

# Memorandum

To: Shrewsbury Zoning Board of Appeals  
From: Jennifer Conley, P.E., PTOE  
Date: January 22, 2016  
Re: Traffic Engineering Peer Review, The Pointe at Hills Farm, Shrewsbury, MA

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Conley Associates, Inc. has been retained by the Town of Shrewsbury to review a Traffic Impact and Access Study (TIAS) associated with The Pointe at Hills Farm project. The TIAS was completed in November of 2015 by Tetra Tech. The TIAS analyzed the traffic impact of 180 apartment units to be located at 440 Hartford Turnpike (Phase I) and 100 apartment units to be located at 526 Hartford Turnpike (Phase II). The study area included the intersections of Route 20 at Stoney Hill Road (west) and Route 20 at Stoney Hill Road (east). Conley Associates, Inc. has completed the review, and the findings are presented below.

## **Existing Conditions**

Conley Associates, Inc. reviewed the information contained in the Existing Conditions section of the TIAS. The existing conditions sections included: roadway descriptions, pedestrian and bicycle accommodations, public transit, existing traffic volume data, and a delay and queueing study for Stoney Hill Road.

The existing roadway conditions described in the TIAS were consistent with conditions observed in the field and presented in aerial photography. The geometry described in the TIAS was also consistent with the geometry used in the operational analysis included in the Appendix. The descriptions of the minimal pedestrian/bicycle accommodations and public transit were appropriate.

The TIAS correctly calculated seasonality for the traffic volume data. The MassDOT traffic volume data provided in the Appendix shows that November traffic volumes are higher than average month volumes as stated in the TIAS.

The TIAS determined an annual growth rate to adjust 2014 traffic volume to a 2015 Existing condition. Conley Associates, Inc. reviewed the MassDOT traffic volume data provided in the Appendix and found the 0.5 percent annual growth rate to be reasonable. The 2014 peak hour traffic volumes were correctly adjusted upwards to determine the 2015 Existing condition traffic volumes. The Existing weekday AM and weekday PM peak hour traffic volumes shown in Figure 6 were calculated correctly.

Traffic counts in the Appendix indicate one pedestrian or bicyclist passed through the study area intersections during the weekday PM traffic count. The truck traffic percentages outlined in the TIAS were consistent with the traffic counts provided in the Appendix.

The daily traffic volume data was calculated using an average of the two day traffic volumes collected on weekdays in April of 2014. Although Conley Associates, Inc. would typically take the higher daily traffic volume, the weekday daily traffic volume presented in the report is reasonable.

The TIAS included a delay and queue study conducted for each Stoney Hill Road intersection during the weekday AM and weekday PM peak hours. Table 1 presents the average delay, maximum delay, average queue, and maximum queue information for Stoney Hill Road (west) and Stoney Hill Road (east). The information presented in Table 1, Stoney Hill Road Delay Study was consistent with the information provided in the Appendix.

The average delay for vehicles exiting Stoney Hill Road was approximately 30 seconds or less during both peak hours. The maximum delay for vehicles exiting Stoney Hill Road occurred during the weekday AM peak hour and was 2.5 minutes. The average queue for a vehicle exiting Stoney Hill Road was one vehicle. The maximum queue on Stoney Hill Road was four vehicles which occurred during the weekday AM peak hour.

### **Future Conditions without the Project**

The TIAS projected the 2015 Existing traffic volumes to a 2022 No Build condition. The seven year horizon for future conditions analysis is consistent with the new Transportation Impact Guidelines issued by MassDOT. The 2022 No Build traffic volumes were calculated using industry standards. The TIAS included the following projects as background developments: a convenience store/gas station at 604 Hartford Turnpike; Altec on Fortune Boulevard; garage buildings/mechanics at 360 Hartford Turnpike; and Boston Medical Products on Chestnut Street.

