

# Principal Arterial Intersection Conversion Study

TAC Planning Committee Meeting

January 12, 2017

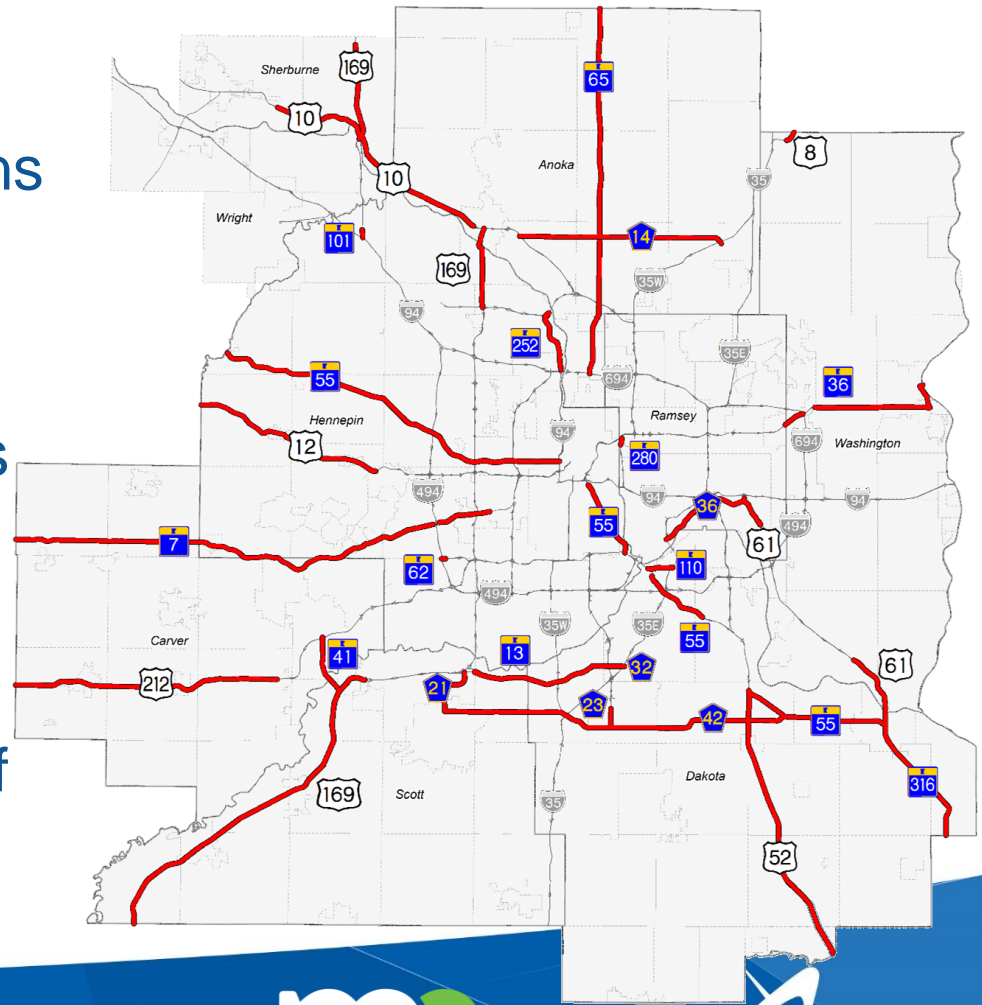


# Presentation Overview

- Background – Need for Study, Objectives
- Phase I Screening (Completed Spring 2016)
  - 374 intersections initially considered
  - 91 intersections selected for Phase II study
- Phase II (Completed Fall 2016)
  - Set regional priorities for grade-separation projects
    - High Priority: 34 intersections
    - Med Priority: 27
    - Low Priority: 30
  - Provide input to policy, investment plans, and local plans

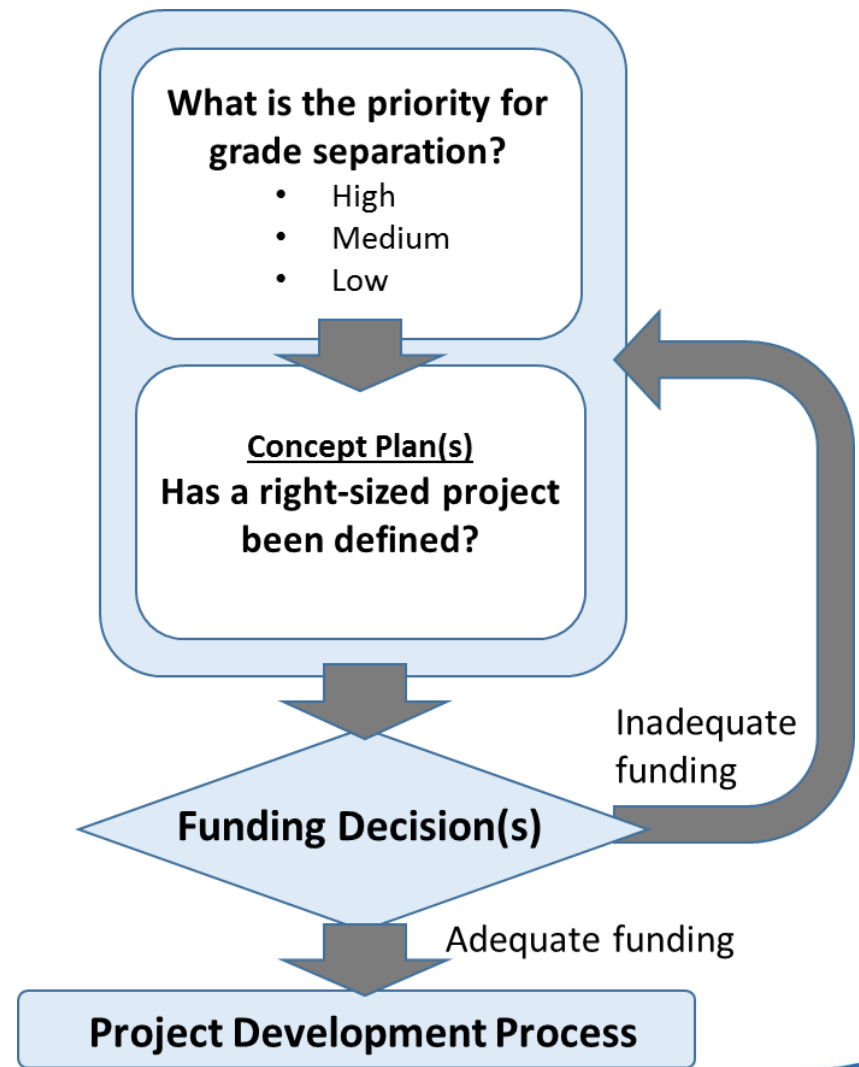
# Background – Need for Study

- Mobility and safety problems at many at-grade intersections
  - Non-freeway principal arterials
  - Initial study area: 300 miles
- Guide strategic investments
  - Intersections
  - Corridors
- First-of-its-kind study; identified in Work Program of 2040 TPP



