

Traffic Impact Study

Mixed Use Development

201-205 West Main Street
Ayer, Massachusetts

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INTRODUCTION

McMahon has completed a review of the projected traffic operations associated with the proposed mixed use development project located at 201-205 West Main Street in Ayer, Massachusetts. The purpose of this traffic impact study is to evaluate projected traffic operations and safety conditions within the study area.

The assessment documented in this traffic impact study includes a review of existing traffic volumes, the anticipated traffic generating characteristics of the project, and projected traffic operations at the project site driveway. The study area was selected based on a review of the surrounding roadway network and estimated trip generating characteristics of the proposed project. This study provides an analysis of traffic operations during the weekday morning and weekday afternoon peak hours, when the combination of adjacent roadway volumes and project trips would be expected to be the greatest. The following report documents the findings of the analysis.

Project Description

The project site, depicted in Figure 1, is bounded by West Main Street to the south, residential and commercial land uses to the east and west, and railroad tracks to the north. The site currently includes an existing building and cleared land which is used for vehicle and materials storage.

The project would raze the existing structures on site and construct a four-story mixed use development including approximately 6,130 square feet of first-floor retail space and 170 residential units on the upper three floors. The proposed site would include 172 ground level parking spaces, including six disability-accessible spaces. The site would be accessed via one full-access driveway located on West Main Street on the northeastern portion of the site.



Study Methodology

This traffic impact study evaluates existing traffic volumes and projected traffic operations within the study area for the weekday morning and weekday afternoon peak hour traffic conditions when the combination of the adjacent roadway volumes and estimated project trips would be expected to be the greatest.

The study was conducted in three steps. The first step consisted of an inventory of existing traffic conditions within the project study area. As part of this inventory, weekday traffic data was collected and a field visit was conducted to document intersection and roadway geometries, posted speed limits, and available sight distance at the proposed site driveway. Crash data along the project site frontage was obtained from the Massachusetts Department of Transportation (MassDOT) to determine if the study area has existing traffic safety deficiencies.

The second step of the study built upon the data collected in the first step to establish the basis for evaluating the potential transportation impacts associated with the proposed development. Projected traffic demands associated with planned future developments that could influence traffic volumes at the study area intersections were assessed. The 2023 Existing traffic volumes were forecasted to the future year 2030 to evaluate the 2030 No Build (without project) and 2030 Build (with project) conditions, consistent with MassDOT traffic study guidelines.

The third step of this study determined if measures were necessary to improve future traffic operations, minimize potential traffic impacts, and provide efficient access to the project site.

Study Area Intersections

Based on a review of the anticipated traffic generating characteristics of the project and a review of the adjacent roadways serving the project site, the intersection of West Main Street at the proposed site driveway was selected for analysis. This report documents existing and future traffic conditions for West Main Street at the proposed site driveway location.

EXISTING CONDITIONS

An assessment of the potential traffic impacts associated with the project requires a comprehensive understanding of the existing traffic conditions within the study area. The existing conditions assessment included in this study consists of an inventory of roadway and intersection geometries, an inventory of traffic control devices, the collection of traffic volume data in the study area, and a review of recent crash data. The existing conditions in the vicinity of the project site are summarized below.

Roadway Network

West Main Street

West Main Street generally runs in the southwest to northeast direction through the Town of Ayer and is classified as an urban minor arterial under Town jurisdiction. In the vicinity of the project site, a speed limit of 35 miles per hour (mph) is posted in both directions of travel. West Main Street provides access to commercial and residential land uses, and provides one travel lane in each direction. West Main Street is currently being reconfigured to include one 11-foot-wide travel lane in each direction, with an eight-foot-wide parking lane on each side of the roadway adjacent to the site. Further east on West Main Street, a bike lane will be provided in both directions of travel, with one vehicle travel lane in each direction and no parking lane. Sidewalks are currently provided on both sides of the roadway and will be maintained during the roadway reconfiguration.

