



## *Memorandum*

**To:** *Ms. Shelly Pederson, PE  
City Engineer  
City of Bloomington*

**From:** *Tony Hepplemann, PE, PTOE*

**Date:** *July 2, 2008*

**Re:** *SuperTarget Traffic Study Review  
WSB Project No. 1330-10*

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WSB & Associates, Inc. (WSB) has reviewed the traffic impact study for the Bloomington Target Development Site located in the southwest quadrant of the Old Shakopee Road (CSAH 1) and Normandale Boulevard (CSAH intersection prepared by Westwood Professional Development Services, Inc. We have the following comments regarding the analysis and findings in the report.

### **TRAFFIC ANALYSIS FOR THE EXISTING CONDITIONS**

We agree with the delay and level of service results from the analysis of the existing conditions that were reported in the study. The PM peak hour is the critical time period at this intersection. In the PM peak hour, the Old Shakopee Road and Normandale Boulevard intersection currently operates between level of service “C” and “D,” and the Old Shakopee Road and Nesbitt Avenue intersection currently operates between level of service “B” and “C.” The left turns from Old Shakopee Circle onto Old Shakopee Road are currently at level of service “F.”

We disagree with the statement in the report that “Synchro results agree most closely with actual conditions experienced at the signalized intersections and SimTraffic more accurately describes the unsignalized intersections.” We believe SimTraffic provides a good representation of actual conditions experienced at signalized intersections as well as unsignalized intersections. The results from Synchro need to be reviewed closely to determine whether the results reported are valid for that intersection. We have found that Synchro provides good level of service results for isolated intersections where there are not effects from adjacent intersections and where there is adequate turn-lane lengths and storage. For the existing conditions, SimTraffic provides similar results to Synchro. **Table 1** shows a comparison of the PM peak hour delay and level of service results for the two programs. In this case, SimTraffic shows slightly better delay and level of service results, but the results are very similar.

The length of queues relative to the available storage has an impact on the intersection operations and level of service. Synchro calls attention to situations where volumes exceed the capacity available for the movement and may cause vehicle queues that are longer than reported. These longer queues may affect the traffic operations at the intersection, but Synchro does not take into account the effects of inadequate turn-lane lengths or effects of adjacent intersections in the level of service calculations.

Because SimTraffic is a simulation of the intersection operations, it does take into account the effects of adjacent intersections and inadequate turn-lane lengths.

**Table 2** shows the PM peak hour queue results for the two programs compared to the queues we observed on June 18, 2008. For Normandale Boulevard and Old Shakopee Road, Synchro notes that the 95<sup>th</sup> percentile volumes exceed the available capacity for the northbound and southbound left turns and that queues may be longer than reported. In SimTraffic, the maximum left-turn queue length is shown as a through-lane queue because there is not adequate left-turn lane storage and the northbound and southbound left turns spill into the adjacent through lane. **Figures 1 and 2** show a snapshot of the simulation when these left-turn queues extend into the through lanes. Again, both programs provide similar results to what was observed, but the results are reported differently.

The benefit of SimTraffic is that it takes into account the effect of backups blocking access to a lane and the impact this has on delay and level of service. For example, there may be adequate capacity for a left-turn movement, but if the length of queues in the through lanes prevents left turns from getting into the left-turn lane, the delays for the left turns may be much greater than if they were able to fill the left-turn lane. Synchro identifies where vehicle queues may be a problem for intersection operations, but it still assumes that the vehicles can use the lane. Therefore, where queues exceed the available storage or back into adjacent intersections, Synchro may report better levels of service than actually exist.

SimTraffic also takes into account the distribution of traffic between lanes when there is more than one lane serving a specific intersection movement. More traffic may want to be in a specific lane based on where they are going once they are through the intersection. For example, if an intersection has dual left-turn lanes, a higher percentage of the left turns might want to be in the inside left-turn lane if most of the left turns wanted to turn right at the next intersection. This would reduce the effectiveness of the dual lefts since one of the left-turn lanes was not being fully utilized.