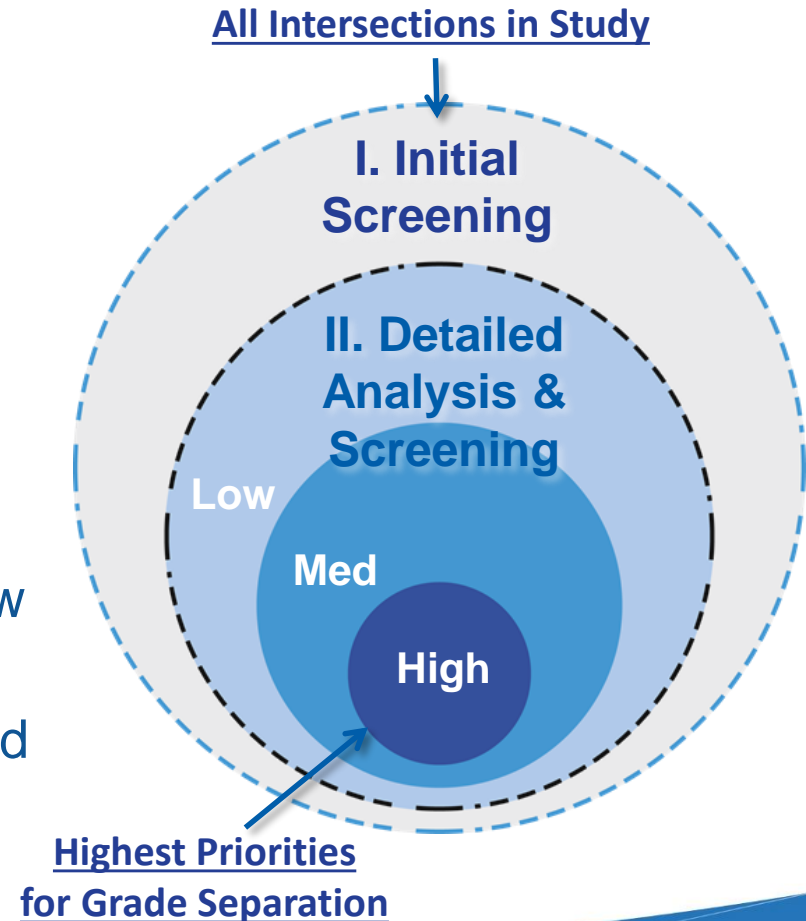
# Study Objectives

- Identify regional priorities given high demand for grade separations and limited funding
- Provide input to funding decisions



# Study Process Overview

- Phase I. Initial Screening
  - Which intersections are not candidates for grade separation at this time?
- Phase II. Detailed Analysis & Screening
  - Set priorities for future grade separations – High, Medium, Low
  - Consider best fit for design solutions (right sizing of proposed projects)



# Study Leadership and Technical Steering Committee (TSC)

- Led jointly by Metropolitan Council and MnDOT
- TSC met seven times from Nov 2015 through Nov 2016
- Additional eight local outreach meetings in Dec 2015 (included county/city reps in eight participating counties)
- The TSC Members represented:
  - Anoka Co.
  - Carver Co.
  - Dakota Co.
  - Hennepin Co.
  - Ramsey Co.
  - Scott Co.
  - Sherburne Co.
  - Washington Co.
  - City of Blaine (TSC local gov. rep.)
  - MnDOT Metro
  - MnDOT District 3
  - Metropolitan Council
  - Federal Highway Administration

# Phase I Results

- Of 374 intersections, 91 (24%) advanced to Phase II
- Intersections screened out based on balancing many criteria
  - Data (volumes, safety)
  - Context (prior planning, funded projects, local preference, setting)
  - Opportunities to revisit in future updates
  - Screened out several local-road intersections
- Tech Memo (project website)

