Step 1

Intersection concepts were evaluated using the criteria outlined in Appendix A – Evaluation Criteria, of the *Purpose and Need Report*.

Step 1 criteria include comparing anticipated intersection crash rate reductions and the ratio of daily traffic volume to roadway capacity (demand/supply) against the existing (No-Build) condition. If a concept shows improvement over the No-Build condition for these two criteria, the concept is advanced to Step 2. Step 2 and Step 3 criteria include safety, mobility, bikeability/walkability, access, and social, economic, and environmental (SEE) impacts.

The information provided here is a summary of a longer technical report: *Alternatives Evaluation Report (through Step 1), which is available upon request.*

Intersection Types Considered in Step 1

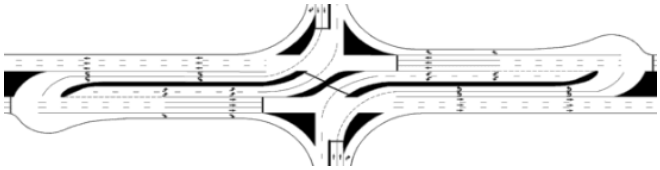
The following general intersection solution types were considered in Step 1 of the process:

At Grade Signalized Concepts

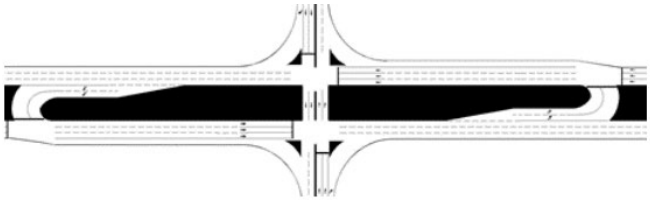
- **No-Build Alternative** - The No-Build Alternative (or "do nothing" alternative) leaves the existing at-grade signalized intersection as-is. This is being evaluated as the basis for comparison.

U–Turn Based Concepts

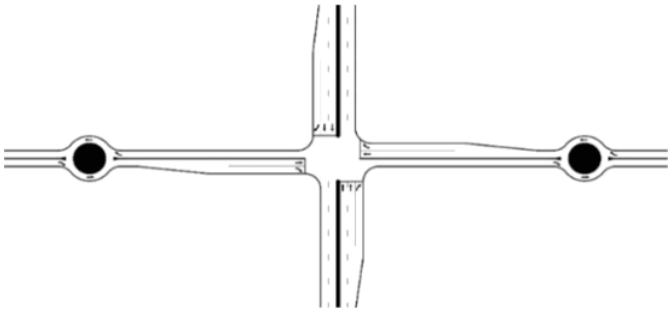
- **Restricted Crossing U-Turn (RCUT)** - Minor roadway left-turn and through movements are removed from the main intersection. These vehicles turn right onto the major roadway before making a U- turn at a downstream median opening. The main intersection and U-turn crossover intersections are signalized.



- **Median U-Turn (MUT) (full/partial)** - Left-turn movements from the major roadway (partial) or both roadways (full) are removed from the main intersection. These vehicles instead execute a U-turn at a median opening on the major roadway downstream of the main intersection. The main intersection is signalized but the U-turn crossover intersections can be signalized or unsignalized.

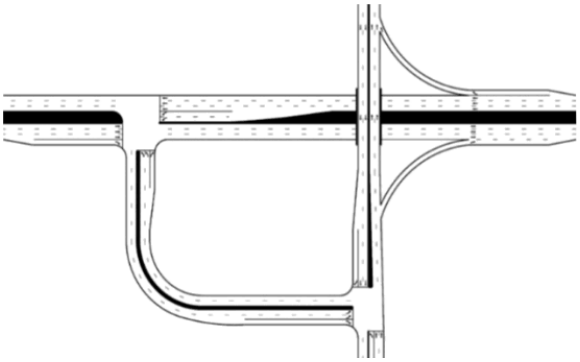


- **Bowtie** - The bowtie intersection is an alternative to the MUT intersection. Left-turn movements from both roadways are removed from the main intersection and are executed via a U-turn at a roundabout on the minor roadway downstream of the main intersection.



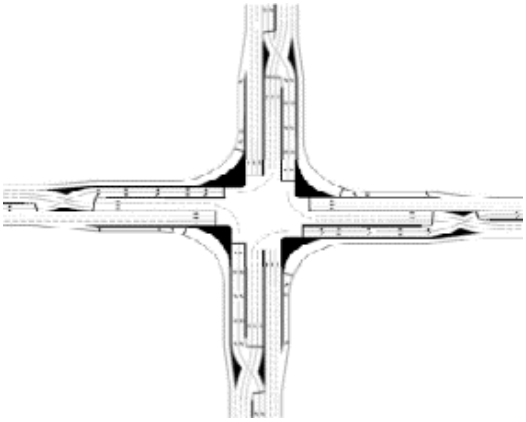
Partial Grade Separated Concepts

- **Single Loop** - All four left-turn movements and some right-turn movements are rerouted onto a connector road in one quadrant, while the major and minor roadways are grade-separated. This intersection can be designed as signalized or unsignalized.

