



MSA Study Summary

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Subject: Winneconne Ave & Commercial St Intersection Control Evaluation Summary
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INTRODUCTION

MSA Professional Services, Inc. (MSA) was asked to complete an intersection control evaluation (ICE) for the intersection of Winneconne Avenue at Commercial Street, in Neenah, Wisconsin (city). The west¹ and north legs of the intersection are also part of STH 114 as well as the Wisconsin Department of Transportation (WisDOT) Connecting Highways system.

The intersection was identified by the city as having ongoing issues with safety, operations, and capacity and was targeted for investigation of potential improvements. Initial operation reviews indicated regular queues of 200 – 300-feet on all approaches with the existing configuration and traffic signal control. The southbound right-turn movement was calculated to be nearing capacity under current conditions. Over the last five years of available crash data, the intersection experienced 34 crash events. The eastbound approach experienced eight front-to-rear (rear-end)-type of crashes, the most of any other approach or crash manner. Of the 34 crash events, eight involved injuries, none of which were worse than severity level B (suspected minor injury). No fatalities were reported during the period. Roadway conditions were noted as a possible factor in at least ten of the overall crashes (snow, slush, ice, or wet pavement). Failure to yield was cited in 11 of the overall crashes.

In order to identify viable alternatives and ultimately recommend one for improving operations and safety, Phase I and Phase II ICE reports were completed for the intersection, following WisDOT reporting standards.

PHASE I ICE

The Phase I ICE investigation focused on determining what potential improvements were viable for the intersection based on a high-level review of the identified issues and space available. Results from the Phase I analyses indicated the following alternatives were viable and should be analyzed further as part of a more detailed Phase II ICE report:

¹ The Winneconne Avenue approaches are oriented in a southwest to northeast direction, but will be referred to as west and east legs for simplicity of discussion.

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1. Modified Traffic Signal – Lane modifications and updated signal phasing
2. Roundabout, 4-Leg – Convert the existing intersection into a multilane roundabout
3. Roundabout, 5-Leg – Convert the existing intersection into a multilane roundabout which realigns Church Street to be part of the main intersection.

PHASE II ICE

The Phase II ICE investigation used the viable alternatives from the Phase I ICE report and looked more in-depth at existing (2022) design year (2042) operations, projected safety performance using the Interactive Highway Safety Design Model (IHSDM) procedures, conceptual level intersection layouts, business and right-of-way (R/W) impacts, and estimated construction costs. Conceptual layouts for the three alternatives are included in the Phase II ICE report.

Results of the analyses indicated that all alternatives are expected to provide acceptable levels of operation (delay, queue, and capacity) through the design year. The roundabout alternatives are expected to provide the most significant and longest-lasting operational and capacity benefits but would cost the most to construct and would have the greatest R/W and business impacts. Including estimated R/W acquisition costs, the four-leg roundabout alternative is expected to cost \$1.8 million more than the modified traffic signal alternative. Both roundabout alternatives would require the purchase of the entire parcel in the northwest corner of the intersection, whereas the modified traffic signal would only require a small strip of R/W to be acquired. The roundabouts would also require the purchase and relocation of the commercial pylon signs for parcels in the north and southeast corners, in addition to relocation of the “Welcome to Historic Downtown Neenah” monument sign and adjacent flagpole. These impacts are shown in Figure 1 and Figure 2.

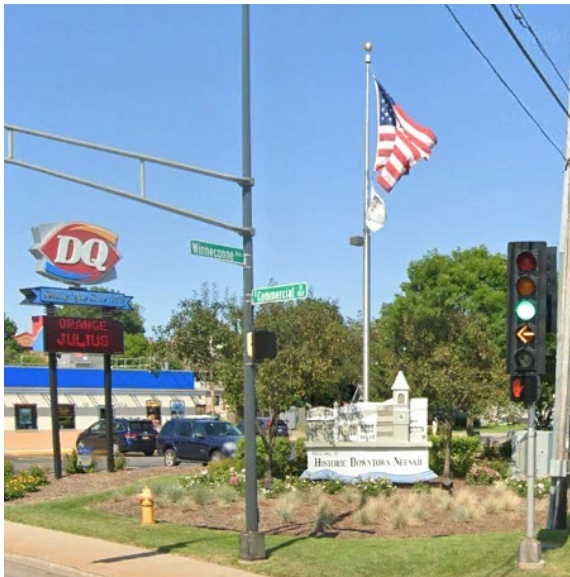


Figure 1, The existing monument sign, flagpole, and commercial pylon sign in the northeast corner



Figure 2, The existing commercial pylon sign in the southeast corner

For safety and geometric constraint reasons, access between Winneconne Avenue and Church Street would be restricted to right-in/right-out movements only for the modified traffic signal and 4-leg roundabout alternatives. The existing intersection of Winneconne Avenue at Church Street

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is within the functional area of the intersection of Winneconne Avenue at Commercial Street. This proximity results in a larger number of conflict points (places where vehicle paths overlap) in a smaller area, which results in a higher probability for crashes to occur.

The roundabout alternatives are expected to generate the largest numbers of crashes, showing an increase over the no-build alternative. Recent studies have shown increases in the overall number of crashes occur when multilane roundabouts are constructed; however, the magnitude of injuries are lower than other intersection types. Due to the geometric design of a roundabout, the most severe manners of collision (head-on and T-bone) which result in K and A-level severity injuries (fatal and suspected serious injury), are all but completely eliminated. Other intersection types such as stop or traffic signal control do not have physical barriers preventing vehicles from colliding in this manner, while also allowing for faster approach speeds prior to any impact.