**PRINCIPAL ARTERIAL INTERSECTION CONVERSION STUDY**

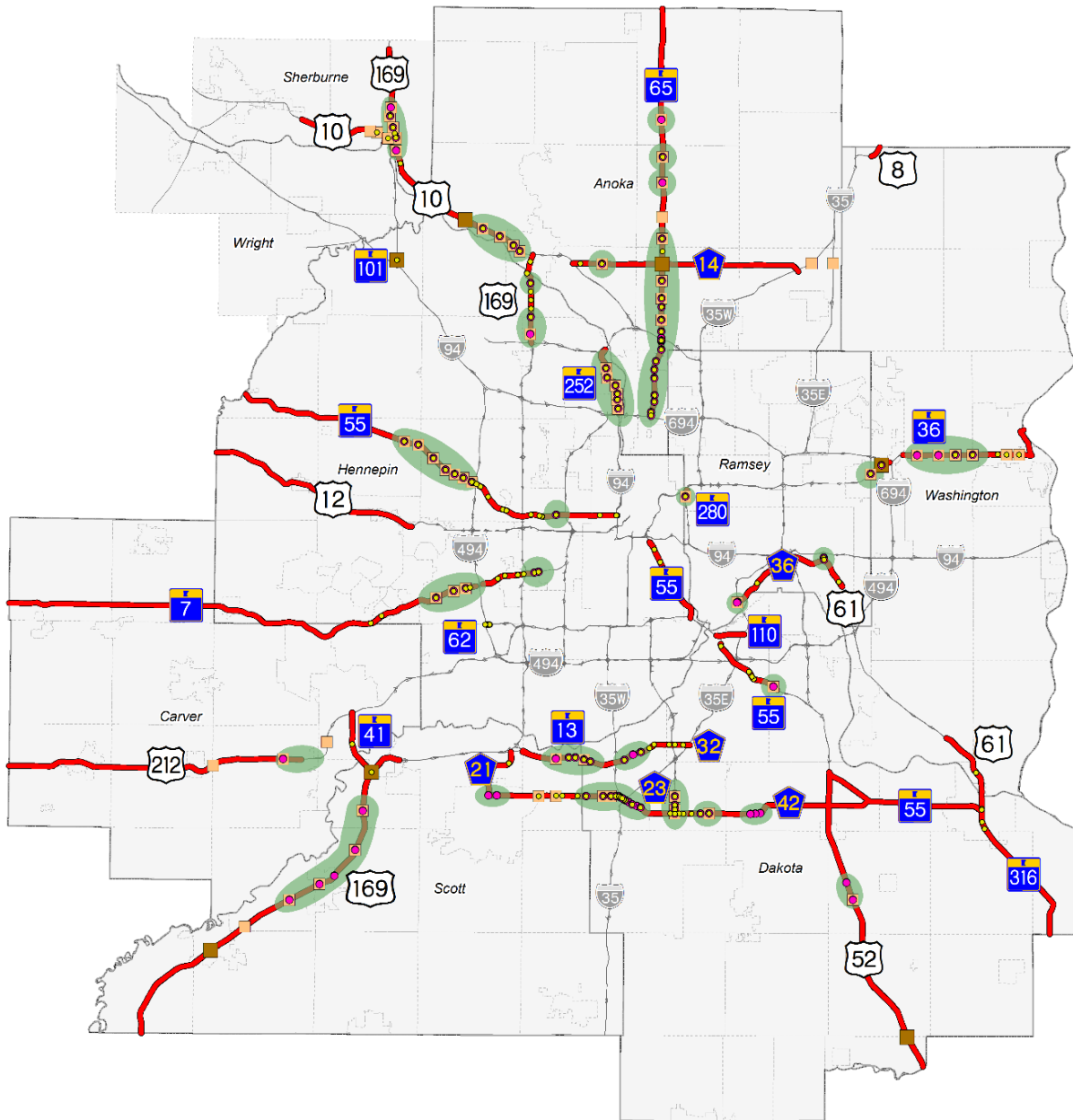
**Background Data, Outreach Summary, and Phase I Screening (Technical Memo)**

March 2016  
Metropolitan Council Contract No. 15P102  
Prepared for:  
Metropolitan Council  
Minnesota Department of Transportation, Metro District

Prepared by:  
Bolton & Menk, Inc.  
Stonebrooke Engineering

*Description:*  
This deliverable provides a complete review of study activities and results through completion of the Phase I screening process, which identified corridors and intersections to advance for detailed study. The next steps (Phase II) will include additional studies and prioritization for the selected intersections to identify potential grade separations and priorities.










# Phase I Screening Map



91  
intersections  
identified for  
detailed Phase II  
analysis

 Phase II Study Area

#### Legend

-  Intersections Meeting Volume Criteria
  -  Phase II Intersections
  -  Locally Identified Future Grade Separation
  -  Recent or Funded Grade Separation
  -  Principal Arterial
  -  Non-Freeway Study Segments
  -  Phase II Study Area
  -  City/Township Boundaries
  -  County Boundaries
- 0 9 Miles  
Source: MetroGIS, MnDOT



# Phase II Analysis and Intersection Scoring (Summary of Methods)

- Weighted Criteria, based on TSC input
  - Mobility = 40%
  - Safety = 30%
  - Context = 40%
- Intersection Capacity Analysis & Score
  - High-level study; current peak-hour operations
  - CAP-X: Capacity Analysis for Planning of Junctions (FHWA planning tool)
- Composite Score (normalized 1-10)

# Phase II Capacity Analysis

- FHWA CAP-X Tool

- Test intersection data against various solutions
- Ask: What type of investment to provide a reasonable volume/capacity (V/C) ratio?

- Example Results, Summarized (Trunk Highway 7):

Capacity Analysis Summary		Existing Intersection	Expanded Intersection	Alternative At-Grade Intersection	Add PA Capacity	Hybrid Interchange	Full Interchange
<b>TH 7-A</b>							
1	CH 101	☒	☒	☒	☐	☒	☐
2	Woodland Rd.	☐	☐	☐	☐	☐	☐
3	Williston Rd.	☒	☒	☒	☐	☒	☐
<b>Key</b>		☒ V/C ≥ 1.0		☒ V/C > 0.85 & < 1.0		☐ V/C ≤ 0.85	

# CAP-X Tool: Example Outputs

Results for Intersections														
#	TYPE OF INTERSECTION	Sheet	Zone 1 (North)		Zone 2 (South)		Zone 3 (East)		Zone 4 (West)		Zone 5 (Center)		Overall v/c Ratio	Ranking
			CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C		
1	Conventional	<a href="#">FULL</a>									1193	<a href="#">0.75</a>	0.75	6
2	Conventional Shared RT LN	<a href="#">CSRL</a>									1139	<a href="#">0.71</a>	0.71	3
3.1	Quadrant Roadway	<a href="#">S-W</a>			2200	<a href="#">1.37</a>			491	<a href="#">0.31</a>	1885	<a href="#">1.18</a>	1.37	12
3.2		<a href="#">N-E</a>	2013	<a href="#">1.26</a>			328	<a href="#">0.21</a>			1916	<a href="#">1.20</a>	1.26	9
3.3		<a href="#">S-E</a>			2138	<a href="#">1.34</a>	2138	<a href="#">1.34</a>			1942	<a href="#">1.21</a>	1.34	10
3.4		<a href="#">N-W</a>	1988	<a href="#">1.24</a>					208	<a href="#">0.13</a>	2157	<a href="#">1.35</a>	1.35	11
4.1	Partial Displaced Left Turn	<a href="#">N-S</a>	160	<a href="#">0.10</a>	988	<a href="#">0.62</a>					1176	<a href="#">0.73</a>	0.73	5
4.2		<a href="#">E-W</a>					171	<a href="#">0.11</a>	63	<a href="#">0.04</a>	1065	<a href="#">0.67</a>	0.67	2
5	Displaced Left Turn	<a href="#">FULL</a>	160	<a href="#">0.10</a>	988	<a href="#">0.62</a>	171	<a href="#">0.11</a>	63	<a href="#">0.04</a>	1049	<a href="#">0.66</a>	0.66	1
6.1	Restricted Crossing U-Turn	<a href="#">N-S</a>	1290	<a href="#">0.81</a>	270	<a href="#">0.17</a>	549	<a href="#">0.34</a>	1283	<a href="#">0.80</a>			0.81	7
6.2		<a href="#">E-W</a>	4316	<a href="#">2.70</a>	2605	<a href="#">1.63</a>	555	<a href="#">0.35</a>	2292	<a href="#">1.43</a>			2.70	15
7.1	Median U-Turn	<a href="#">N-S</a>	1063	<a href="#">0.66</a>	193	<a href="#">0.12</a>					1173	<a href="#">0.73</a>	0.73	4
7.2		<a href="#">E-W</a>					202	<a href="#">0.13</a>	299	<a href="#">0.19</a>	1349	<a href="#">0.84</a>	0.84	8
8.1														

