

Memorandum

Date 07/11/2019

To Alison C. Steinfeld, Planning Director
Department of Planning and Community Development
333 Washington Street
Brookline, MA 02445

From James D. Fitzgerald, P.E., LEED AP

Subject 445 Harvard Street, Brookline, MA – Traffic Peer Review

Environmental Partners (EP) has reviewed the Transportation Impact Assessment (TIA) provided by Vanasse & Associates, Inc. (VAI) for the Proposed Mixed-Use Development at 445 Harvard Street in the Town of Brookline dated July 23, 2018.

In general, VAI has prepared the TIA in a professional manner, consistent with standard engineering practices with the exception of the issues identified below. The following is a summary of EP's traffic review. Walker Parking Consultants will provide a separate peer review of the proposed parking.

EXISTING CONDITIONS

The site is located at 445 Harvard Street, on the southeastern corner of the Harvard Street at Thorndike Street intersection in the Town of Brookline, as shown in Figure 1 below. The parcel is currently occupied by a gas station/auto repair shop and contains access points on both Harvard Street and Thorndike Street.

Harvard Street is functionally classified as an urban principal arterial and provides one vehicle travel lane, an exclusive bicycle lane, and on-street metered parking in each direction through the study area. The metered parking is a two-hour maximum in operation Monday to Saturday, 8:00 AM to 8:00 PM; Sundays and holidays are excluded. Sidewalks are present on both sides of the roadway. There is no posted speed limit within the study area. Land use along Harvard Street is primarily commercial.

Thorndike Street is functionally classified as an urban collector and provides one vehicle travel lane in each direction, with free two-hour on-street parking along its east side. Sidewalks are present along both sides of the roadway. There is no posted speed limit within the study area. Land use along Thorndike Street is primarily residential.

Harvard Street and Thorndike Street intersect to form a four-way unsignalized intersection, with Harvard Street operating freely with no control, and Thorndike Street operating under "STOP" control. Crosswalks are present across all approaches to the intersection with pedestrian ramps at each crosswalk terminus; however, the ramps are not compliant with current Americans with Disabilities Act (ADA) and Massachusetts Architectural Access Board (MAAB) guidelines.

Figure 1: Study Area



Massachusetts Bay Transit Authority (MBTA) bus and rail service is available near the study area. MBTA Bus Route 66 provides service along Harvard Street, with the closest bus stop located one block southeast of the project site at the intersection of Harvard Street and Coolidge Street. The MBTA Green Line also has nearby stops, with the closest stop on the “B” Branch, located approximately 1,600 feet northwest of the project site at the intersection of Commonwealth Avenue and Harvard Avenue.

PROPOSED PROJECT

The Applicant proposes to construct a mixed-use development at 445 Harvard Street. The proposed five-story building will consist of 25 apartment units with 4,380± square feet (sf) of commercial space on the ground floor. The proposed development includes the removal of the existing gas station/auto repair shop and the closure of the existing driveways on both Harvard Street and Thorndike Street. The proposed driveway will be located on Thorndike Street, approximately 90 feet from the intersection with Harvard Street. The proposed development includes an at-grade parking garage with 20 parking spaces using a “shuffle system”.

INTERSECTION SAFETY

VAI reviewed the crash data at the Harvard Street/Thorndike Street intersection provided by the Massachusetts Department of Transportation (MassDOT) for the period between 2011 and 2015. For a

more accurate crash history, EP recommends obtaining crash reports from the Brookline Police Department.

For the period between 2011 and 2015, there were six crashes reported at the Harvard Street/Thorndike Street intersection, four involving pedestrians and two involving bicyclists. No fatalities were recorded.

Since the submission of the TIA in July 2018, MassDOT has added crash data through 2017. In 2017, there were two additional crashes at the Harvard Street/Thorndike Street intersection. Consequently, for the most recent five-year period between 2013 and 2017, there were seven crashes at the Harvard Street/Thorndike Street intersection, with four crashes resulting in injury.

As no traffic counts were done as part of this TIA, VAI did not calculate an intersection crash rate for a point of comparison to the District and Statewide averages for unsignalized intersections. EP researched MassDOT count stations near the study area to determine an approximate average daily traffic count (ADT) along Harvard Street to calculate an intersection crash rate. Using this information, EP calculated a crash rate of 0.19 crashes per million entering vehicles (MEV), which is significantly lower than both the District and Statewide averages of 0.52 per MEV and 0.57 per MEV, respectively.

