US16/Neck Yoke Road Intersection Evaluation and Screening Process

- Step 1: Intersection type: RCI vs. signalized intersection
- Step 2: Main intersection location: Neck Yoke Road vs. central driveway
- Step 3: Number of access points: one main intersection vs. one main intersection plus a partial northern access

Consultant Recommendation: technical recommendation of Build Option to carry forward into the NEPA process (environmental study)

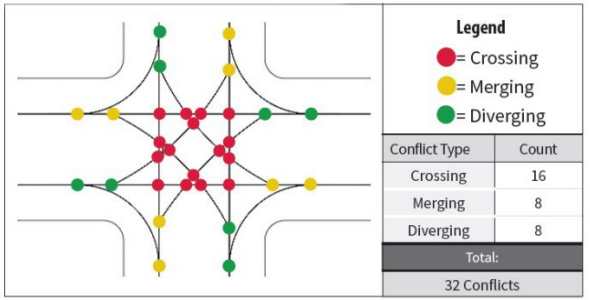
The self-paced slides highlight key findings throughout process to provide an overarching summary of the process used to develop the Consultant Recommendation. Please reach out to a study representative if you are interested in discussing these items in greater detail.

Step 1: Intersection Type
Consultant Recommendation: RCI

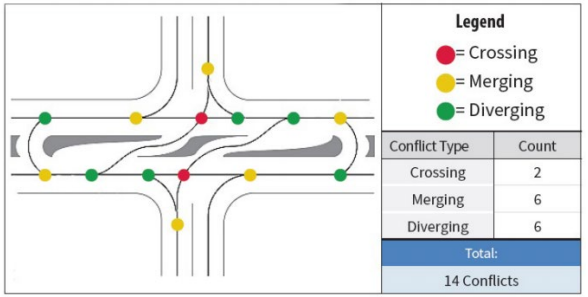
- Traffic Safety
  - Notable reduction in 'crossing' conflict points
    - Typically the most common and severe intersection conflict
  - MnDOT research has shown 80% reduction in Fatal & Injury crashes
  - US16 analysis:
    - Up to 30% greater predicted reduction in Fatal & Injury crashes than signalized intersection (65% total reduction)

- Traffic operations
  - US16 through traffic does not need to stop at bottom of steep grades
  - Side-street RCI travel times similar to waiting for a traffic signal
  - US16 analysis:
    - 75% less overall intersection delay than signalized intersection
    - Traffic signal requires 3rd EB lane due to large vehicles

Conventional Intersection: Conflict Points



RCI: Conflict Points



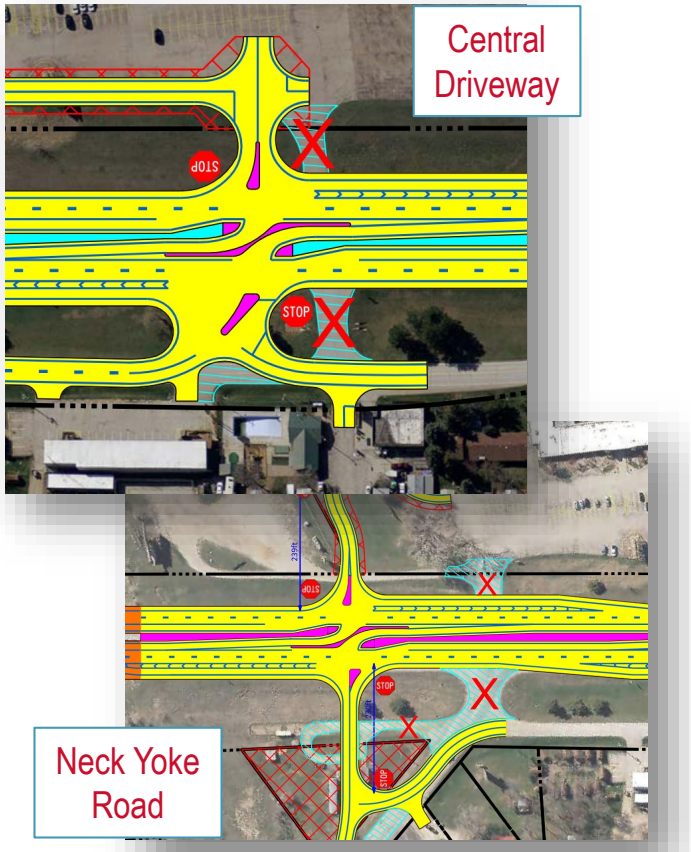
MnDOT crash data: http://www.dot.state.mn.us/roadwork/rci/docs/rci-info-sheet.pdf
Figure: https://safety.fhwa.dot.gov/intersection/innovative/uturn/fhwasa18048/