Solutions Tested for One Intersection Location:

Intersection  
Analysis

Results for Interchanges																
#	TYPE OF INTERCHANGE	Sheet	Zone 1 (Rt Mrg)		Zone 2 (Lt Mrg)		Zone 3 (Ctr. 1)		Zone 4 (Ctr. 2)		Zone 5 (Lt Mrg)		Zone 6 (Rt Mrg)		Overall v/c Ratio	Ranking
			CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C		
10.1	Diamond	<a href="#">N-S</a>					1006	<a href="#">0.63</a>	994	<a href="#">0.62</a>					0.63	7
10.2		<a href="#">E-W</a>					185	<a href="#">0.12</a>	193	<a href="#">0.12</a>					0.12	3
11.1	Partial Cloverleaf	<a href="#">N-S</a>					879	<a href="#">0.55</a>	167	<a href="#">0.10</a>					0.55	6
11.2		<a href="#">E-W</a>					304	<a href="#">1.26</a>	168	<a href="#">0.11</a>					0.19	5
13.1	Displaced Left Turn	<a href="#">N-S</a>	171	<a href="#">0.11</a>			1092	<a href="#">0.68</a>	990	<a href="#">0.62</a>			1163	<a href="#">0.73</a>	0.73	8
13.2		<a href="#">E-W</a>	114	<a href="#">0.07</a>			67	<a href="#">0.04</a>	143	<a href="#">0.09</a>			171	<a href="#">0.11</a>	0.11	1
14.1	Double Crossover Diamond	<a href="#">N-S</a>	171	<a href="#">0.11</a>	990	<a href="#">0.62</a>	1011	<a href="#">0.63</a>	1126	<a href="#">0.70</a>	173	<a href="#">0.11</a>	1163	<a href="#">0.73</a>	0.73	8
14.2		<a href="#">E-W</a>	121	<a href="#">0.08</a>	95	<a href="#">0.06</a>	55	<a href="#">0.03</a>	175	<a href="#">0.11</a>	203	<a href="#">0.13</a>	70	<a href="#">0.04</a>	0.13	4
15.1	Single Point	<a href="#">N-S</a>	173	<a href="#">0.11</a>			1457	<a href="#">0.91</a>					1186	<a href="#">0.74</a>	0.91	10
15.2		<a href="#">E-W</a>	121	<a href="#">0.08</a>			182	<a href="#">0.11</a>					70	<a href="#">0.04</a>	0.11	2

Interchange  
Analysis

# Phase II Weighted Criteria

- Phase II Criteria & Weights – *Which intersections:*
  - Serve higher volumes of traffic, reduce mobility, and cause variable travel times? (**Mobility = 40%**)
  - Have a higher rate/cost of severe crashes? (**Safety = 30%**)
  - Can accommodate grade separation, serve regional routes, and leverage other modes? (**Corridor Context = 30%**)
- Technical Steering Committee (TSC) members helped to establish these weights



# Composite Scores & Priorities

- Composite Score
  - Representative Capacity Score (half of composite score)
  - Score for Weighted Criteria (the other half)
  - Resulting scores guided grade-separation priorities
- Example (Trunk Highway 7):

## Intersection measures:

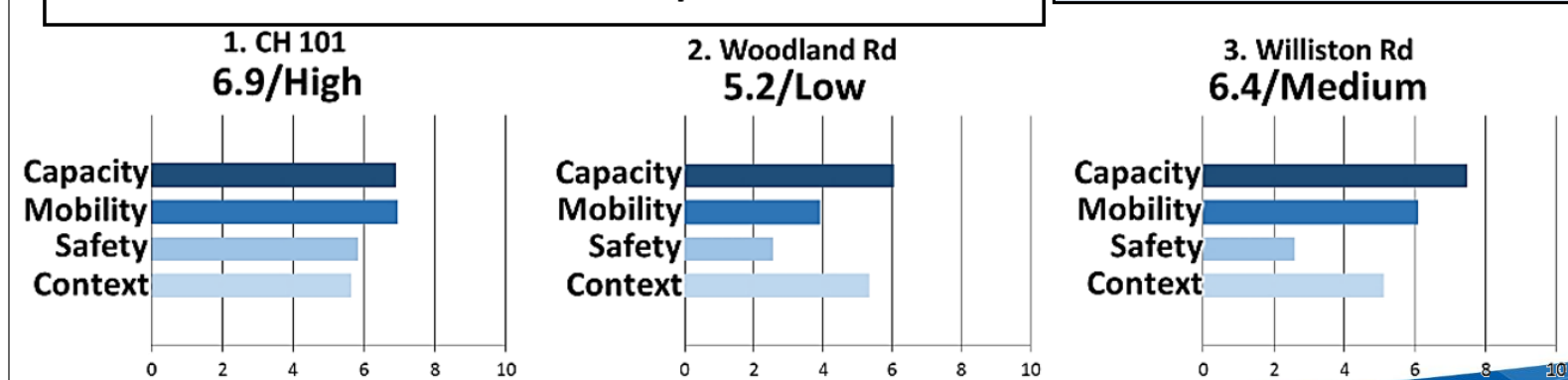
**Capacity:** Do peak-hour volumes exceed design?