2023 Existing Traffic Volumes

Existing Peak Hour Traffic Volumes

To assess peak hour traffic conditions, a 48-hour weekday Automatic Traffic Recorder (ATR) count was conducted on West Main Street in the vicinity of the site. The count was conducted from Tuesday, May 9, 2023 through Wednesday May 10, 2023. The results of the ATR count are tabulated by 15-minute periods and are provided in Appendix A of this report. A summary of the weekday traffic volumes on West Main Street is provided below in Table 1.

Table 1: ATR Summary

Roadway	Direction	Weekday ¹		AM Peak ² PM Peak ³		85th ⁵
		ADT	Hour	Hour	HV% ⁴	Percentile Speed
West Main Street	Eastbound	4,215	420	380	3%	31
	Westbound	3,980	275	425	4%	32
	Combined	8,195	695	805	3%	31

1 Average weekday daily traffic volume in vehicles per day (vpd)

2 Weekday morning peak hour traffic volume, occurring on May 10th from 7:15 AM to 8:15 AM

3 Weekday afternoon peak hour traffic volume, occurring on May 10th from 3:30 PM - 4:30

4 Weekday average percentage of heavy vehicles

5 85th percentile speeds in miles per hour (mph)

Based on the ATR data, the average weekday daily traffic is approximately 8,195 vehicles per day, with approximately 4,215 vehicles per day traveling in the eastbound direction and approximately 3,980 vehicles per day traveling in the westbound direction. Between the two count dates, May 10th experienced higher traffic volumes, with the weekday morning peak hour for West Main Street

occurring between 7:15 AM and 8:15 AM and the weekday afternoon peak hour occurring between 3:30 PM and 4:30 PM. The 85th percentile speed along West Main Street was measured as 31 miles per hour in the eastbound direction and 32 miles per hour in the westbound direction.

Seasonal Variation

To account for seasonal variation in traffic volumes, the MassDOT 2019 Weekday Seasonal Adjustment Factors were reviewed. Based on the data, traffic volumes collected during the month of May on urban arterial roadways are slightly above traffic volumes for an average month; therefore, no seasonal adjustments were made to the vehicle volumes collected during the ATR counts. The MassDOT factors are provided in Appendix B of this report.

Crash Summary

Crash data was obtained from MassDOT for the most recent five-year period available (2016 to 2020) in order to evaluate the existing safety conditions at the location of the project site driveway. A summary of the crash data is provided in Appendix C.

The MassDOT Crash Rate Worksheet calculations were used to determine whether the crash frequency at the site driveway location was unusually high given the travel demands. The MassDOT Crash Rate Worksheet calculates a crash rate expressed in crashes per million entering vehicles (MEV). The calculated rate is then compared to the average rate for intersections statewide and within MassDOT District 3. For unsignalized intersections, the statewide average crash rate is 0.57 crashes per MEV and the MassDOT District 3 crash rate is 0.61 crashes per MEV.

Between 2016 and 2020, one crash was reported within the vicinity of the proposed site driveway location, an angle collision which resulted in personal injury. The resulting crash rate is approximately 0.07 crashes per MEV, which is below both the statewide and MassDOT District 3 averages.

A review of available MassDOT information indicates that West Main Street in the vicinity of the project site driveway location has not been identified as a high-crash location which would be considered eligible for the Highway Safety Improvement Plan.

FUTURE CONDITIONS

To determine future traffic demands on the study area roadways and intersections, the 2023 Existing traffic volumes were projected to the future-year 2030 condition, by which time the proposed project would be anticipated to be built and occupied. Traffic volumes on the study area roadways in 2030 are considered to include all existing traffic, as well as new traffic resulting from general growth in the study area and from other planned development projects, independent of the proposed project. The potential background traffic growth, unrelated to the proposed project, was considered in the development of the 2030 No Build (without project) peak hour traffic volumes. The estimated traffic increases associated with the proposed project were then added to the 2030 No Build volumes to reflect the 2030 Build (with project) traffic conditions. A detailed description of the development of the 2030 No Build and 2030 Build traffic volume networks is presented below.