Step 2: Main Intersection Location

Consultant Recommendation: at Neck Yoke Road

- Central driveway resulted in undesirable configuration:
  - Close proximity to US16 service road
  - Overlap of turning movements between: US16, US16 service road, and driveways
  - Large pavement footprint on east leg
  - Driver expectancy concerns

- The Neck Yoke Road location was selected based on:
  - Up to 200' between US16 and US16 service road
  - Separates US16/Neck Yoke Road intersection turning movements from US16 service road access points
  - Much 'cleaner' to navigate for unfamiliar drivers



Step 3: *3 'Finalist' RCI Configurations Overview*

Build Options

1.1C: RCI at Neck Yoke Road + Northern Partial Access

1.1D: RCI at Neck Yoke Road (West)

1.1e: RCI at Neck Yoke Road (West) + Northern Partial Access

Key Differences

- Main intersection location:
  - At Neck Yoke Road or shifted west (south)
- Number of access points:
  - Single RCI
  - RCI plus northern partial access
- Frontage road connectivity

Image: Google Earth

Step 3: *Intersection Operations*

Experienced Travel Time (ETT) and LOS – control delay (stop or YIELD sign) plus extra distance travel time to account for diverted path travel times of an alternative intersection. Analysis based on forecasted Year 2050 traffic volumes.

Main Intersection Operations

Measure	1. RCI 1.1c *AM / PM*	2. RCI 1.1d *AM / PM*	3. RCI 1.1e *AM / PM*	No Build *AM / PM*
ETT LOS	3.8 / 6.1 *A / A*	3.8 / 8.1 *A / A*	3.8 / 6.1 *A / A*	23 / 591 *C / F*

Findings:

- Single RCI 1.1d provides ample capacity for Year 2050 traffic volumes
- 1.1c and 1.1e provides operational benefit in the higher-volume PM peak by spreading demand across multiple access points.

Step 3: *Safety*

Predictive Safety Analysis – predicted reduction in crashes by implementing the proposed Build Option improvements.

Predicted Reduction in Crashes

Crash Type	1. RCI 1.1c	2. RCI 1.1d	3. RCI 1.1e	No Build
Fatal & Injury	*55% reduction*	*70% reduction*	*61% reduction*	Baseline *(168 crashes)*
Total Crashes	*49% reduction*	*64% reduction*	*51% reduction*	Baseline *(370 crashes)*

Findings:

- All three provide exceptional safety benefits to the area, particularly for Fatal & Injury crashes.
- Greatest benefit is the single RCI 1.1d, which minimizes conflict points in the area.

Step 3: *Other Considerations*

Following Public Meeting #2, area stakeholders expressed preferences for locating all westbound US16 turn lanes entirely off of the 6% downgrade east of Neck Yoke Road and multiple access points. These comments were the impetus for Build Options 1.1d and 1.1e. The following summarizes additional considerations associated with these modifications.

Measure	1. RCI 1.1c	2. RCI 1.1d	3. RCI 1.1e
Turn Lanes Located Entirely on Grade < TBD%? *Mitigation Measure:*	No *Increased turn lane deceleration length*	**Yes**	**Yes**
ROW Needed (acres)	0.8	2.7	2.3
Environmental	-	• Displacement of 1 parcel • Potential impact to Reptile Gardens septic system	• Displacement of 1 parcel • Potential impact to Reptile Gardens septic system

Step 3: *Construction Costs and Benefit-Cost Analysis*

A Benefit-Cost Analysis (BCA) was conducted using a 'lite' version of the US16/US16B/Catron Boulevard intersection BCA. A BCA attempts to monetize benefits to the greatest extent possible to assess feasibility (B/C ratio > 1.0) of a Project. Qualitative and quantitative analyses are also important components in the evaluation of Build Options.

Measure	1. RCI 1.1c	2. RCI 1.1d	3. RCI 1.1e
Construction Cost	$9.4M	**$10.8M**	**$10.8M**
Benefit – Cost Ratio	**4.4**	**4.5**	**4.1**

Consultant Recommendation

- *HDR's recommendation to the Study Advisory Team*

- *Placeholder Recommendation forthcoming….*

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