**Mobility:** Are daily volumes and congestion high?

**Safety:** Are there many or severe crashes?

**Context:** Are plans and multi-modal factors supportive?

## Intersection Scores and Grade-Separation Priorities



# Phase II Priority Map (91 Intersections)

## Grade-Separation Priorities:

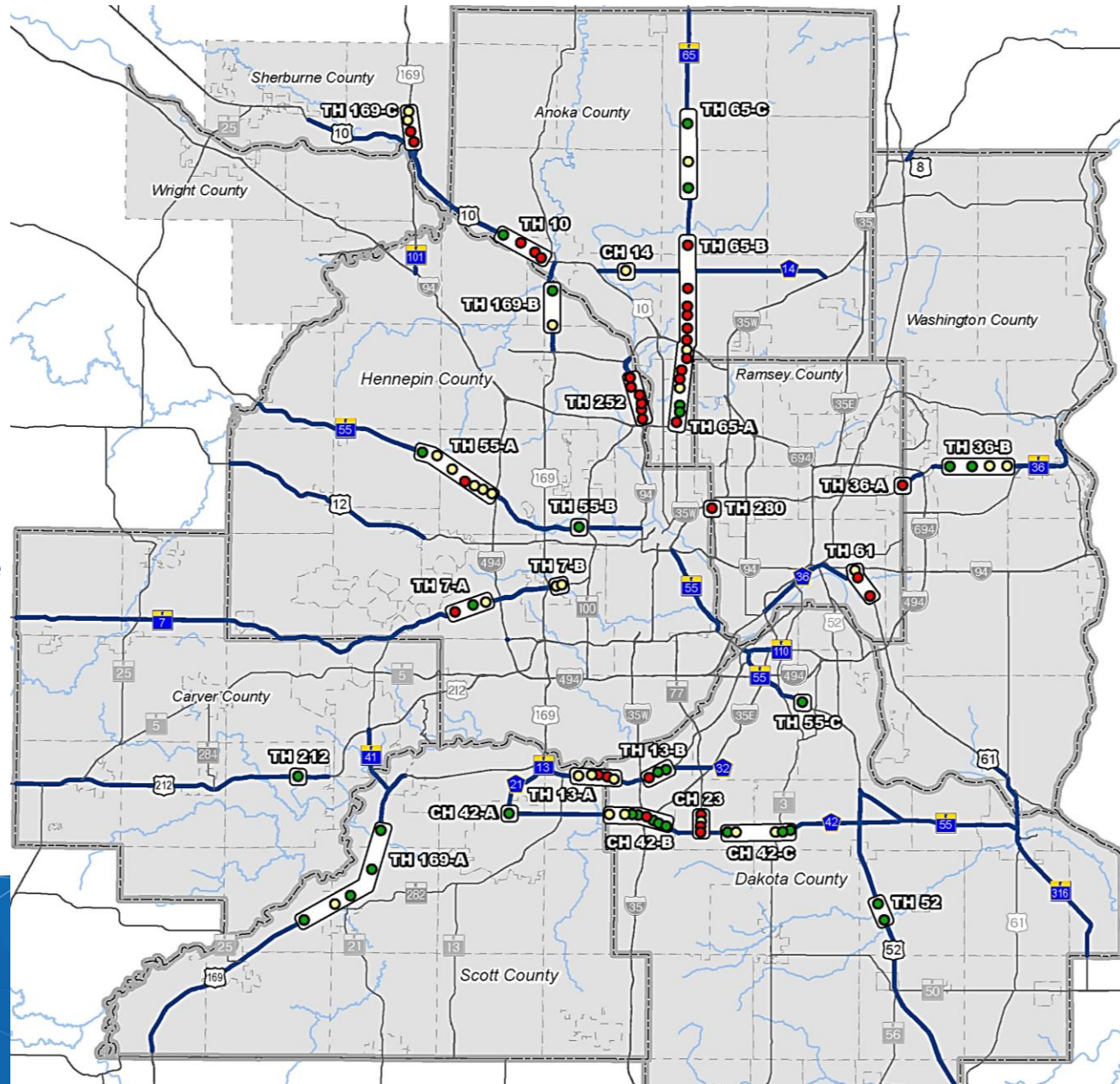
- 34 High
- 27 Medium
- 30 Low

## 26 Focus Areas

- Intersection locations & corridors
- Likely basis for future corridor studies

### Grade-Separation Priority

- High
- Medium
- Low

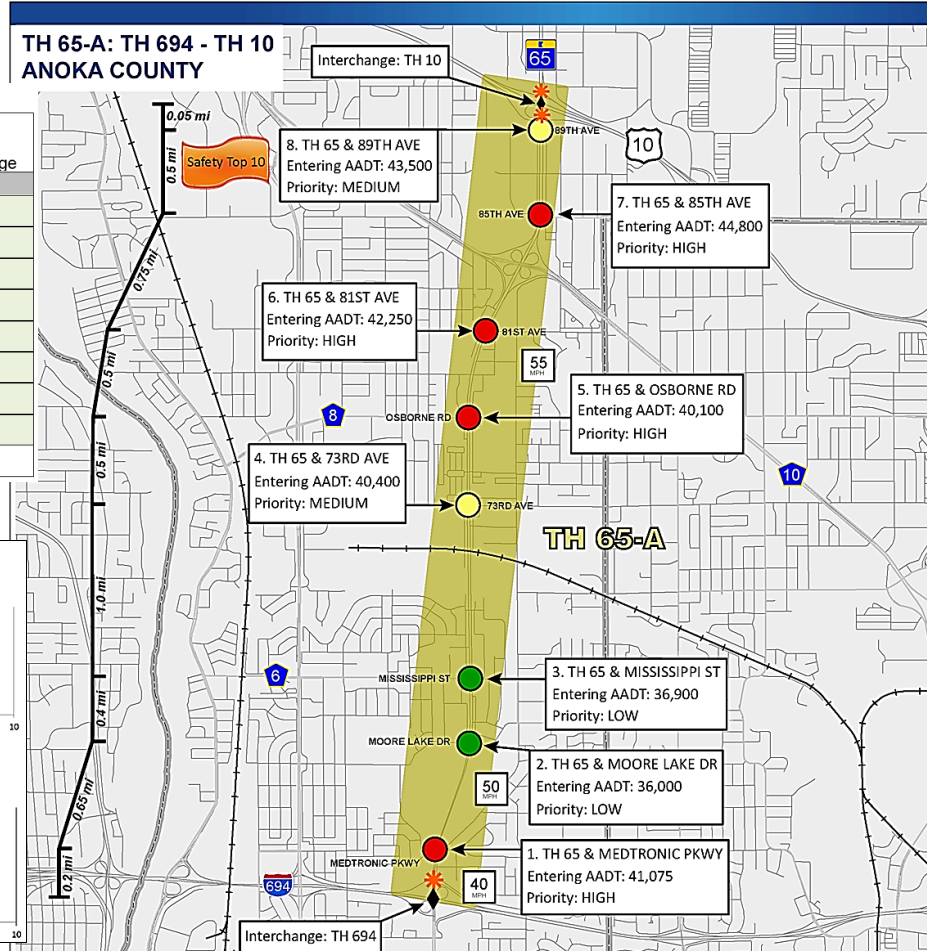
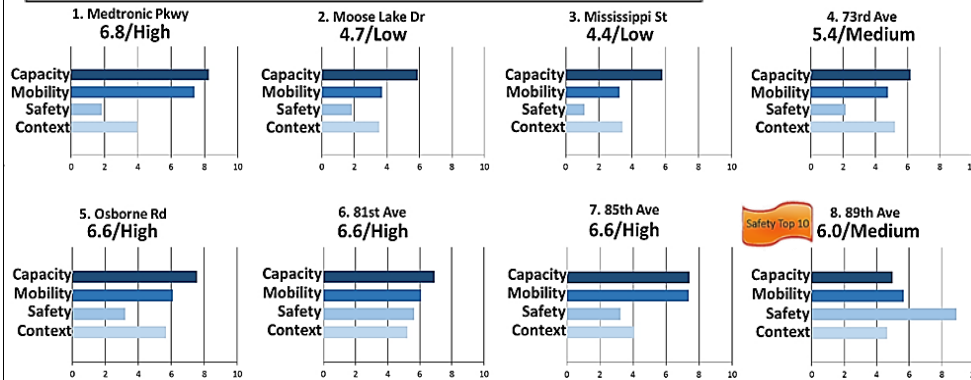


# Detailed Focus Area Example (TH 65-A)

## Capacity Analysis Summary

	Existing Intersection	Expanded Intersection	Alternative At-Grade Intersection	Add PA Capacity	Hybrid Interchange	Full Interchange
<b>TH 65-A</b>						
1	Medtronic Pkwy.	☒	☒	☒	☐	☐
2	Moore Lake Dr.	☐	☐	☐	☐	☐
3	Mississippi St.	☐	☐	☐	☐	☐
4	73rd Ave.	☐	☐	☒	☐	☐
5	Osborne Rd.	☒	☒	☒	☒	☐
6	81st Ave.	☒	☒	☒	☒	☐
7	85th Ave.	☒	☒	☒	☐	☐
8	89th Ave.	☐	☐	☐	☐	☐
<b>Key</b>		☒ V/C ≥ 1.0	☒ V/C > 0.85 & < 1.0	☐ V/C ≤ 0.85		

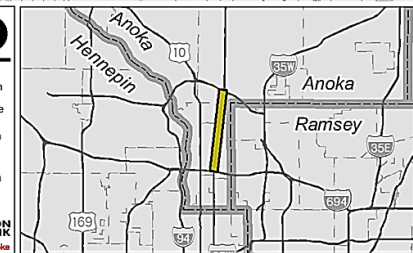
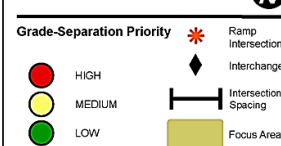