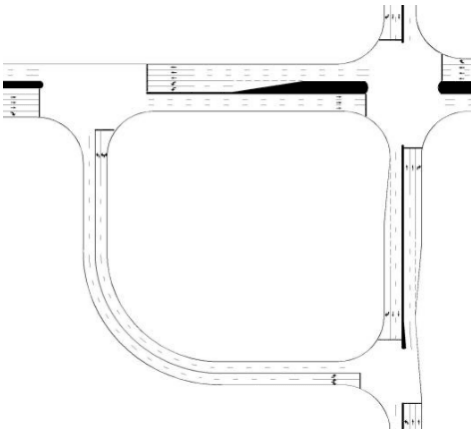


Displaced Movement/Crossover Based Concepts

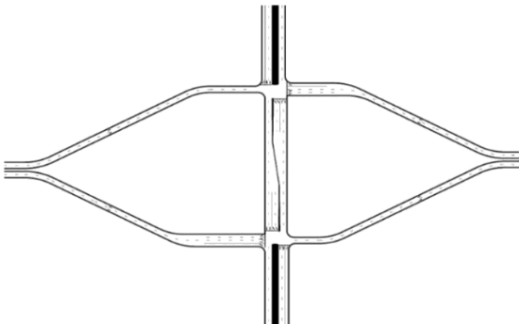
- **Displaced Left Turn (partial)** - The arterial left-turning vehicles cross over to the other side of the roadway at a signalized intersection several hundred feet in advance of the first ramp intersection. At both of the ramp intersections, the protected left turns occur simultaneously with the opposing through movements. This design is also referred to as a Continuous Flow Interchange.



- **Quadrant** - All four left-turn movements are rerouted onto a connector road in one quadrant. The main intersection is signalized, and the connector road intersections can be signalized or unsignalized.

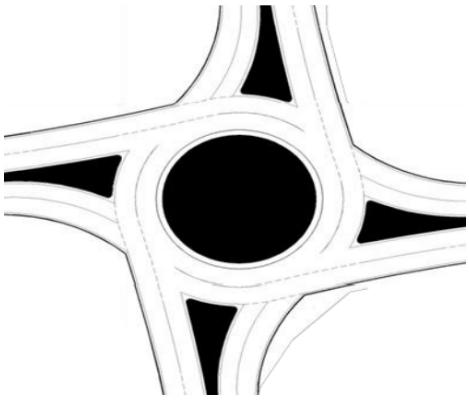


- **Split Intersection -** The split intersection separates traffic flow on the major roadway into two one-way roads with separate intersections with the minor roadway. This configuration is similar to a traditional diamond interchange without grade separation.



At Grade – Unsignalized Concepts

- **Standard Roundabout -** A roundabout is a circular unsignalized intersection in which traffic flows in one direction around a central island. Traffic entering the roundabout must yield to traffic already inside the roundabout.

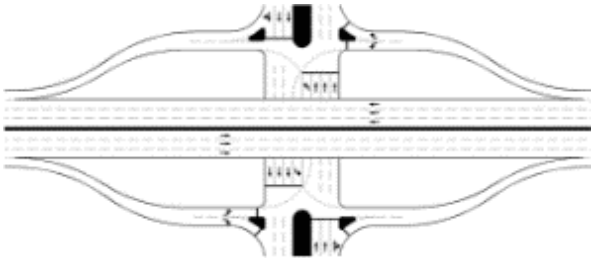


- **Unsignalized RCUT** - Minor roadway left-turn and through movements are removed from the main intersection. These vehicles turn right onto the major roadway before making a U- turn at a downstream median opening. The main intersection and U-turn crossover intersections are unsignalized.

Interchange Concepts

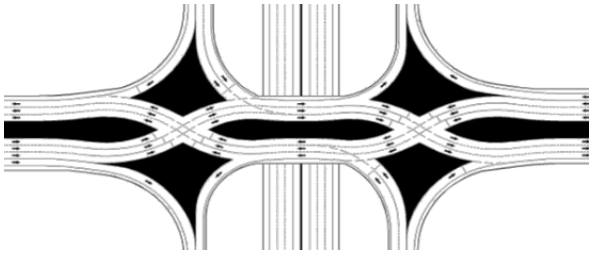
Diamond

- **Traditional Diamond -** The traditional diamond interchange is a grade-separated interchange with two intersections on the arterial. The intersections may be signalized or unsignalized. Each direction of travel on the freeway has one on-ramp and one off-ramp.

