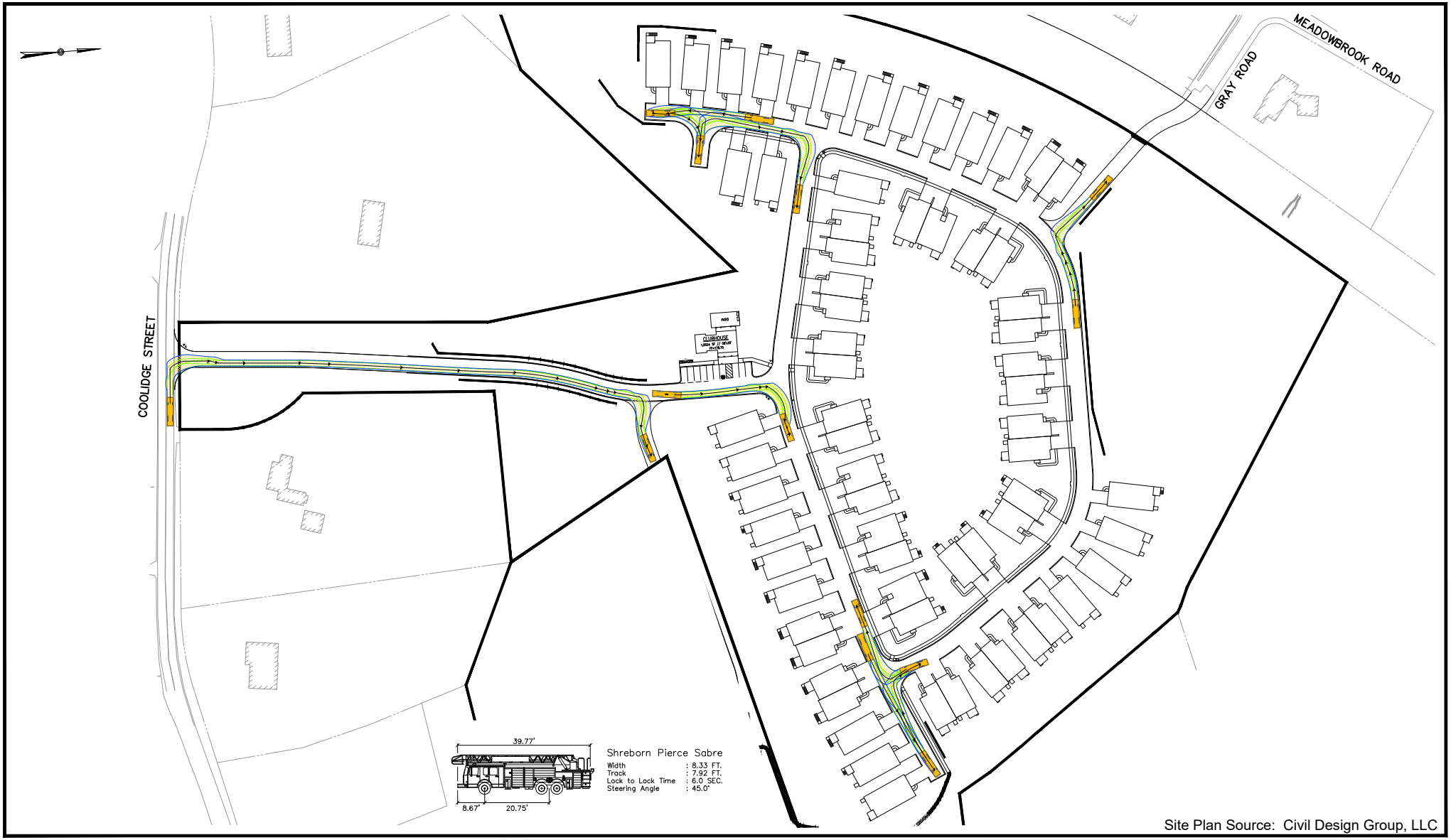
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	504	478	4	4	4
Future Vol, veh/h	5	504	478	4	4	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	548	520	4	4	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	524	0	-	0	1080	522
Stage 1	-	-	-	-	522	-
Stage 2	-	-	-	-	558	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1043	-	-	-	241	555
Stage 1	-	-	-	-	595	-
Stage 2	-	-	-	-	573	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1043	-	-	-	239	555
Mov Cap-2 Maneuver	-	-	-	-	239	-
Stage 1	-	-	-	-	591	-
Stage 2	-	-	-	-	573	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	16.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1043	-	-	-	334
HCM Lane V/C Ratio	0.005	-	-	-	0.026
HCM Control Delay (s)	8.5	0	-	-	16.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

□ AutoTURN® Analysis



Site Plan Source: Civil Design Group, LLC

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers
28 Lord Road, Suite 280
Marlborough, MA 01752

Proposed Development
Sherborn, Massachusetts

SCALE
0 30 60 120 180 FEET

Exhibit 1
Autoturn Analysis
Sherborn Ladder Truck

Scale: As Noted
DWG No. 1095 Fig 2-Autoturn-Sight Dist (10-12-2020).dwg

Date: October 2020
Project No. 1095