



To: **Mark London**
Executive Director
Martha's Vineyard Commission

Date: **November 20, 2013**

From: **Keri Pyke, P.E., PTOE**

SHS Project No.: **2013062.00**

Subject: **Stop & Shop Expansion, Tisbury, MA**
Additional Traffic Peer Review

The memorandum below provides additional comments and recommendations regarding the proposed Stop & Shop expansion in Tisbury, Massachusetts. Vanasse Hangen Brustlin, Inc. (VHB) provided a memorandum dated November 8, 2013, in response to our last peer review memorandum, which was dated October 2, 2013. VHB and HSH attended the Commission's Land Use Planning Committee (LUPC) meeting on November 12, 2013. Following that meeting, the minutes of the meeting were distributed to both VHB and HSH via email, along with a number of questions that you would like addressed for the Commission meeting scheduled for November 21, 2013. This memorandum reviews the latest VHB memos and provides responses to those questions. HSH also received supplementary information from VHB on November 19, 2013, a memorandum which was dated November 13, 2013. Some pieces of that information were used in later sections of this memo.

Traffic Analysis

The primary focus of VHB's memorandum is the traffic impact analysis and which methodology is most appropriate to assess the impacts.

Distribution of "Up Island" Traffic

VHB still maintains that 80% of traffic traveling to the store from "up island" via State Road will use Main Street and Norton Lane to get to the store. We respectfully disagree. We believe that on any given day, a person may change his/her travel route to the store based whether there is already congestion on Main Street. In addition, as one Commission member expressed at the LUPC meeting, there are some people that will always use Main Street, just as there are some who will always go through Five Corners. We believe that what will actually happen will be in between the two analyses that were provided, perhaps closer to 50% using Main Street and 50% continuing through Five Corners via Beach Road and Water Street.

Synchro vs. VISSIM

VHB has gone back to using Synchro to analyze Five Corners, which we still do not agree with given the complex nature of the intersection's geometry and control. The unsignalized four-way intersection analysis grossly underestimates or overestimates the delay and queues on all approaches of the intersection. For example, the analysis of Five Corners in the memo dated November 8, 2013, indicates that the queues on Beach Road and Beach Street at Five Corners are practically non-existent in the weekday evening peak hour, which we know is not the case in peak season based on observations done by the MVC in July 2013 (see page 2 of the appendix of the memo).

While we understand the complexities of modeling the intersection using VISSIM, we still believe that analysis also has some merit and is a closer approximation of the traffic conditions that currently exist. VHB has also analyzed both the No Build and Build conditions as under signalized conditions. While this might be a useful way to consider the mitigation, we have no basis to compare it to real world conditions, which Islanders experience every day in peak season, so we are left still wondering how we can compare the future conditions and assess the impact of the expanded store on traffic in Five Corners.

Although the Five Corners intersection has STOP signs for the Lagoon Pond Road, Water Street, and Beach Street Extension approaches, in reality the intersection operates more on a yield control basis, where drivers on each approach are courteous to each other, each moving in turn on a rolling stop basis. Similar behavior is exhibiting by drivers on the Beach Street and Beach Road approaches, even though they do not have STOP signs. In an attempt to try to understand how the analysis relates to the existing conditions, we performed an analysis of the Five Corners intersection under yield control. The results are summarized in the attached Table 1, and the Synchro output is attached for review.

Questions Raised Following LUPC Meeting

Building Area for Trip Generation

The Institute of Transportation Engineers' (ITE's) *Trip Generation Manual, 9th Edition, Volume 1: User's Guide and Handbook* defines floor area in two ways, as gross floor area (GFA) and as gross leasable area (GLA). The independent variable used to calculate the trip generation for Land Use Code (LUC) 850 Supermarket is GFA. Page 8 of Volume 1 is attached for reference.

Assessing the Impact at Five Corners

We know how many cars can get through Five Corners in the peak season – these are the volumes that were counted in July 2013. But what the models aren't showing is the unmet demand – those cars that are still in queue and haven't proceeded through the intersection yet.

A review of the queue counts and travel time runs performed by MVC staff in July 2013 indicates an average queue length over the multiple days of observations of approximately 2,300 feet, or 115 cars (based on a car length of 20 feet) on Beach Road. The average travel time from the time a vehicle joined the back of queue on Beach Road to proceed through Five Corners was almost 7 minutes. The average queue length in the afternoon hours was approximately 3,200 feet, and the average afternoon travel time was almost 9 minutes. The data is attached for reference.