TRIP GENERATION

VAI applied the latest edition (Tenth Edition) of the Institute of Transportation Engineers (ITE) Trip Generation Manual to estimate the existing and proposed site-generated vehicle trips using the following Land Use Codes (LUC):

- Existing:* LUC 944 – “Gasoline/Service Station” (four fueling positions)
- Proposed:* LUC 820 – “Shopping Center” (4,380 sf of retail space)
- LUC 221 – “Multifamily Housing (Mid-Rise)” (25 residential units)

Existing Trip Generation

VAI estimated the vehicle trips to and from the existing site using LUC 944 – “Gasoline/Service Station”. According to ITE, “This land use includes gasoline/service stations where the primary business is the fueling of motor vehicles. The sites included generally have a small building (less than 2,000 gross square feet) that houses a cashier and limited space for motor vehicle maintenance supplies and general convenience products. A gasoline/service station may also have ancillary facilities for servicing and repairing motor vehicles and may have a car wash.” While this appears to be the most appropriate Land Use Code based on description, based on site visit observations (as outlined below), EP questions the validity of the estimated trip generation. Due to this observed discrepancy coupled with the relatively large deviation between the data set points for this Land Use Code, EP recommends obtaining traffic counts for a more accurate comparison to the proposed usage.

VAI did not account for pass-by trips as part of the trip generation for the existing usage. Pass-by trips account for vehicles that are already present in the adjacent passing stream of traffic and are not considered new trips generated by the site. Traffic studies¹ show that for LUC 944, on average, 58% of vehicle trips were pass-by trips during the AM peak period, and 42% of vehicle trips were pass-by trips during the PM peak period. EP recommends using a reduction for pass-by trips to more accurately predict the trip generation of the existing gas station.

¹ ITE Trip Generation Handbook, 3rd Edition

EP performed a site visit and collected traffic counts in 5-minute increments for a 30-minute period to compare to the estimated trip generation. The site visit took place during the PM peak period on Tuesday, July 9, 2019 during seasonable conditions, with the following results:

		5:17 to 5:22 PM	5:22 to 5:27 PM	5:27 to 5:32 PM	5:32 to 5:37 PM	5:37 to 5:42 PM	5:42 to 5:47 PM
<i>Harvard Street Driveway:</i>	Entering	0	0	1	1	0	1
	Exiting	0	0	0	0	0	0
	Total	0	0	1	1	0	1
<i>Thorndike Street Driveway:</i>	Entering	0	0	0	0	0	0
	Exiting	2	1	1	1	1	1
	Total	2	1	1	1	1	1

To summarize, EP observed a total of three vehicles entering/exiting the Harvard Street Driveway and a total of seven vehicles entering/exiting the Thorndike Street Driveway for a total of ten vehicles entering and exiting the site for a 30-minute period. When projected to a 60-minute period, a total of 20 vehicles are estimated to enter and exit the site during the evening peak hour, compared to the 56 trips estimated using ITE Trip Generation, a difference of 36 less trips. This discrepancy in the estimated (existing) trips would dictate whether or not an increase in trips would be experienced under proposed conditions.

Other observations include:

- All observed vehicles entered the site via the Harvard Street Driveway and exited the site via the Thorndike Street Driveway
- Only two vehicles entered and exited the site to use the gas station; the remainder of the vehicles were on site for the service center, i.e. it does not appear that the *primary* use of the site is a gas station, as described in LUC 944
- The longest observed queue on Thorndike Street at the intersection with Harvard Street was two vehicles, i.e. EP observed very little delay at the study intersection

Proposed Trip Generation

LUC 820 describes “Shopping Center” as “an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center’s composition is related to its market area in terms of size, location, and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands.” EP agrees with the use of this Land Use Code; however, due to the relatively small size of this retail space, the development falls outside of the available data set (the smallest data point at 9,000 sf), which may skew the results of the trip generation from standard ITE methodology. As done for previous peer reviews, EP recommends that VAI use the data points for the smallest developments available to calculate an average rate, which is more likely to accurately predict the trips generated from a retail development of this size. As seen in previous peer reviews, this will slightly increase the number of generated trips for the retail component of the development.

VAI did not account for pass-by trips as part of the trip generation. Traffic studies² show that for LUC 820, on average 34% of vehicle trips were pass-by trips during the PM peak period; no data is available for the AM peak period. A reduction for some pass-by trips may be appropriate to more accurately predict the trip generation of the retail component of the proposed development, particularly for comparison against the existing gas station.

LUC 221 describes “Multifamily Housing (Mid-Rise)” as “apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors).” VAI used the average rate method, which results in approximately the same number of generated trips as the fitted rate method for this land use code. EP agrees with the use of this land use code and the methodology. VAI did not account for a reduction in vehicle trips due to those who commute by foot, bicycle, or public transportation.