The methodology used to determine the 2022 No Build condition peak hour traffic volumes followed industry standards. The traffic associated with each of the background developments was correctly added to the 2022 peak hour traffic volumes. Conley Associates, Inc. verified that the 2022 No Build weekday AM and weekday PM peak hour traffic volumes shown in Figure 7 were accurately depicted.

### **Site Generated Traffic**

The TIAS calculated trip generation for Phase I and Phase II of the proposed residential project following industry standards. Trip generation was based on the Institute of Transportation Engineer's (ITE) Trip Generation Manual, 9<sup>th</sup> Edition. Conley Associates, Inc. verified that the trip generation was calculated using ITE Land Use Code (LUC) 220 Apartment and followed the building program outlined in the TIAS. The trips associated with Phase I and Phase II of the project were correctly calculated and the information in Table 4, Project Trip Generation was consistent with the trip data provided in the Appendix.

Local trip generation rates were calculated based on the 2014 traffic counts and the number of single family homes using Stoney Hill Road as an access to Route 20. Conley Associates, Inc. reviewed existing aerial photography of Stoney Hill Road and concurred that the 180 single family home estimate in the neighborhood was reasonable. The local trip generation was

calculated correctly and compared to the appropriate ITE rate for single family homes. The local trip generation rates were lower than the ITE trip generation rates. Using the local data, the trip generation estimate for The Pointe at Hills Farm would have been lower.

The mode share information provided in Table 5 of the TIAS is consistent with the information found in the Appendix based on 2010 Census information from Transportation Planning Products. The existing mode splits in Shrewsbury are as follows: 89 percent single occupancy vehicle, 7 percent carpool, with the remaining 4 percent using transit/bicycle/walk/other. Conley Associates, Inc. believes it unlikely that there will be anything other than vehicle trips associated with the project. The TIAS does not take any credit for alternative methods of transportation, which is appropriate.

The TIAS calculated trip distribution using US Census Journey to Work data for Shrewsbury residents as well as local traffic patterns. Conley Associates, Inc. reviewed the gravity model provided in the Appendix and found the trip patterns to be reasonable. As outlined in the TIAS, the distribution based on the gravity model oriented 44 percent of the trips to and from points east of the site along Route 20 and 56 percent to and from points west of the site along Route 20. However, the TIAS did not base trip distribution on these patterns. The TIAS based trip distribution on the trip distribution of the existing Stoney Hill Road traffic counts.

Conley Associates, Inc. reviewed the trip patterns of existing neighborhood residents and found that the distribution used in the TIAS was reasonable. The trip distribution based on actual traffic patterns was correctly illustrated in Figure 8, Trip Distribution (Phase I) and Figure 9, Trip Distribution (Phase II). Conley Associates, Inc. verified that the project trips shown in Figure 10 were calculated correctly.

### **Future Conditions with the Project in Place**

The trips associated with Phase I and Phase II of The Pointe at Hills Farm were added to the 2022 No Build condition peak hour traffic volumes to determine the 2022 Build condition peak hour traffic volumes. The 2022 Build weekday AM and weekday PM peak hour traffic volumes shown in Figure 11 were correctly calculated.

Table 7, Traffic Volume Comparison shows the increase in Route 20 traffic volumes between the 2022 No Build and 2022 Build condition peak hour traffic volumes. Based on the TIAS, the project will increase traffic volumes at the intersection of Route 20 at Stoney Hill Road (west) by approximately four percent during the weekday AM peak hour and by approximately seven percent during the weekday PM peak hour. This intense level of impact is felt at that intersection only. On either side of Stoney Hill Road (west), the impact to Route 20 will be three percent during the AM peak hour and five percent during the PM peak hour. A similar impact is expected at Stoney Hill Road (east). The 2022 No Build and 2022 Build condition traffic volume increases were consistent with figures provided in the report.