So what impact will adding volume on Beach Road have to an already congested street and intersection? In order to understand the impact on current queue lengths, let us consider a few items. Let us suppose that one leg of an intersection can process 500 vehicles in one hour. If 550 vehicles try to come through the intersection in one hour, at the end of the hour, there will be 50 vehicles that haven't gone through yet, waiting in queue. If, in the next hour, another 550 vehicles approach the intersection, there would now be 100 cars in queue, because the initial unmet demand of 50 cars from the previous hour used part of the demand for the next hour. This is how the queues build up over time. Eventually, when the demand lessens, the queues are eventually able to get through the intersection.

Keeping that in mind, we can look at the volumes entering Five Corners on Beach Road, based on count data collected by MVC staff in July 2013. We've provided an attachment that applies the above logic about queuing over a period of time. Based on that logic, calculations in the appendix shows how the queue might change over time, based on real counts, and how those queue lengths might change if the additional Stop & Shop traffic were added. Based on the analysis of Five Corners using yield control under existing conditions, approximately 424 vehicles can move along Beach Road through the intersection in an hour. This is the processing rate, based on an approximation of the current intersection conditions on a weekday afternoon. If we increase the capacity by 5% increments, the length of time that there are queues on Beach Road decrease by increments, until eventually there is a free flow condition on Beach Road, with no delay or queues, which is more closely approximated by the potential signalized/police control condition. The new Stop & Shop will add 5-7% more traffic at Five Corners. The intersection may be able to accommodate this traffic with little impact, depending on the operations on any given day, especially if the capacity is increased such as with police control (see later sections).

Depending on the existing queues at Five Corners, the impact of the additional traffic will be highly variable, as the traffic conditions are today in peak season. On days when the intersection is already

blocked for more than a few hours, such as a “town day” when the weather is less than ideal, the queues heading into and out of Downtown Vineyard Haven may be longer because of the cumulative queuing effect discussed previously, and the impact may be greater. On days with more sporadic queues including periods of free flow, the impact would be relatively limited. Based on those fluctuations on any given day, a shopper might decide to use a different route or not go at all. At some point, the tolerance for sitting in traffic is reached. This is also probably similar to what happens today when queues are long.

Police Control

We agree that the way to model Five Corners under police control is through a signalized analysis. What we find problematic about the analysis provided by VHB is that the traffic signal was modeled as a simple two-phase signal. This means that two approaches can proceed together in each green phase – in this case Beach Street and Beach Road move together, followed by Water Street and Lagoon Pond Road together. Although Synchro can model a signalized five-legged intersection, VHB did not add Beach Street Extension back into the modeling. The simple two-phase operation that VHB modeled in their November 8 memo presents a rosier picture than what is likely to happen in reality. Modeling the intersection as a multi-phased signalized intersection would theoretically increase the capacity by up to 25%, which seems overly optimistic because of the unusual geometry and because the police officer will not be able to solve the congestion problem in Downtown as simply as the analysis results show, or it would have been done by now. However, the sensitivity modeling suggests that if an officer skilled in directing traffic improves the operation by 10-12%, it could eliminate the queuing, even with the additional trips due to the Stop & Shop expansion.

We believe that the intersection is more likely to operate where the officer allows each leg to move independently. In traffic signal speak, we call this split phasing – each approach moves separately while all the other approaches are stopped. We did a quick Synchro analysis of this condition for the No-Build condition and the two distributions of the Build condition. The results are summarized in the attached table. Based on this analysis, the police officer could make the current condition worse. If there were more than one officer controlling the intersection, they might be able to have Beach Road and Beach Street move together, which could help.

There is also the possibility that the officer, or more than one officer, could direct traffic at the intersection and allow Beach Street and Beach Road to move together, Lagoon Pond Road and Water Street to move together, and Beach Street Extension to move on its own. This more closely approximates a three-phase traffic signal. It is not possible to model this condition in Synchro because of the unusual geometry of the intersection.

All of these analyses don't take into account the queuing from other streets that frequently contributes to congestion and queuing in Downtown Vineyard Haven.

It should be noted that it would likely still be necessary for the officer to pull traffic through from Water Street when a ferry arrives in order to prevent gridlock in Downtown Vineyard Haven, since Water Street is the only way out. In that respect, the presence of an officer to direct traffic would not change significantly from what happens today.

This concludes our additional traffic peer review of the proposed Stop & Shop redevelopment. If you have any questions or comments, please contact me at (617) 348-3301.