Future Roadway Improvements

Based on Town of Ayer and MassDOT project information, one planned roadway improvement project would apply to the West Main Street corridor in the site vicinity. The proposed project includes the construction of concrete sidewalks, and a repaving/restriping of West Main Street to include bike lanes and parallel parking. As of the site field visit on May 30, 2023, the sidewalks have been constructed, the roadway has been repaved, and updated striping has been outlined but not completed. Based on correspondence with the Town of Ayer, the restriping is anticipated to be completed in June 2023. The project is not anticipated to specifically affect the future trip generation characteristics of the project site. The on-street parking spaces may be used by retail trips to and from the site, and the presence of the bike lanes may encourage non-vehicular travel along the West Main Street corridor.

Background Traffic Growth

Traffic growth is primarily a function of changes in motor vehicle use and expected land development within the area. To predict the rate at which traffic on the study area roadways can be expected to grow during the seven-year forecast period (2023 to 2030), both overall traffic growth and local planned developments were reviewed.

Background Traffic Growth

Background traffic growth accounts for changes in traffic volumes associated with general changes in population and other developments that are not known at this time. To establish an appropriate growth rate for the study area, the Town of Ayer was consulted. A 1.0% background growth rate has been used previously for traffic studies in Ayer. However, in consultation with the Town, a background growth rate of 1.5% was established for the West Main Street corridor, to account for the high development potential in parallel with the ongoing roadway improvements. The 1.5% growth rate was used for this project to grow the 2023 traffic volumes to future year 2030.

Site-Specific Growth

In addition to the background traffic growth rate, the traffic volumes associated with other proposed developments in the area were considered. Based on discussions with the Town of Ayer, no known projects are planned and/or are under construction that may affect traffic volumes along West Main Street in the site vicinity.

2030 No Build Traffic Volumes

The 2023 Existing peak hour traffic volumes were grown by 1.5 percent per year (compounded annually) over the seven-year study horizon (2023 to 2030) to establish the 2030 base future traffic volumes on West Main Street. The resulting 2030 No Build peak hour traffic volumes for the weekday morning are projected to be approximately 465 eastbound vehicles and approximately 304 westbound vehicles, and the 2030 No Build peak hour traffic volumes for the weekday afternoon are projected to be approximately 422 eastbound vehicles and approximately 471 westbound volumes. The 2030 No Build traffic volumes are also documented in the traffic projection model presented in Appendix D of this report.

Site-Generated Traffic

To estimate the number of vehicle trips associated with the project, the Institute of Transportation Engineers' (ITE) publication, *Trip Generation Manual, 11th Edition*, was referenced. This publication provides traffic generation information for various Land Use Codes (LUCs) compiled from studies conducted by members nationwide. The trip generation estimates for this study were developed based on data presented in the *Trip Generation Manual* for LUC 822 (Strip Retail Plaza, <40k) and LUC 220 (Multifamily Housing, Low-Rise). This reference establishes vehicle trip rates (in this case expressed in trips per square foot for LUC 822 and trips per dwelling unit for LUC 220) based on actual traffic counts conducted at similar types of existing land uses.

Not all vehicle trips to retail land uses are considered "new" trips. A portion of the total trips attracted to such land uses are "pass-by" trips. Since pass-by traffic is already on the adjacent roadways, this portion of the total development traffic is reflected in the existing traffic volumes and does not represent additional traffic on the roadway network. Therefore, the total proposed trips associated with the retail land use is reduced by the percentage of pass-by trips to estimate the "new" traffic generated by the proposed development, i.e, that traffic which would be added to the study area roadways and intersections.

