# ***Memorandum***

By: Roger Dickinson, P.E, PTOE
Date: June 22, 2012
RE: Oman Analytics Summary of Traffic Issues Memorandum

The following responds to the above-referenced Oman Analytics memorandum.

1. Need for Adequate Evaluation Methodology

   Michael Oman contends that the traffic analyses and simulations for the Hannaford project inadequately replicate existing traffic conditions, particularly with regard to simulating the long queues that form in the southbound direction during the afternoon peak hour on Route 116 through Hinesburg village.

   This was discussed and resolved months ago. There was legitimate concern about how well our original analyses modeled the Route 116 corridor in Hinesburg. As a result we did extensive additional work including field studies and computer simulations, and presented the results to the Town in our December 12, 2011 memorandum and December 20, 2011 Powerpoint presentation. These showed that vehicles enter queues (are stopped) at each of the three major intersections: Commerce Street, Mechanicsville Road and Charlotte Road. While this may appear to motorists to be one continuous queue, the simulation software shows it as three queues. Combined to reflect the single queue drivers perceive, the 2017 No-Build queues shown in the simulation model for these three intersections are: 564 feet, 689 feet and 1,046 feet respectively; for a combined total of 2,299 feet.

   Moreover, observations of the actual queues during the PM peak hour reveal that typically some of the traffic in the queues between those intersections is not actually at a full stand-still. Some of the traffic moves along slowly in what is often referred to as a "rolling queue". In other words, typically there is not one long queue of fully stopped cars beginning at the Charlotte Rd intersection that extends to Commerce St and beyond, but rather separate queues at each intersection interspaced by slow moving vehicles that by definition are not "stopped".

   The SimTraffic simulation software does not consider a rolling queue that is moving faster than 7 mph to be a queue of stopped vehicles. Because some of the rolling queue that is observed during the PM peak hour moves somewhat faster than 7 mph it therefore does not show up in the queue lengths indicated by the software. This does not mean the software model is inaccurate; it is simply a matter of how it defines the results. The combination of the three separate queues and the "rolling queues" that move faster than 7 mph combine in the simulation software to provide a reasonably accurate model of what drivers experience and what we have actually observed to be occurring along Route 116 during the PM peak hour.

The Town's independent traffic engineer, Rick Bryant, P.E., agrees. Upon review of our December 12, 2011 memorandum and December 20, 2011 Powerpoint presentation, he wrote a memo dated January 19, 2012 in which he says:

> *"At this point the model predicts queues that are in the range of observations made by L&D, Oman and Bryant. No further model calibration is warranted".*

2. <u>Possible Approaches to Improving Analytical Performance at the Charlotte Rd Intersection</u>
Mr. Oman offers two suggestions to improve the "analytical performance" at the Charlotte Rd intersection under the premise that abnormal traffic arrival rates presently exist. We examined demand vs. service rates ourselves late last year, and concluded that the two suggested modifications (adjusting the total approach volume and applying peak hour factors) are not warranted and would not cause significant changes in the analytical results. This conclusion was reached after examining southbound Route 116 traffic arrival rates at a location north of Commerce St in five-minute intervals during the afternoon peak period, and comparing those results to the peak hour volumes observed during the June 2010 CCMPO turning movement counts (TMC) at the Commerce St, Mechanicsville Rd and Charlotte Rd intersections.

The June 2, 2010 CCMPO TMC at Commerce St showed a total of 719 vph arriving and 734 vph departing on Route 116 southbound during the 4:15-5:15 pm peak hour period. At Mechanicsville Rd, the June 3, 2010 CCMPO TMC showed a total of 647 vph arriving and 801 vph departing on Route 116 southbound during the pm peak hour period that occurred that day (4:45-5:45 pm). At Charlotte Rd, the June 2, 2010 CCMPO TMC showed 852 vph arriving on VT 116 southbound during the 4:15-5:15 pm peak hour period and passing through that intersection. The foregoing pm peak hour volumes can be said to represent "service" volumes; that is traffic that actually passed through the intersection during the peak hour.

In comparison, the results of the 5-minute interval traffic count performed by this office of Route 116 southbound traffic north of Commerce St showed steadily increasing peak hour volumes until reaching 688 vph in the 4:15-5:15 pm one-hour period; and then remaining relatively constant before peaking at 690 vph in the 4:35-5:35 pm one hour period. The average one-hour volume during that time span equaled 681 vph. The results indicated relatively constant "arriving" traffic flow during the peak hour period on Route 116 southbound that was less than the earlier observed peak hour "service" volumes at each of the above intersections.