## Intersection Scores and Grade-Separation Priorities



### Intersection measures:

- Capacity:** Do peak-hour volumes exceed design?
- Mobility:** Are daily volumes and congestion high?
- Safety:** Are there many or severe crashes?
- Context:** Are plans and multi-modal factors supportive?

### Legend



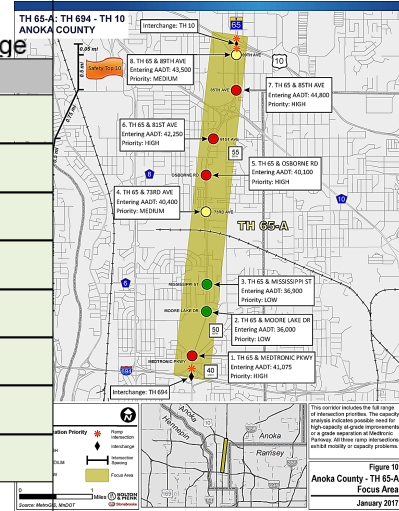
This corridor includes the full range of intersection priorities. The capacity analysis indicates possible need for high-capacity at-grade improvements or a grade separation at Medtronic Parkway. All three ramp intersections exhibit mobility or capacity problems.

**Figure 10**  
**Anoka County - TH 65-A**  
**Focus Area**

# Capacity Analysis Example (TH 65-A)

## Capacity Analysis Summary

		Existing Intersection	Expanded Intersection	Alternative At-Grade Intersection	Add PA Capacity	Hybrid Interchange	Full Interchange			
<b>TH 65-A</b>										
1	Medtronic Pkwy.	☒	☒	☒	☒	☐	☐			
2	Moore Lake Dr.	☐	☐	☐	☐	☐	☐			
3	Mississippi St.	☐	☐	☐	☐	☐	☐			
4	73rd Ave.	☐	☐	☒	☐	☐	☐			
5	Osborne Rd.	☒	☒	☒	☐	☒	☐			
6	81st Ave.	☒	☒	☒	☐	☒	☐			
7	85th Ave.	☒	☒	☒	☐	☐	☐			
8	89th Ave.	☐	☐	☐	☐	☐	☐			
<b>Key</b>		☒	V/C ≥ 1.0		☒	V/C > 0.85 & < 1.0		☐	V/C ≤ 0.85	