No pass-by rates are available for LUC 822; therefore pass-by rates for a similar land use, LUC 821 (Shopping center, 40k-150k) were used. Based on ITE data for LUC 821, approximately 40 percent of the total weekday afternoon peak hour trips attracted to this type of land use are attributed to pass-by trips. The 40% pass-by rate was applied to the weekday afternoon peak hour trip generation estimate. No pass-by rate is applied for the weekday morning peak hour in order to present a more conservative analysis.

The resulting trip generation estimates for the proposed project are summarized in Table 2 below.

Table 2: Vehicular Trip Generation

Description	Size	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour			Weekday Daily		
		In	Out	Total	In	Out	Total	In	Out	Total
Multifamily Housing ¹	170 units	18	57	75	59	35	94	583	583	1,166
Strip Retail Plaza ²	6,130 s.f.	9	6	15	28	28	56	167	167	334
- <i>Pass-By Trips</i> ³		<i>n/a</i>	<i>n/a</i>	<i>n/a</i>	<i>11</i>	<i>11</i>	<i>22</i>	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
Total New Trips		27	63	90	76	52	128	750	750	1,500

1 ITE Land Use Code 220 (Multifamily Housing (Low-Rise)), based on 170 dwelling units.

2 ITE Land Use Code 822 (Strip Retail Plaza (<40k)), based on 6,130 square feet.

3 No pass-by rate is provided by ITE for LUC 822. The ITE pass-by rate of 40% for LUC 821 (Shopping Center (40k - 150k)) is applied for the weekday afternoon peak hour.

As shown in Table 2, the proposed project is estimated to generate approximately 90 new vehicle trips (27 entering vehicles and 63 exiting vehicles) during the weekday morning peak hour and approximately 128 new vehicle trips (76 entering vehicles and 52 exiting vehicles) during the weekday afternoon peak hour.

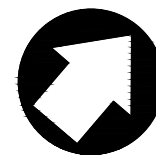
Project Trip Distribution and Assignment

The traffic projected to be generated by the project was distributed onto the study area roadways based on a number of sources. For the residential portion of the project, U.S. Census Journey-to-Work data for the Town of Ayer was reviewed and is provided in Appendix E. of this report. The retail trips were distributed onto the study area roadways based on patterns of existing traffic volumes. The resulting arrival and departure patterns for the residential and retail components of the mixed use development are presented in Figure 2 and are documented in the traffic projection model located in Appendix D.

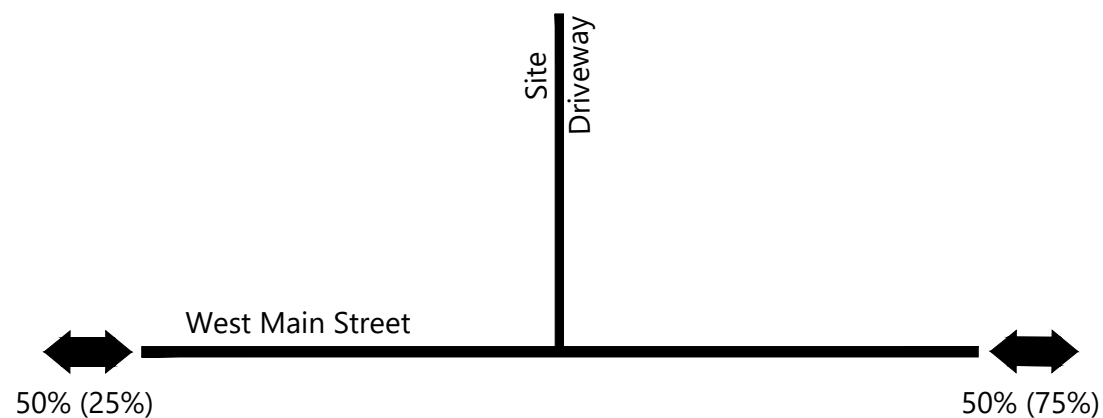
The new project-related trips were then assigned to the surrounding roadway network based on the project trip distribution patterns presented in Figure 2. The resulting distributed new peak hour project trips are shown in Figure 3.