With regard to the effect of peak hour factors on the analytical results, we first should explain that the peak hour factor concept was originally developed as a way to compensate for the fact that old fixed time traffic controllers were unable to respond to normal variations in peak hour traffic flow. The 15 minute time period was selected as the peak time period within the peak hour to adjust hourly flows to. With vehicle detection and actuated timing now available in current traffic signal controllers, signal timings are automatically adjusted to account for variations in peak hour traffic flow; thus rendering the original peak hour factor concept somewhat obsolete. This is one of the reasons why VTrans has adopted its standard procedure, as Mr. Oman notes, of not applying a peak hour factor when the observed traffic volumes have already been adjusted to a Design Hour Volume (DHV); the 30$^{th}$ highest hour in a year. Mr. Oman suggests that there might be sufficient variability in traffic flow within the peak hour to warrant departing from VTrans procedures.

An examination of peak hour factors from the June 2, 2010 CCMPO TMC pm peak hour at the Charlotte Rd intersection would allay this concern. We had previously examined those peak hour factors in our earlier work. They equal 0.94 for southbound VT 116 traffic in particular, and 0.965 for all movements. Both are approaching the ideal value of 1.0 representing constant traffic flow, and well within the normal range of variability that is typically accommodated by actuated signal timing.

In summary, our work has demonstrated, through direct observations of peak hour traffic flow through Hinesburg village and examination of actual pm peak hour traffic patterns, that the traffic analyses and simulation modeling have been calibrated to the maximum extent possible. Indeed, the Town's traffic engineer, Rick Bryant, P.E., reached similar conclusions in his January 19, 2012 Memorandum:

> *"The action taken by L&D to calibrate the traffic model is reasonable and appropriate for this type of study." "No further model calibration is warranted."*

3. <u>Outstanding Items</u>
   a) <u>Trip Generation of the Proposed Hannaford's</u>
   Michael Oman suggests performing a sensitivity analysis to determine the potential consequences of a higher than estimated Hannaford pm peak hour trip generation. Such an analysis is not generally required or performed in traffic impact assessments, as the accepted practice is to use trip generation rates compiled by the Institute of Transportation Engineers, which has been done for the proposed Hannaford. That ITE trip generation rates provide a reasonable and likely conservative over-estimated pm peak hour trip generation estimate for this project is supported by our own work in performing trip generation counts at several Vermont supermarkets and shopping centers which consistently show actual trip rates lower than ITE rates as well as by trip generation data contained in the Vermont Trip Generation Manual published by VTrans which also shows lower rates. With regard to trip generation, the Town's traffic engineer, Rick Bryant, P.E., in his January 19, 2012 Memorandum after reviewing Oman's assertions regarding trip rates concluded:

   > *"…the lower estimates provided by L&D are likely to prove to be more accurate."*

   In addition, Hannaford has agreed to perform follow-up traffic monitoring to verify its actual pm peak hour trip generation and to provide additional traffic analyses and/or mitigation should it significantly exceed the estimated 386 vte/hr.

   b) <u>Analysis of Northbound Queuing Including Potential Silver St Blockage</u>
   The center of the Silver St approach is located 780 ft south of the existing stop bar in the northbound lane of Route 116 at Charlotte Rd. The 742 ft northbound queue length at the Charlotte Rd intersection noted by Michael Oman was the maximum one-time queue length that occurred in the SimTraffic simulation of that intersection during the entire one-hour analysis period. That particular analysis also included Lantman's existing pm peak hour trip volumes which we believe overestimates what is likely to actually occur. We also wish to point out that this is not the maximum queue length that will occur on a typical day, but rather the maximum that will occur during the DHV; the 30$^{th}$ highest hour in a year.

The average northbound Route 116 queue length extending back from Charlotte Rd in that same DHV analysis was only 287 ft. Based on these results, we conclude that the northbound queue on VT 116 will not materially interfere or impede vehicles desiring to exit Silver St during the pm peak hour.

Further, morning peak hour capacity analyses were provided to the Town's traffic engineer, Rick Bryant, P.E. His January 19, 2012 Memorandum notes that northbound Route 116 morning peak hour queues exceed 1,000 ft under both No-Build and Build conditions. The analyses determined that Hannaford's proposed traffic signal modifications at the Charlotte Rd intersection will improve future morning peak hour traffic flow and reduce future northbound queue lengths. We also note, as has been observed to occur at Mechanicsville Rd, that instead of blocking an intersection, motorists will often courteously permit vehicles to exit side streets and driveways.

c) <u>Poor Levels of Service at Mechanicsville Rd and Silver St Intersections</u>
Hannaford has offered to contribute its pro-rata share to install a traffic signal at the Mechanicsville Rd intersection consistent with Vermont legal standards for assessing impact fees. Our analyses show that a signalized Mechanicsville Rd intersection will operate at level of service B, with Mechanicsville Rd traffic experiencing level of service C (22 seconds/vehicle delay). Southbound Route 116 traffic will experience level of service B (18 seconds/vehicle delay), and its maximum queue will only extend 343 ft; less than 40% of the distance to Commerce St. The new signal would also be synchronized with the existing Commerce St and Charlotte Rd signals to allow smooth traffic flow and diminished congestion compared to current conditions.