Trip Generation Summary and Comparison

Table 1 (Trip Generation Summary and Comparison – Proposed Mixed-Use Development) compares the anticipated trips by the proposed mixed-used development to the estimated trips of the existing gas station/auto repair shop. The table indicates a reduction in vehicle trips between the existing usage and the proposed usage. Given the reasons outlined above, EP recommends obtaining traffic counts to determine if the proposed trip generation is indeed a reduction from existing, and whether or not further traffic analysis will need to be performed.

SIGHT DISTANCE

VAI reviewed sight distance along Thorndike Street for the proposed project site driveway. VAI used the American Association of State Highway and Transportation Officials (AASHTO) guidelines to calculate the required sight distance. Intersection Sight Distance (ISD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an oncoming vehicle and safely complete a turning or crossing maneuver. Stopping Sight Distance (SSD) is the distance required for a vehicle traveling at the design speed of a roadway to stop prior to striking an object in its travel path. 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 sight distance to anticipate and avoid collisions.”

Sight Distance at the Project Site Driveway

To calculate an appropriate sight distance, 85th percentile speeds are typically used. No traffic counts were performed as part of this TIA. VAI assumed a 25 mph speed on Thorndike Street approaching from the east (westbound) and 15 mph approaching from the west (eastbound). However, this conflicts with documented speeds used by VAI for their sight distance evaluation of the development at 455 Harvard Street, on the opposite side of Thorndike Street from the proposed site. VAI’s memo generated for 455 Harvard Street, dated July 14, 2017, established an 85th percentile speed of 20 mph in both directions along Thorndike Street.

VAI stated in the current TIA that, “On-street parking adjacent to the Project site driveway should be prohibited within 20-feet of the driveway.”

Using a 20 mph speed, for right turns and left turns from the driveway, the minimum required ISD is estimated at 195 feet and 225 feet, respectively. VAI’s report for the current project indicates that with

² ITE Trip Generation Handbook, 3rd Edition

the removal of on-street parking within 20 feet of the driveway, 175 feet of sight distance is attainable looking to the right from the site driveway (towards approaching westbound traffic). However, using the provided site plans and measuring from 14.5 feet beyond travelled way as specified by AASHTO, it appears that the close proximity of the proposed building to the back of sidewalk, tight garage opening, and on-street parking (20 feet from driveway) will result in even less available sight distance, only about 45 feet. As mentioned in VAI's Memorandum, the existing stockade fence along the eastern property line is anticipated to be removed.

Although VAI's documented 90 feet of sight distance between exiting site traffic and eastbound Thorndike Street traffic appears attainable if on-street parking is restricted, this sight distance still does not meet the preferred ISD requirements at the site driveway.

The minimum sight distance requirements of SSD were then compared. For 20 mph, a minimum of 115 feet SSD is required. Since the Harvard Street intersection is only 90 feet from the site driveway and vehicles will likely be entering Thorndike Street at a slower travel speed, the available sight distance between exiting site driveway vehicles and eastbound Thorndike vehicles seems reasonable provided no on-street parking exists in between. However, a vehicle exiting the site driveway would need to be well into the Thorndike Street eastbound travel lane in order to be seen by an oncoming Thorndike Street westbound vehicle traveling 20 mph due sight obstructions of the on-street parking 20 feet from the driveway. EP requests clarification of the on-street parking restrictions within the vicinity of the site. Reference should be made to the sight distance evaluations and diagram prepared by VAI in their Memorandum dated July 14, 2017 for Thorndike Street as part of the 455 Harvard Street development for consistency.

An assessment of the Town's requirement for adequate sight distance between an exiting vehicle and pedestrians within 5 feet of the driveway was not provided by VAI. It appears this requirement may not be met given the corners of the proposed parking garage are located along the back of sidewalk and the narrow driveway width, currently shown less than the Town's minimum 20 feet.

Sight Distance at the Harvard Street/Thorndike Street Intersection

VAI did not review sight distance for the intersection of Harvard Street and Thorndike Street as part of this TIA. Since the traffic generated by the proposed site will enter and exit solely to and from Thorndike Street, sight distance at this intersection should be considered. Sight distance at this intersection was discussed during the previous peer review for 455 Harvard Street. At the time, the proponent's Memorandum indicated 85th percentile speeds of 26 mph along northbound Harvard Street and 27 mph along southbound Harvard Street, referencing traffic counts conducted by VAI in April 2017.