2030 Build Traffic Volumes

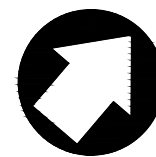
To establish the 2030 Build peak hour traffic volumes, the distributed project trips were added to the 2030 No Build peak hour traffic volumes. The resulting 2030 Build weekday morning and weekday afternoon peak hour traffic volumes are presented in Figure 4, and are documented in the traffic projection model presented in Appendix D of this report.



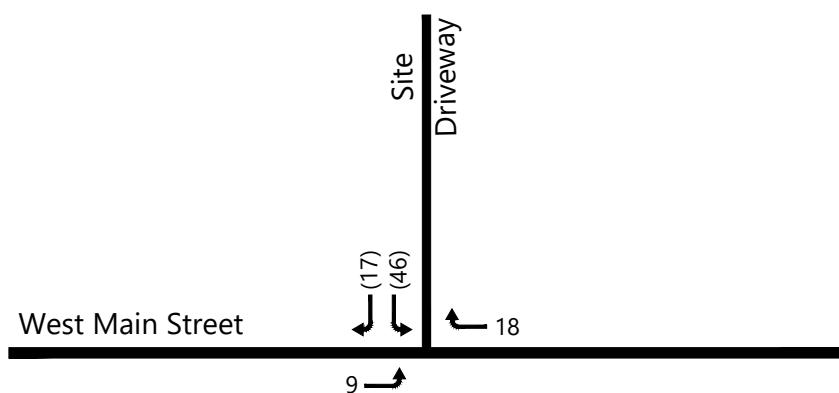
SCHEMATIC-
NOT TO SCALE



Retail (Residential)



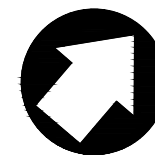
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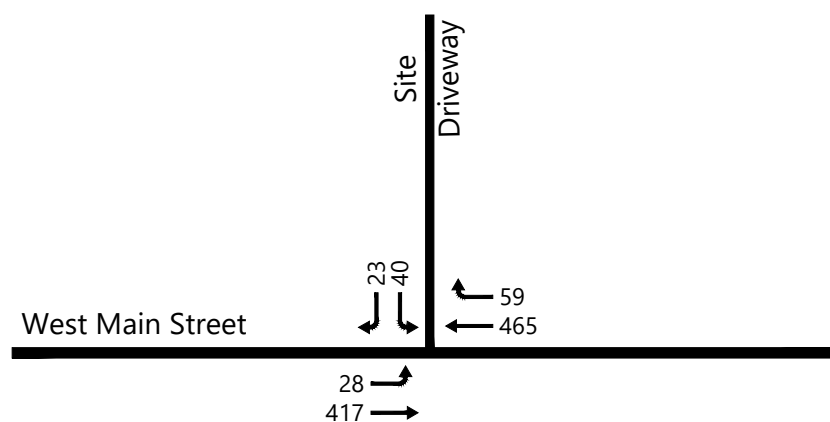
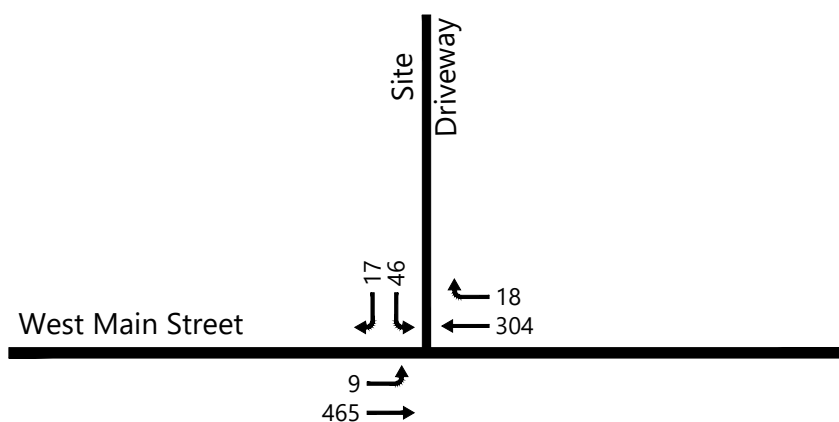
Weekday Morning Peak Hour
Entering (Exiting)