Unlike Mechanicsville Rd, future pm peak traffic volumes at the Silver St intersection do not satisfy the peak hour warrant for signalization. Prior to preparing this memorandum, our level of service analyses at this intersection were performed using Highway Capacity Software (HCS) with the level of service E result that Mr. Oman notes for the projected 2017 Build condition.

In observing traffic flow at this intersection in late 2011, we noted distinct platoons in the southbound traffic flow on Route 116 resulting from the upstream signal at Charlotte Rd. When the traffic signal at the Charlotte Road intersection turns red for Route 116 traffic it creates gaps in the southbound traffic that allow vehicles exiting Silver St to turn onto Route 116. When the signal turns green the southbound traffic arrives at Silver Street in a group, often referred to as a "platoon". Despite those observations, we found that the HCS and Synchro software does not adequately model the benefits of these platoons and the gaps between them, especially for the Silver St left-turn movement. This is similar to the inadequacy we found with the HCS and Synchro software when modeling the rest of the Route 116 corridor in Hinesburg that ultimately led us to use SimTraffic traffic flow simulation software as a more accurate tool for modeling this corridor.

To address this, when preparing this memo we extended our SimTraffic model to include the Silver Street intersection and found that SimTraffic appears to reasonably model existing southbound platoons and their affect on the gaps available to the Silver St left-turn movement. SimTraffic's calculated delay for the 2017 Build condition (including Lantman's retaining its existing pm peak hour trip generation) is 51% less than calculated using HCS and 28% less than calculated using Synchro. Applying the

lower 28% reduction from the Synchro/SimTraffic results would improve the previously reported future level of service for the Silver St left-turn movement from E (43 sec) to D (31 sec). This more accurately reflects what we observe is actually occurring at the Silver Street intersection during the PM peak hour.

In summary, based on the above results we conclude that the Silver St left-turn movement will experience better levels of service than predicted by HCS or Synchro, and that future levels of service will not be reduced to E by the proposed Hannaford.

d) Improved Signal Operations as Base Case

We appreciate that the Town is independently pursuing improvements to the Charlotte Rd intersection and encourage their efforts. The requested "base case" analysis was performed and submitted in a memo dated April 30th of this year, but we have not yet had the opportunity to present the results at a DRB hearing. The results showed that implementing the proposed traffic signal phasing modifications prior to Hannaford being constructed would result in an overall level of service C rating with an overall delay of 27 seconds/vehicle (2017 No-Build). That compares to level of service C with an overall delay of 31 seconds/vehicle with Hannaford (2017 Build).

e) Queuing on Commerce Street

Queues from signalized intersections often block nearby driveways in an urban or village setting. This should not be unexpected. It is unfortunate that Michael Oman uses data from our December 11, 2011 memorandum when more recent data is available; namely the February 21, 2012 PowerPoint presentation to the DRB. The analyses presented therein included Lantman's maintaining their existing pm peak hour trip generation levels; a position advocated by Mr. Oman on behalf of his clients. The February 21st PowerPoint presentation also included data from the SimTraffic simulation analyses, as opposed to Synchro analyses that were used in the December 11, 2011 memorandum. The February 21st PowerPoint presentation analyses also maintained the existing Commerce St lane assignments, as requested by the Town's traffic consultant.

The results presented to the DRB on February 21st showed the maximum queue (not the 95% percentile but the 100th percentile) in the Commerce St left-turn/thru lane extending 144 ft under the 2017 No-Build condition and 252 ft under the 2017 Build condition. Average peak hour queue lengths equal 60 ft and 114 ft, respectively. Again, these are not typical day queue lengths, but rather queue lengths that would occur during the DHV (30th highest hour in a year).

More importantly, they are considerably less than the lengths cited by Mr. Oman, and will block nearby Commerce St curb cuts considerably less than Mr. Oman represents. With the new Hannaford, Jolley's easterly driveway and the new entrance to Firehouse Plaza (Aubuchon's) located directly opposite will be blocked less than half the time during the DHV and far less often during typical afternoon peak hours. Aubuchon's eastern driveway, Dark Star's and Tailhook's driveways will not be blocked at all.