## **ANALYSIS OF FUTURE CONDITIONS**

### No-build Traffic Volumes

We have reviewed the historical traffic volumes on both Old Shakopee Road and Normandale Boulevard. The Average Daily Traffic volumes have fluctuated up and down by as much as 20%. The most recent ADTs are just slightly less than the average over the last ten years. Therefore, we think the 1% annual growth rate that was applied is appropriate.

### Trip Generation

We have reviewed the trip generation rates that were used to estimate the trips from the proposed development and believe that the rates used are appropriate for this project. The site is expected to generate 1,323 PM peak hour trips with 680 in and 643 out. We have also reviewed the proposed reductions for internal trips and pass-by trips and believe that the percentages proposed are appropriate for this project. The multi-purpose trip reduction will reduce the PM peak hour trips from the site on the adjacent streets by 100 vehicles with 54 fewer in and 45 fewer out. The estimated site generated trips already passing by the site in the PM peak hour is 306 with 157 in and 150 out. These trips will turn in and out of the site but will not add to the total traffic on the adjacent streets. We question how the pass-by percentages were applied to the site but believe that the slight changes we would make would change

the intersection turning movement forecasts at the key intersections by only a few vehicles and not affect the overall results.

### Trip Distribution

WSB looked at the potential market area and travel sheds for the proposed site. Our analysis is illustrated on **Figure 3**. Based on this analysis, there are two issues we have with the proposed approach direction distribution of the site. First, the combination of the 3% of trips from adjacent properties and the 2% from businesses on Nesbitt Avenue seems quite high for these land uses. The area represents only 4% of the geographic market area, and the entire area is made up of industrial uses that are unlikely to generate many peak-hour trips to Target. The assumption that this 5% of the site generated trips essentially uses the back door and does not impact the intersections of Old Shakopee Road and Normandale Boulevard and Old Shakopee Road and Nesbitt Avenue, does not seem appropriate. The second issue is that the percentage of trips to and from the north on Normandale Boulevard seems a little high and the percentage of trips to and from the east on Old Shakopee Road seems a little low. We estimated about 15% of the site generated traffic to and from the north on Normandale Boulevard (9% less than indicated in the traffic study) and about 32% to and from the east on Old Shakopee Road (12% more than indicated in the traffic study). The impact of this would be to increase the westbound left-turn movement at the Old Shakopee Road and Normandale Boulevard intersection which could further reduce the future level of service at this intersection.

### Analysis of 2011 Build Forecasts

The report shows that the Old Shakopee Road and Normandale Boulevard Intersection will operate at level of service "D," and the Old Shakopee Road and Nesbitt Avenue intersection will operate at level of service "C" in the PM peak hour. This information is obtained from the Synchro output. What is not contained in the report are the Synchro warnings that volumes exceed capacity on certain approaches and queue lengths may be longer or even theoretically infinite. **Table 3** shows the Synchro and SimTraffic output for the 2011 Build PM peak hour queue lengths and levels of service for the Old Shakopee Road and Normandale Boulevard intersection. The footnotes on the bottom of the table are from the Synchro output.

As stated earlier, Synchro calls attention to the queue issue but does not include it in the delay calculations. SimTraffic does take into account the effects of these long queues on the intersection level of service. The effect of the long queues on the westbound approach of the Old Shakopee Road and Normandale Boulevard intersection will be to block access to the westbound left-turn lane and increase delay for both left turns and through vehicles on this approach. Also on the northbound approach to this intersection, the left-turn queues exceed the available storage and back up into the main site entrance for Target and block the northbound through lanes. Because this left-turn lane is often full, traffic is backed up into the site as well as south of the site access intersection.