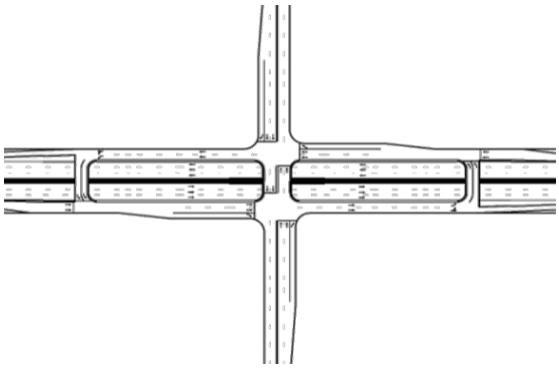


Displaced Movement/Crossover Based

- **Diverging Diamond** - The diverging diamond interchange is an alternative to the traditional diamond interchange where arterial traffic crosses over to the other side of the roadway in between the two ramps. This allows vehicles to turn left onto the on-ramps without crossing over opposing lanes of traffic. This design is also referred to as the double crossover diamond interchange.

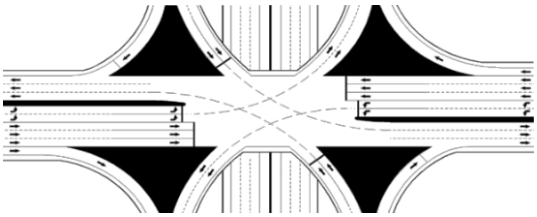


- **Michigan Urban Diamond** - The Michigan urban diamond interchange is a variation of the traditional diamond interchange that removes left-turn movements from the arterial intersections. These vehicles instead make U-turns at directional crossovers on frontage roads. This design is also referred to as a Median U-Turn (MUT) Interchange. This intersection can be designed as fully signalized or partially unsignalized.

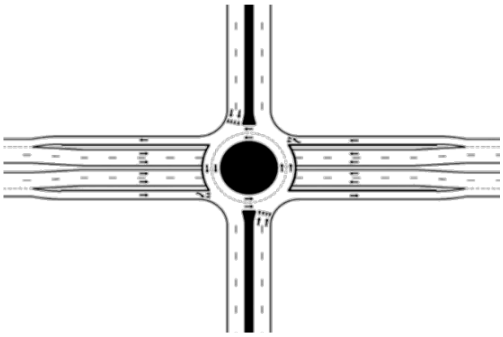


Single-Intersection Interchanges

- **Single Point Urban -** The single point urban interchange is an alternative to the traditional diamond interchange in which all ramps begin or end at a single intersection on the arterial.

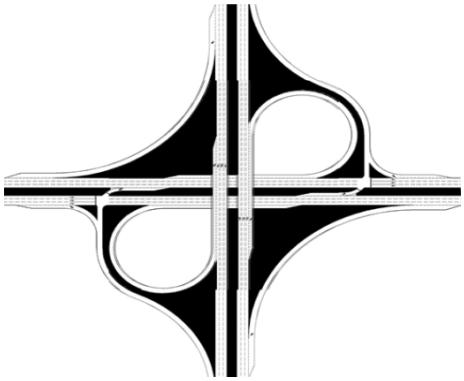


- **Single Roundabout -** The single roundabout interchange is a grade-separated interchange in which all ramps begin or end at a single roundabout on the arterial.

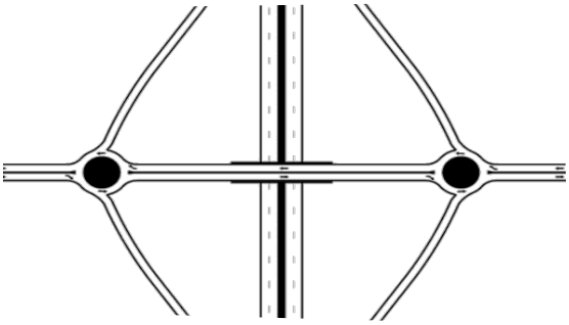


Other

- **Partial Cloverleaf** - The partial cloverleaf interchange is a grade-separated interchange with a combination of directional ramps and loop ramps. This configuration may include up to two intersections on the arterial. The intersections may be signalized or unsignalized.



- **Double Roundabout** - The double roundabout interchange is a grade-separated interchange in which all ramps begin or end at one of two roundabouts on the arterial. This design typically allows for a narrower bridge width than the single roundabout interchange.



Graphics and text from Virginia Junction Screening Tool (VJuST), Version 1.1, November 2020.

Options Not Considered

Several options were not considered for the first screening as they are not appropriate for the traffic volume patterns, magnitude of traffic volume, or facility context:

- All-Way Stop Control Intersection
- Two-Way Stop Control Intersection (on Lake Elmo Avenue)
- Continuous Green T Intersection
- Restricted Crossing U-Turn (RCUT) Intersection (signalized, with unsignalized U-turns)
- Mini Roundabout
- Full Displaced Left Turn Intersection
- Thru-Cut Intersection
- Echelon Intersection
- Center Turn Overpass Intersection
- Contraflow Left Interchange
- Displaced Left Interchange