### **Traffic Operations Analysis**

The capacity analysis procedures outlined and used in the TIAS follow industry standards. Conley Associates, Inc. conducted a review of the analysis sheets found in the Appendix. The report figures and the analysis summary sheets for each intersection were consistent for the 2015 Existing, 2022 No Build, and 2022 Build condition peak hour traffic volumes. In addition, the LOS and delay summary for the weekday AM peak hour (Table 10) and the weekday PM peak hour (Table 11) were correct based on the information provided in the Appendix.

The TIAS compared the field measured average delay to the average delay calculated by Synchro at the Route 20 at Stoney Hill Road intersections. Conley Associates, Inc. verified that the LOS and delay results shown in Table 12, Existing Stoney Hill Road Delays and LOS (Synchro Model vs. Actual), were consistent with the information provided in the Appendix.

Although not discussed in the TIAS, the field measured LOS and average delay results are significantly better than those calculated by the Synchro software for the existing conditions. The Synchro reports indicate that the Route 20 at Stoney Hill Road intersections are operating at LOS F during the weekday AM peak period. In fact, these intersections are operating at LOS D based on field measured delay. Similarly, Synchro reports LOS F at the Stoney Hill Road west intersection and LOS D at the Stoney Hill Road east intersection during the weekday PM peak hour. The field delay studies show that these intersections are operating at LOS B or better during the weekday PM peak hour. Although field delay studies showed the study area intersections to be operating better than calculated by Synchro, no credit was taken in the LOS results for the No Build and Build conditions analysis. Therefore, it is likely that the Route 20 at Stoney Hill Road intersections will experience better operations than those reported by Synchro in the 2022 No Build and 2022 Build conditions.

### **Crash History**

The TIAS researched the crashes that have occurred at both intersections of Route 20 and Stoney Hill Road and presented data on the types of crashes and conditions in which those crashes occurred. Conley Associates, Inc. reviewed the MassDOT crash data and found 38 total crashes over the five year period where the TIAS reported 32 total crashes. In order to determine if these additional crashes would have significant impact on the crash rates, the worksheets provided in the TIAS were reviewed. The Intersection Crash Rate Worksheets are provided in the Appendix twice. The first set included the correct number of crashes and years of data and the second set included an incorrect number of crashes and years of data, however, the crash rate results in Table 13 in the TIAS do not reflect the incorrect crash rates found in the Appendix. The crash rate results in Table 13 reflect the correct crash rates where the correct number of crashes, years, and volumes were entered. It is likely that the later Intersection Crash Rate Worksheets were wrongfully included in the Appendix. As indicated above, Conley Associates, Inc. found additional crashes associated with this portion of Route 20 that were not included in the TIAS. Even with the addition of those crashes, the crash rates would be below the District 3 average.

### **Sight Distance Analysis**

The TIAS reviewed the available sight lines at the proposed driveways. Using the site plan, the TIAS calculated the stopping sight distances (SSD) and intersection sight distances (ISD) available at the proposed locations. Conley Associates, Inc. reviewed the data provided and concurs that the SSD is met for the site driveway locations. As outlined in the TIAS, the ISD is not met at the Phase I Site Driveway at Stoney Hill Road and will only be met at the Phase II Site Driveway at Stoney Hill Road with removal of vegetation. Although it is desirable to meet the ISD minimums, Conley Associates, Inc. concurs with the TIAS that the SSD minimums are the safety thresholds of more importance.

### **Project Related Roadway Improvements**

This TIAS outlines the proposed configuration and allowable movements at each of the site driveways. Conley Associates, Inc. reviewed Figure 20 in regards to the Phase I access points as well as the discussion in the text and found them to be consistent with the information presented during the public hearing. Of particular interest is the provision of the left turn lane into Stoney Hill Road (west). The provision of this left turn lane will provide a safer location for vehicles to queue while waiting to turn left into Stoney Hill Road (west). The design will provide for a deceleration lane into the site from Route 20, but tightens up the width and radii at the Stoney Hill Road (west) intersection effectively eliminating the existing area used for deceleration at that location. While it appears that the design at Stoney Hill Road (west) is consistent with MassDOT standards, it does present a change from the current operation.