When construction costs and projected safety benefits are compared, the modified traffic signal alternative has a benefit/cost ratio of 0.46; the 4-leg roundabout alternative is -2.47. (Note, due to limitations of the IHSDM, a benefit/cost ratio for a 5-leg roundabout is not able to be calculated. It is expected to be lower than the 4-leg alternative.)

The 5-leg roundabout alternative is the only alternative that does not have a significant impact to the Valley Transit (Route 32) line that uses Winneconne Avenue and Church Street. Turn movement restrictions would require at least part of the bus route to be moved to a different street in order to access northbound Church Street with the modified traffic signal alternative. The 5-leg roundabout alternative would still allow direct access to northbound Church Street within the intersection. Indirect access to northbound Church Street would be allowed with the 4-leg roundabout alternative; however, this would require the bus to make a U-turn at the roundabout in order to turn right onto northbound Church Street.

CONCLUSIONS

Conclusions discussed below are based on the results of the alternatives considered in the Phase II ICE investigation. Development changes being considered for the adjacent properties could allow for some modifications of the alternatives investigated as part of the formal Phase II ICE. Additional analysis would be necessary to determine the impacts “fine tuning” the proposed alternatives, such as modifications of downstream lane configurations (lane reductions/merges) or other geometric adjustments and could be done as a preferred alternative is selected.

Based on the raw results of the Phase II ICE investigation, the modified traffic signal is the preferred option. The modified traffic signal has the best benefit/cost ratio, reduces the expected number of crashes, results in the least amount of R/W impacts, and does not require any businesses to be acquired. Unlike the roundabout alternatives, the modified traffic signal has reduced operations (higher delay and queues, lower residual capacity). The modified traffic signal improves on existing operations through the design year, just not to the same extent as the roundabout alternatives. The modified traffic signal alternative does not significantly reduce the likelihood of severe crashes (injury level B, A, or fatalities (K)). However, in the last five years, crashes of this injury magnitude were not reported.

In order to accommodate the design vehicle movements along the STH 114 portions of the intersection, the stop bars for the southbound and eastbound approaches need to be relocated upstream of the intersection in order to allow the design vehicles enough room to complete their

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maneuvers. The eastbound stop bar could remain in its current location; however, in order to accommodate the southbound right turn, additional R/W would be necessary as well as the relocation of at least one significant utility pole.

Restricting access to Church Street down to right-in and right-out movements will impact the existing Route 32 Valley Transit bus line, as it currently turns left from eastbound Winneconne Avenue onto northbound Church Street. The bus line would need to be modified to accommodate this new restriction. Several potential alternatives exist, including:

- Moving northbound operations to Commercial Street and using Church Street for southbound operations
- Relocating the eastbound left-turn to Isabella Street, then using Adams Street to reconnect with Church Street

Current cost estimates included implementing traffic signal changes necessary to accommodate the proposed lane adjustments only, as crash patterns did not indicate the need for additional signalization infrastructure changes for the other intersection approaches. Any further changes would require an increase in funding, but could all be implemented at the same time.

Additional considerations that could be evaluated with the development of further design plans could include:

- Install a raised median on the north approach to separate the southbound right-turn lane from the through lane. The raised median would allow a place of pedestrian refuge, shortening the distance that would need to be crossed at one time, in addition to providing additional signal timing flexibility. Installation of such an island would significantly increase the alternative's impacts to the property in the northwest corner of the intersection and Church Street.
- Install a raised median on the west approach to separate the eastbound and westbound lanes. The physical barrier would better prevent left turns to and from Church Street than if regulatory signs were used alone. Addition of the median would increase the R/W impacts as well:
 - Northern Shift
 - No R/W would need to be acquired on the south side of the approach
 - Creates additional impacts for design vehicles completing southbound right turns from Commercial Street
 - Southern Shift
 - Creates new R/W impacts on the south side of the road where there were few or none previously
 - Allows for realignment of the eastbound left-turn lanes. This could reduce the impacts these left turns have on the southbound approach lanes.
- Upgrading to monotube and signal head-per-lane for all approaches. This would maximize signal visibility, which could further reduce the incidence of front-to-rear crashes. It would also bring the signal infrastructure to the latest WisDOT design standards. Depending on the size of poles needed, additional utility modification may be required in order to accommodate the new poles and associated foundations.
- Converting five-section, protected/permissive left-turn signals to four-section flashing yellow arrow (FYA) indications. This conversion not only offers additional crash reduction potential, but also offers more signal phasing flexibility to accommodate future growth.

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- Adding pedestrian push buttons for calling pedestrian phases. Currently, the pedestrian phase is called with every green light. When there are no pedestrians present, this results in additional phase time being used for a phase that may not need it, when it could be used to instead serve other phases requiring more time. It could also allow for conflicting pedestrian phases to be served sooner. Given the existing traffic signal pole layout, additional “pedestrian button poles” may be needed in order to comply with ADA and PROWAG location regulations.
- Adding emergency vehicle preemption (EVP). EVP can allow for certain emergency vehicles to pass through the intersection faster by being able to call for their own green light indication. This equipment does require transponder equipment to be installed on each emergency vehicle in order for it to be effective. The signal infrastructure could be installed now to save implementation costs later.

Implementing some or all of the additional traffic signal modifications listed above, beyond what is required for the modified traffic signal alternative would require additional discussion and further investigation to determine a better cost estimate. Simultaneous implementation would have several benefits, including better public perception of only making modifications at one time rather than coming back later for additional work. Completing all the work at once would increase the overall implementation cost estimate, but it would have cost efficiencies with construction mobilization and necessary underground rewiring to accommodate the new signals. It could also offer additional timing flexibilities to better accommodate future growth.

Attachment A : Phase 2 ICE Report (Text & Attachments)

Attachment B : Phase 1 ICE Report (Text Only)