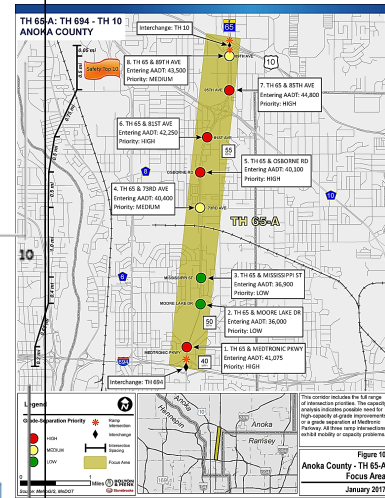
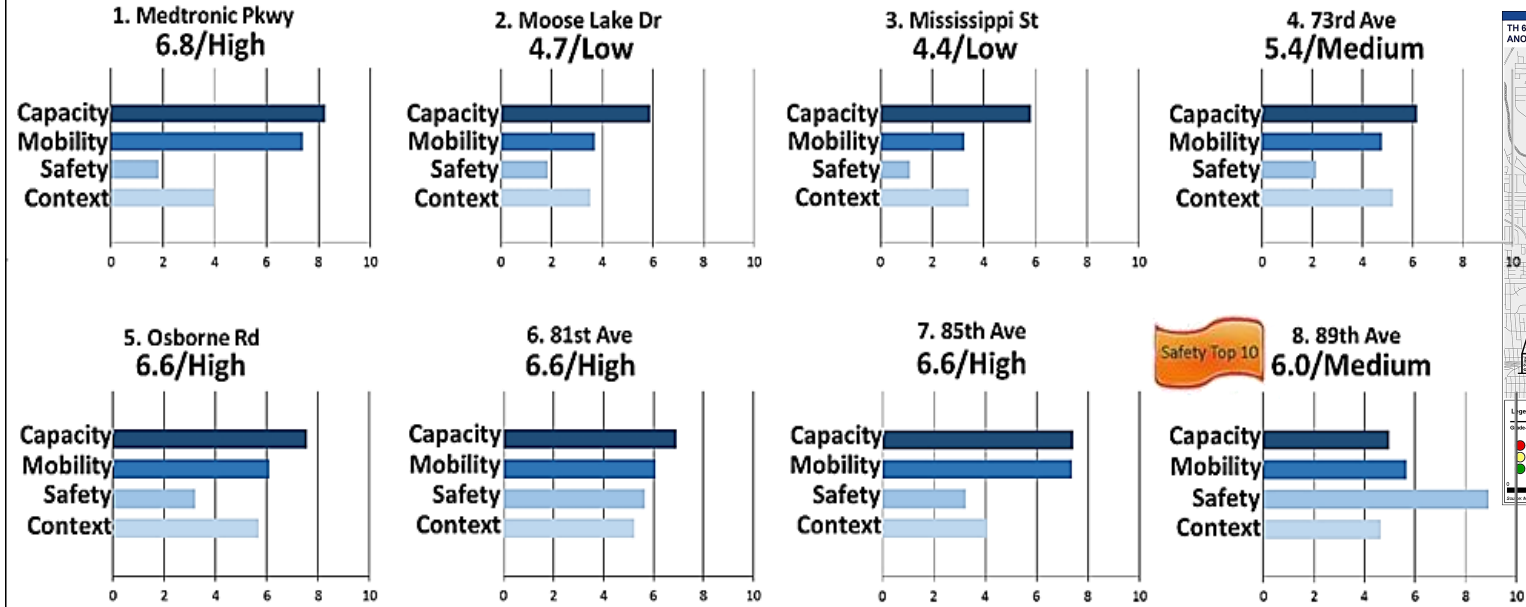


- **Existing Intersection** – The existing traffic demands and conditions at the intersection
- **Expanded Intersection** – Assumes the addition of turn lanes to the intersection
- **Alternative At-Grade Intersection** – Assumes a reduced-conflict or unconventional intersection
- **Add PA Capacity** – Assumes the addition of continuous capacity to principal arterial mainline
- **Hybrid Interchange** – Assumes use of limited grade separation elements with other at-grade features
- **Full Interchange** – Assumes a fully grade-separated intersection (various configurations)



# Composite Score Summary (TH 65-A)

## Intersection Scores and Grade-Separation Priorities



**Intersection measures:**

- Capacity:** Do peak-hour volumes exceed design?
- Mobility:** Are daily volumes and congestion high?
- Safety:** Are there many or severe crashes?
- Context:** Are plans and multi-modal factors supportive?

# Focus Area Observations

- The Focus Areas and intersection priorities provide potential guidance for any future studies
- Two Focus Areas include only High-Priority intersections
  - Anoka Co. TH 65-B, 93rd Lane to Bunker Lake Blvd. (six intersections; 5.5 miles)
  - Hennepin County TH 252, 66th Ave. to 85th Ave. (six intersections; 2.5 miles)
- There are Opportunities to Coordinate Corridor-Wide Intersection Improvements
  - Possible consolidation or closure of intersections at some locations
  - Appropriate scaling or “right-sizing” of future intersection or interchange solutions