Weekday Afternoon Peak Hour
Entering (Exiting)



SCHEMATIC-
NOT TO SCALE



TRAFFIC OPERATIONS ANALYSIS

In previous sections of this report, the quantity of traffic at the study area intersections has been discussed. This section describes the overall quality of the traffic flow at the study area intersection during the weekday morning and weekday afternoon peak hours under 2030 Build peak hour traffic conditions. As a basis for this assessment, intersection capacity analysis was conducted using Synchro capacity analysis. The analysis is based on capacity analysis methodologies and procedures contained in the *Highway Capacity Manual, 6th Edition* (HCM), which is summarized in Appendix F. A discussion of the evaluation criteria and a summary of the results of the capacity analyses are presented below.

Level-of-Service Criteria

Average total vehicle delay is reported as level-of-service (LOS) on a scale of A to F. LOS A represents delays of 10 seconds or less and LOS F represents delays in excess of 50 seconds for unsignalized movements. A more detailed description of the LOS criteria is provided in Appendix F.

Capacity Analysis Results

Intersection capacity analysis was conducted using Synchro capacity analysis software for the 2030 Build traffic conditions during the weekday morning and weekday afternoon peak hour, with the project site driveway in place. As mentioned previously, the peak hour traffic volumes utilized as part of this analysis are provided in the traffic projection model, attached in Appendix D of this report.

The detailed Synchro capacity analysis worksheets for the 2030 Build traffic conditions are presented in Appendix G. The capacity analysis results for the signalized study area intersections are presented in Table 3.

Table 3: Intersection Capacity Analysis Results

Intersection	Movement	Weekday Morning Peak Hour					Weekday Afternoon Peak Hour			
		LOS ¹	Delay ²	V/C ³	95th Q ⁴		LOS	Delay	V/C	95th Q
West Main Street at Site Driveway	EB LT	A	0.2	0.01	0		A	0.5	0.03	3
	WB TR	A	0.0	0.00	0		A	0.0	0.00	0
	SB LR	C	17.2	0.19	18		C	20.8	0.23	23

1 Level-of-Service

2 Average vehicle delay in seconds

3 Volume to capacity ratio

4 95th percentile queue length in feet

As shown in Table 3, the exiting movement at the intersection of West Main Street and the proposed site driveway is projected to operate at LOS C with approximately 17 seconds of delay during the weekday morning peak hour, and operate at LOS C with approximately 21 seconds of delay during the weekday afternoon peak hour. The driveway is projected to operate under capacity during both time periods. With the bike lane in place leading up to the site under future conditions, some estimated vehicle trips may be taken as bicycle trips under future conditions, which may reduce future traffic volumes at the site driveway. Additionally, with the new parallel parking spaces in place under

future conditions on West Main Street immediately adjacent to the site, a portion of visitors to the proposed retail uses on-site may park on West Main Street rather than entering the site, further reducing vehicle trips at the proposed driveway.

Site Access and Circulation

Access to the proposed mixed-use development would be provided by one full-access driveway on West Main Street. A total of 172 total parking spaces would be provided on-site at ground level, with the majority of the parking being covered and located underneath the proposed multifamily residential use on the site. In order to provide more direct access to the rear of the site in emergency situations, an aisle on the eastern portion of the site would be paved with grass pavers, allowing emergency vehicles to bypass the parking area underneath the residential building.