Conley Associates, Inc. has reviewed the Phase II access plan. Based on the TIAS, a full access driveway is proposed on Route 20 and a full access driveway is proposed on Stoney Hill Road (east). No improvements are currently proposed in the vicinity of Phase II.

The TIAS investigated the signalization of Stoney Hill Road (west) by reviewing the existing traffic data over the course of a weekday (adjusted to 2015 Existing condition) and adding in project related traffic. The distribution over the course of the day for the Phase I trips was determined using the hourly distribution over the course of the day that was observed on Stoney Hill Road. This methodology follows sound engineering practice and indicates that the traffic volumes calculated will not meet the eight hour traffic signal warrants. Based on feedback received at the public hearing, Conley Associates, Inc. will comment further on this item later in this Memorandum.

### **Transportation Demand Management**

Although the TIAS outlines a number of items that will be provided on site, it is unlikely that a significant amount of vehicular trips will be reduced at the site. The TIAS has not estimated any reduction in trips which is appropriate.

### **Transportation Monitoring Program**

The TIAS outlines a Transportation Monitoring Program to determine if the trip generation of the proposed site is consistent with what was estimated in the TIAS at milestones upon project completion. This data will be helpful to the Town by providing additional information as to

whether trip generation for apartment complexes in Shrewsbury are consistent with ITE estimates. However, the Town will need to work with Counsel to determine an appropriate condition in the event that the signalization of Stoney Hill Road (west) is conditioned on the results of the monitoring.

### **Conley Associates, Inc. Comment on Neighbor Testimony**

Conley Associates, Inc. attended the public hearing held on December 28, 2015. In addition to the presentation by the applicant's traffic engineer, a number of neighbors raised questions and concerns. Although it is the responsibility of the applicant's traffic engineer to answer the questions raised at the public hearing (and in writing), Conley Associates, Inc. has been asked to provide comment on the items of greatest concern to the neighbors.

A large number of the concerns regarded expanding the scope of study to include different intersections or roadway sections along Route 20. Conley Associates, Inc. found the focus of the study to be appropriate for this project. The impact of the project will be less significant at other locations.

Another issue raised in the email correspondence was when the data collection occurred and how many days should have been collected. Unless there is a particular date that is in question due to a holiday, snowstorm, major event or major incident, a single date of data collection is adequate. Traffic volumes do vary slightly day to day, however when traffic counts are adjusted to an average month they compare very well to follow up traffic counts taken at the same location and adjusted to an average month. The TIAS did include 24 hour traffic count data on Route 20 and on Stoney Hill Road.

The traveling speed of vehicles on Route 20 was a concern raised at the hearing. The TIAS included speed data collected on Route 20 that indicated that vehicles were traveling at 85<sup>th</sup> percentile speeds of 51 to 55 miles per hour depending on the day and direction. Because speed limits are typically set based on the 85<sup>th</sup> percentile speed of a roadway, no change would be recommended. The speed that drivers are comfortable traveling at is currently close to the posted speed limit.

The length of the crash data research was a concern raised by neighbors who may have been in crashes that occurred prior to that data collection. Crash data is typically reviewed for a three year period to avoid any particular year influencing the data with a spike or trough. The TIAS reviewed crash data for a five year period which is appropriate. Researching further back may reveal a crash or two that involved certain neighbors, but it is unlikely that the overall average crash rate would be influenced significantly unless the configuration has changed in a way that affected safety.