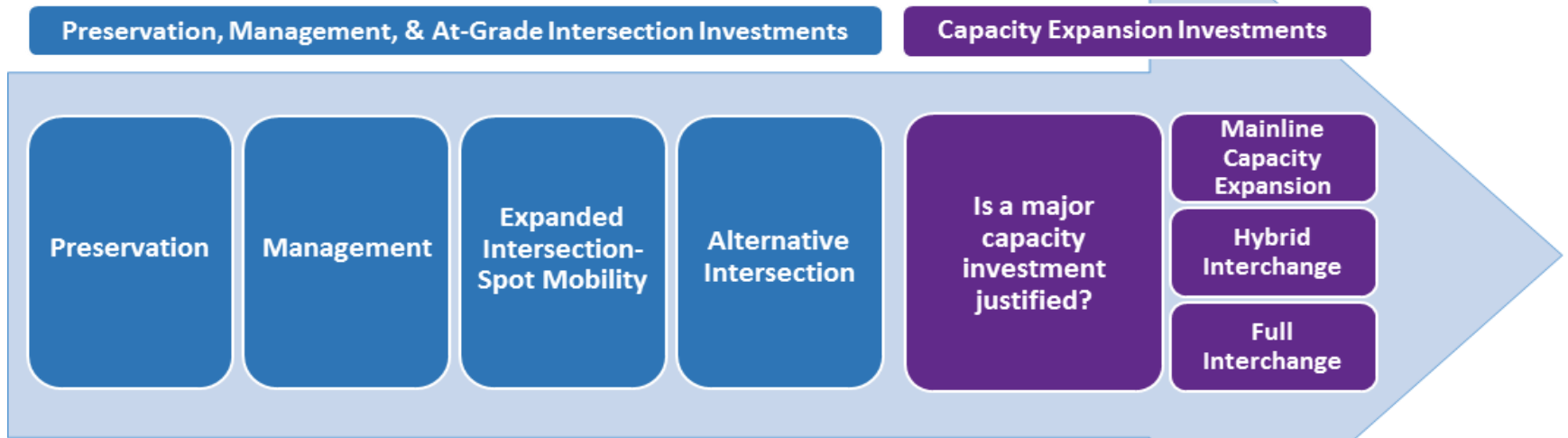
# Study Outcomes and Limitations

- Provided a regionally consistent comparison of the intersections and relative priorities
  - Intent of the Study: regional guidance for investments
  - Provides corridor overviews (Focus Areas)
- Did not address interactions among multiple closely spaced intersections (corridor traffic details)
- Did not fully address unique context issues, including potential growth and change

# Role of the Study in Future Planning

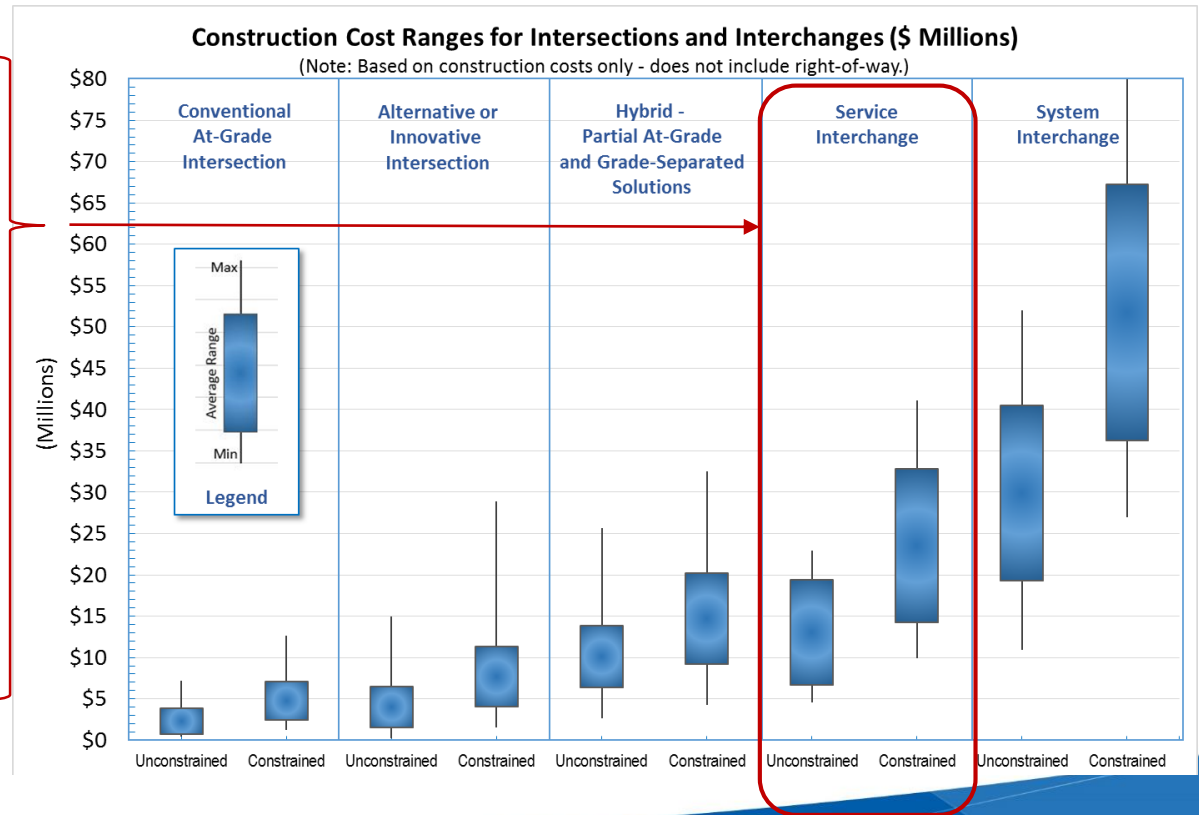
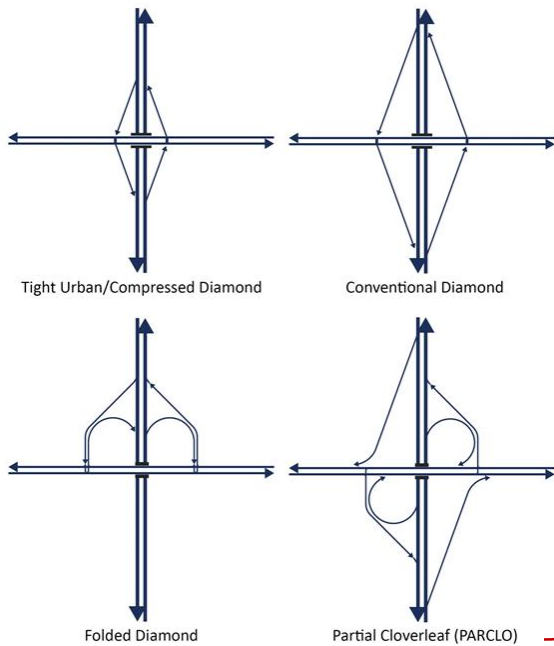
- Trend: 16 new interchange projects over the last 10 years (less than half of the 34 High-Priority intersections)
- Results will:
  - Modify TPP and MnSHIP investment scenarios
  - Provide input to funding decisions (for example, Regional Solicitation, TED, SaM, and RALF programs)
  - Serve as a reference for local planning and policy reviews
  - Make the case for additional funding
- Advises the right-sizing of proposed projects based on intersection priorities

# Regional Investment Philosophy



- Council and MnDOT
  - Define strategic capacity enhancements in the TPP
  - Recommend development of intersection improvements based on a progression of investment decisions
- Study is part of improved targeting for investments

# Study Tools: Solution Sets and Cost Ranges



# Questions

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Project Website:  
<https://metro council.org/PAICS>