Sight Distance

A field review of the available sight distance was conducted at the existing site driveways. The American Association of State Highway and Transportation Officials (AASHTO) publication, *A Policy on Geometric Design, 2018 Edition*, defines minimum sight distances at intersections. The minimum sight distance is based on the required stopping sight distance (SSD) for vehicles traveling along the main road. According to AASHTO, "If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient time to anticipate and avoid collisions. Based on the Automatic Traffic Recorder counts performed on West Main Street, the 85th percentile speeds were measured at 31 mph in the eastbound direction and 32 mph in the westbound direction. In order to present a conservative analysis, the posted speed limit of 35 mph was used to calculate the required stopping sight distance. Table 4 summarizes the stopping sight distance standards for the posted speed limit and the available sight distance at the site driveway location.

Table 4: Stopping Sight Distances

Site Driveway Location	Approaching	Speed Limit	85th % Speed	SSD ¹ Required	SSD Measured	Meets Required SSD?
		(mph)	(mph)			
West Main Street	Eastbound	35	31	250	350	Yes
	Westbound	35	32	250	350	Yes

1 Stopping sight distance (see AASHTO equations 3-2 and 3-3) for the posted speed limit.

As shown in Table 4 above, the available stopping sight distances for vehicles approaching the site driveway location on West Main Street exceed the AASHTO required stopping sight distance for the posted speed limit.

In addition to the required stopping sight distance, *A Policy on Geometric Design* also defines desirable sight distance. The desirable sight distance allows vehicles to enter the main street traffic flow without requiring the mainline traffic to slow to less than 70 percent of its speed and is referred to as intersection sight distance (ISD). Table 5 summarizes the standards for intersection sight distance for the posted speed limits, and the available sight distances at the existing site driveways.

Table 5: Intersection Sight Distances

Site Driveway Location	Looking	Speed Limit (mph)	85th % Speed (mph)	ISD ² Recommended	ISD Measured	Meets Recommended ISD?
West Main Street	Left (East)	35	32	335	350	Yes
	Right (West)	35	31	390	450	Yes

1 Intersection sight distance (see AASHTO equations 9-1 and 9-2) for the posted speed limit.

As shown in Table 5, the available intersection sight distances at the site driveway location exceed the AASHTO-recommended intersection sight distances for the posted speed limits.

Under proposed conditions, on-street parking is proposed to be constructed on both sides of West Main Street. Potential impacts of the on-street parking on sight lines for vehicles exiting the proposed site will be coordinated with the Town of Ayer, as necessary.

CONCLUSION

The proposed project would remove the existing buildings on the proposed project site located on West Main Street in Ayer, Massachusetts, and construct a mixed use development including approximately 6,130 square feet of first-floor retail space and 170 multifamily residential units. A total of 172 parking spaces would be provided on the site. The site would be accessed via a full-access driveway on West Main Street.

Based on data published by ITE, the proposed development would be estimated to generate approximately 90 new vehicle trips (27 entering vehicles and 63 exiting vehicles) during the weekday morning peak hour and approximately 128 new vehicle trips (76 entering vehicles and 52 exiting vehicles) during the weekday afternoon peak hour.

Capacity analysis of the proposed site driveway on West Main Street under future conditions with the proposed project in place indicates that the exiting movement at the site driveway is projected to operate at LOS C during the weekday morning and afternoon peak hours, with a 95th percentile queue of one vehicle or less than in length. Vehicle movements on West Main Street past the proposed site driveway are projected to operate with negligible delay.

Based on a review of AASHTO criteria, sight distances at the proposed site driveway location exceed the minimum and recommended sight distance criteria, allowing for safe and efficient access to and from the project site. Upon finalization of the West Main Street roadway reconstruction project, additional coordination may be required to provide adequate sight lines for the proposed project site driveway.

Based on the findings and results presented in this traffic study, the proposed project is projected to have a minimal impact on overall traffic conditions in the study area.