Based on VAI's July 14, 2017 document for 455 Harvard Street, 180 feet of sight distance could be available looking left from Thorndike Street towards approaching northbound Harvard Street traffic (in front of the subject site) if parking and loading were restricted between the intersection through the former site driveway. This exceeds the required minimum SSD of 160 feet. However the current site plans show a "TEMP LOADING ZONE" on Harvard Street. With parking/loading allowed on this corner, existing sight distance would be obstructed. As noted below, clarification on intended loading and/or on-street parking along Harvard Street and Thorndike Street is requested.

It is our understanding that alterations to the northeast corner of the Harvard Street/Thorndike Street intersection as part of the 455 Harvard Street development including a bumpout and parking restrictions are anticipated to provide adequate SSD between Thorndike Street traffic and southbound Harvard Street traffic.

Given the increase in pedestrian traffic anticipated by the proposed development throughout the Harvard Street at Thorndike Street intersection, it is recommended that curb extensions or “bump-outs” be considered at the remaining corners of the intersection to improve pedestrian safety.

SITE DRIVEWAY

According to the Town of Brookline requirements, the two-way driveway opening needs to be a minimum of 20 feet wide. The opening is shown on the plan to be only 16 feet wide, narrower than the required width, and should be widened. Vehicle templates should be provided to show adequate turning area without infringing on travel in the other direction. (VAI noted the need to address driveway width in their July 23, 2018 Memorandum.)

PEDESTRIAN ACCOMMODATIONS

The Applicant’s plans show sidewalk reconstruction directly in front of the site along Thorndike Street and Harvard Street. The driveway apron is proposed to be at the sidewalk elevation to minimize inconvenience to pedestrians. Coordination with mitigation as part of 455 Harvard Street is required including proposed bumpouts on the adjacent Harvard Street at Thorndike Street intersection corner.

Given the increase in pedestrian traffic anticipated by the proposed development throughout the Harvard Street at Thorndike Street intersection, it is recommended that curb extensions or “bump-outs” be considered at the remaining corners of the intersection to improve pedestrian safety for those accessing the subject site.

TRANSPORTATION DEMAND MANAGEMENT (TDM)

TDM treatments have been outlined in VAI’s Memorandum. This includes the Applicant investigating MassRIDES and encouraging healthy transportation options, posting public transportation maps and schedules in a central location, providing a “welcome packet” to new residents/employees with transportation options, and promoting Emergency Ride Home program.

BICYCLE ACCOMMODATIONS

Bicycle storage has been shown on the site plan.

LOADING ZONE/TRASH PICKUP

The Applicant’s plan shows the existing site driveway onto Harvard Street as closed under proposed conditions with a “TEMP LOADING ZONE”. A loading zone in this area would impact sight lines for Thorndike Street traffic approaching Harvard Street as outlined above.

However, VAI’s document indicates “Consideration should be given to designating a portion of the curbside area along the Project site frontage on Thorndike Street as a short-term loading zone for deliveries, tenant moves and resident drop-off/pick-up.” As noted above, on-street parking or stopping will impact sight lines. Clarification is required where loading and trash pick-up will take place.

SUMMARY

- For a more accurate crash history, EP recommends obtaining crash reports from the Brookline Police Department for the most recent five-year period.
- Due to the discrepancy between VAI’s estimated existing site trips and observations coupled with the relatively large deviation between the data set points for the used Land Use Code, EP recommends obtaining traffic counts for a more accurate comparison of existing to proposed generated trips.
- EP requests clarification regarding site distance at the proposed site driveway along Thorndike Street, referencing the sight distance evaluations and diagram prepared by VAI in their Memorandum dated July 14, 2017 for Thorndike Street as part of the 455 Harvard Street development for consistency. EP requests a similar diagram.
- An assessment of the Town’s requirement for adequate sight distance between a vehicle exiting the proposed site driveway and pedestrians is requested.
- Inconsistencies exist between the site plan and VAI’s report relative to on street parking and/or loading for both Harvard Street and Thorndike Street. Clarification on intended loading, trash pick-up, and/or on-street parking along Harvard Street and Thorndike Street is requested for consideration with sight distance.
- Given the increase in pedestrian traffic anticipated by the proposed development throughout the Harvard Street at Thorndike Street intersection, it is recommended that curb extensions or “bump-outs” be considered at the remaining corners of the intersection to improve pedestrian safety.
- According to the Town of Brookline requirements, the two-way driveway opening needs to be a minimum of 20 feet wide. Vehicle templates should be provided to show how vehicles would maneuver turns given the tight roadway and building location along back edge of sidewalk.