June 23, 2016

Mr. Igor Kotlyar, PE
Senior Project Engineer
City of Ann Arbor
301 E. Huron Street, P.O. Box 8647
Ann Arbor, MI 48107-8647

RE: Nixon at Dhu Varren / Green Intersection
Assessment of Proposed Roundabout Configuration

Dear Mr. Kotlyar:

As requested, OHM Advisors has reviewed the decision to select a single lane roundabout as the City-preferred alternative for the intersection improvement for Nixon Road at Dhu Varren Rd / Green Rd. The roundabout option was considered one of two acceptable improvement options developed by Opus International in their study of this location, dated March 2015. Their top recommendation was for realigning and widening Dhu Varren Rd and lane widening on Nixon and Green Rd for the installation of a traffic signal. However, it was clear from the Opus report that the roundabout option was also a strong contender, given its superior characteristics for safety and mobility.

As a prelude to designing intersections, OHM Advisors usually prefers to reassess the selection of a roundabout to ensure that the design is appropriate and will be sufficiently robust to safely handle traffic out to the planned horizon year for the community. Our technical memorandum of June 21, 2016 describes the steps we took to collect new traffic and non-motorized counts for this reassessment, accounting for the planned residential developments within the City along the Nixon Road corridor, and expanding the volume data out to the forecast year of 2035. When comparing this new travel data to that used by Opus, we see some minor differences. However, the two data sets are of the same order of magnitude, so we would anticipate that the analysis results for alternatives would be comparable.

We started our investigation by looking at operations. We use RODEL as our preferred analysis tool for evaluating roundabout capacity for both conceptual and detailed design. The analysis considered both a.m. and p.m. peak periods for both opening day and the 2035 horizon year traffic volumes. Opening day volumes considered the existing traffic as measured in our counts from earlier this year plus the anticipated trip generation from the full buildout of the Nixon Farms (North and South) and the Woodbury Club Apartment developments.

The operational analysis showed us that Opus was correct in recommending a single-lane roundabout. However, in our more detailed exploration of operations, we conclude that a full bypass lane in the southwest quadrant, handling east bound to south bound movements, is not needed for opening day volumes. Further, it is questionable if it would be needed for the horizon year. Given the uncertainty of forecasting traffic volumes out 20 and more years, we conclude that planning for a future bypass lane should occur now with our design. However, we recommend that it not be constructed at this time. This is because national safety reviews of roundabouts indicate that over-building capacity, especially in the context of additional lanes, introduces a more complex situation than is initially needed, which has the potential to increase the risk of crashes.
In any case, we do not recommend the free flow bypass lane configuration depicted in the Opus study. Our experience is that such designs should not be used in an area with the potential for significant pedestrian and bicycle usage. Rather, we generally support the design of what are called partial bypass lanes. The key difference is that partial bypass lanes join with the departing lanes under a YIELD control, instead of adding a full lane and then merging that lane into the departing lane. By teeing up the bypass lane and with the YIELD control, speeds are kept low for any pedestrian crossing, and the safety of bicyclists is improved.

Regarding safety, we tend to place a very high emphasis on the strength of roundabouts for reducing the severity of crashes and the resulting injuries. This is especially true for single lane roundabouts. The safety performance of roundabouts continues to be evaluated in various studies. The most comprehensive national review of roundabout safety is National Cooperative Highway Research Program (NCHRP) Report No. 572 (2007), Transportation Research Board, National Academy of Sciences and Engineering. It shows that signalized intersections that were converted to roundabouts experienced a 78 percent reduction in severe injury collisions and a 44 percent reduction in total crashes. More recently, the Michigan Department of Transportation Research Report RC 1566 (2012) did an evaluation of roundabouts within Michigan that showed comparable results.

Both the national and Michigan evaluations show that roundabouts are reasonable intersection improvements from the perspective of pedestrians and bicyclists. When designed correctly, roundabouts have low approach and entry speeds that are pedestrian friendly. There are fewer conflict points between pedestrians and vehicles at roundabouts. The splitter islands for each roundabout approach simplifies and greatly shortens the crossing distance for pedestrians, as the islands are refuges for pedestrians.

The Opus report for Nixon Road at Dhu Varren Rd / Green Rd. touched on the relative safety of signalized intersections compared to roundabouts. This general safety discussion did not address specific considerations related to the conceptual designs included in the study. We note that the conceptual design for the signal option at that time had the Dhu Varren approach to the signal in a horizontal curve and intersecting Nixon with a pronounced skew angle. These features are associated with safety concerns, as the curvature would limit visibility at the signalized intersection for left turning vehicles (potential head-on left turn crashes) and the skew results in substandard view angles of the cross road (potential angle and right turn rear end crashes). We further note that the conceptual design for the roundabout includes a full bypass lane, which requires a merge condition when joining to SB Nixon Rd. This type of bypass lane is associated with a safety concern, as it allows for higher speeds and requires drivers to glance over their shoulders to complete the merge. As already noted above, we do not recommend that a bypass lane be constructed at this time. When one is needed, we would recommend the design of a partial bypass, which better controls speeds, provides a better view angle for all users and improves safety for pedestrians and bicyclists.

Finally, we have performed an abbreviated life cycle cost analysis which uses a new research tool made available in late 2015. This analysis derives from NCHRP Project 03-110 and compares the installation of a roundabout with that of a traffic signal. While the methodology allows for consideration of additional factors, our analysis focused on safety and operating costs. Safety costs use the National Highway Traffic Safety Administration (NHTSA) accounting data for fatal, injury and property damage collisions. The operational costs include NHTSA figures for motorist delay. The life cycle cost analysis, discussed further in our technical memorandum to you dated June 22, 2016, indicates that a single lane roundabout is a prudent choice for this location.

**Recommendation:**

OHM Advisors has examined the potential safety and operations of a roundabout for this intersection, and conducted a life cycle cost evaluation comparing a roundabout to a signalized intersection. We have concluded that a single lane roundabout should remain the City-preferred alternative for the intersection of Nixon Road at Dhu Varren/Green Roads.
Sincerely,
OHM Advisors

Stephen B. Dearing, PE, PTOE
Lead Traffic Engineer

Steven M. Loveland, PE, PTOE
Project Manager

Attachments:
- Memo - Traffic Volume Data and Forecasting