Questions were raised in regard to the choice to provide two access points to each phase of development. The applicant's traffic engineer indicated that MassDOT would prefer to limit access points on Route 20 and would rather have access to the sites provided via Stoney Hill Road. Although Conley Associates, Inc. has not met with MassDOT regarding this project at

this time, it is typical of MassDOT to practice access management on their state highways and limit access to existing local roadways wherever possible. It is not clear at this time if there are benefits to the applicant and the Town to pursuing additional access eliminations. Conley Associates, Inc. would like the applicant to comment on whether it is possible that with consolidation on the opposite side of Route 20 as well as having all Phase I traffic exiting via Stoney Hill Road (west) that a traffic signal becomes a more palatable mitigation strategy to MassDOT.

The neighbors expressed their desire for a traffic light verbally at the meeting as well as afterward in email correspondence. The comment was made that people are currently taking a right to avoid taking a left out of Stoney Hill Road. As outlined by the Traffic Engineer at the meeting, the distribution does show that to be the case whereas the distribution Town-wide shows there would be more lefts.

There was a very detailed presentation prepared by a local resident on the topic of roadway improvements. The presentation provided the concerns of a vehicle attempting to pull out from each Stoney Hill Road intersection as well as from the new site driveways and then went on to recommend a traffic signal at Stoney Hill Road (west). The presentation listed other locations in Town that are either similar to the currently proposed condition or are similar to the condition with a traffic signal in place. Conley Associates, Inc. is not familiar with the traffic operations of Edgemere Boulevard and the conditions under which its traffic signal was installed, but the TIAS is correct that in most cases a traffic signal is not installed if an eight hour warrant is not met.

The traffic volume data available may not provide all of the information needed. For example, the TIAS indicates that the existing Stoney Hill Road is generating traffic differently than is expected based on the industry standards. And the Stoney Hill Road data was used to distribute the new traffic from the proposed site over the course of the day. The Town may have traffic monitoring data from other apartments in Town that would provide another data point of residential distribution over the course of the day. In addition, during the public hearing it was made clear that some residents avoid the Stoney Hill Road (west) when possible. There may be some demand for that west intersection that is currently diverting to avoid difficult maneuvers. That traffic may divert back in the event that a traffic signal was provided at Stoney Hill Road (west).

A neighbor did ask that the Stop signs and Stop lines be illustrated on the proposed plans for the roadway improvements on Route 20 and that the applicant's traffic engineer ensure that adequate sight lines will be available to and from the vehicle in that location. Conley Associates, Inc. concurs that that would be appropriate to include in the information provided to the Board.

Another concern raised by residents is the elimination of the informal deceleration area for vehicles turning right into Stoney Hill Road (west). The proposed design includes tightening the mouth of Stoney Hill Road including tighter turning radii. The neighbors expressed a concern that they will feel truck traffic barreling up behind them as they slow to turn into Stoney Hill

Road (west). Based on the information provided, it is not clear if the applicant had investigated maintaining the wide shoulder and turning radii at this location.

During the public hearing, Conley Associates, Inc. was curious whether the property owner across the street had been contacted and coordinated with in regards to improvements at Route 20 and Stoney Hill Road (west). Has an eastbound left turn lane been considered at the Stoney Hill Road (west) intersection? The provision of this turn lane would provide protection for the traffic visiting that site regardless of whether a traffic signal is pursued at that location.

Finally, the neighbor presentation indicated that it is quite likely that vehicles will turn left out when exiting the Phase I right in, right out driveway and cites an example in Town. Conley Associates, Inc. understands that this does occur at many locations and that enforcement is sometimes difficult. Based on the plans provided by the applicant, the site will be designed to discourage that movement. Based on the discussions at the hearing, a number of residents currently choose to turn right out of Stoney Hill Road even though they are allowed to turn left currently, only to avoid making that difficult maneuver.

### **Recommendations and Conclusions**

As presented, Conley Associates, Inc. has found that the TIAS follows the industry standard steps for completion of a traffic impact analysis. The remaining item of concern is in regards to the improvements proposed at Stoney Hill Road (west). Conley Associates, Inc. recommends additional discussion with MassDOT and the other stakeholders (Town, property owner across the street) to determine if traffic signalization and other additional improvements should be implemented.