**Figures 4 through 6** show snapshots from SimTraffic of the vehicle queues that result from the future 2011 Build traffic volumes. Because these queues affect access to turn lanes and through lanes, the level of service is much worse that reported by Synchro. In this case, we believe that SimTraffic does provide a better estimate of the future level of service at this intersection. The SimTraffic delay and level of service results for the three signalized intersections are reported in **Table 4**. SimTraffic indicates that the overall delay at the intersection of Old Shakopee Road and Normandale Boulevard

exceeds 90 seconds per vehicle, which is level of service “F” operations. SimTraffic provides similar results to Synchro at Old Shakopee Road and Nesbitt Avenue where there are no queue problems or spill over effect from the Normandale Boulevard and Old Shakopee Road intersection. However, it shows slightly worse level of service at the main site entrance on Normandale Boulevard because of the effects of the backups on Normandale Boulevard.

### Impact of Railroad Operations

The study reports that the Canadian Pacific Railroad crosses Normandale Boulevard and Old Shakopee Road. The railroad crossing on Normandale Boulevard is about 750 feet south of the Normandale Boulevard and Old Shakopee Road intersection, and the crossing on Old Shakopee Road is about 1,100 feet east of the intersection. Currently, there are two to three trains per day in each direction using this track, and they do occasionally go through the intersection in the PM peak hour. The impact of train operations on the intersection traffic operations at Normandale Boulevard and Old Shakopee Road and at Normandale Boulevard and the main site entrance was not considered in the traffic study. The report indicated that the railroad crossing signals would be interconnected with the traffic signals to avoid queuing onto the railroad tracks when a train goes through the intersection. It should be noted that vehicle queues from the Normandale Boulevard and Old Shakopee Road intersection with the 2011 Build alternative will extend beyond the railroad tracks. To clear these queues when a train is coming, will require clearing both the northbound lefts and the westbound through and left-turn movements. Since these are conflicting movements, the call to the signal will have to go out almost a whole signal cycle before the train crosses Old Shakopee Road or Normandale Boulevard. This will result in greater delays for other movements at the intersection. This will make the traffic operations at the Old Shakopee Road and Normandale Boulevard Intersection even worse than reported by SimTraffic.

### **CONCLUSION**

Based on our review of the traffic study, we have reached the following conclusions:

- SimTraffic results should be reported and considered in the assessment of the traffic impacts of the development because they take into account the following:
  - Effects of lane blockage due to queue lengths
  - Effects of uneven traffic distribution between lanes
  - Effects of queues and traffic operations at upstream and downstream intersections (vehicles may not be able to go when light is green because of queues at downstream intersection)
- The PM peak hour is the critical time period.
- Old Shakopee Road and Normandale Boulevard Intersection currently operate at Level of Service “C” to “D” in the PM peak hour.
- Proposed development will generate almost 16,000 daily trips with 1,323 in the PM peak hour. With reductions for multi-purpose trips, the site is expected to have 1,223 PM peak hour trips that enter or leave the site.

- The proposed development will add 917 new PM peak hour trips to Old Shakopee Road and Normandale Boulevard.
- The proposed development will significantly increase westbound Old Shakopee Road left-turn movements and northbound Normandale Boulevard left-turn movements in the PM peak hour which will significantly impact the level of service at this intersection. WSB believes the westbound Old Shakopee Road left-turn movement in the PM peak hour may be 70 vehicles more than estimated in the traffic study.
- Based on SimTraffic results, the added traffic from the proposed development that was estimated in the traffic study, will cause the intersection of Old Shakopee Road and Normandale Boulevard to operate at Level of Service "F" with an average delay per vehicle at the intersection of over 98 seconds. This delay will be even more if an additional 70 left turns are added to the westbound Old Shakopee Road leg of the intersection in the PM peak hour as determined in our analysis.
- The vehicle delay at the intersection of Old Shakopee Road and Normandale Boulevard will be even greater when a train crosses Old Shakopee Road and Normandale Boulevard during the PM peak period.
- The queues in the left-turn lane on northbound Normandale Boulevard at the Old Shakopee Road intersection will prevent traffic from turning left out of the development site main entrance on Normandale Boulevard. The queues will also cause traffic to back up on northbound Normandale Boulevard south of the main site entrance and will block traffic from turning onto Normandale Boulevard at 110<sup>th</sup> Street.
- The proposed development traffic will make it virtually impossible to make a left turn onto Old Shakopee Road from intersecting residential streets during the PM peak hour.