6.0 Intersection Decision Process

Building on the travel demand analysis documented in Section 5.0, the intersection decision process focused on identifying intersections that are either currently experiencing congestion, or are projected to experience congestion by 2030. The county applied established criteria related to safety, traffic operations, and facility type to identify and analyze capacity challenged intersections. The results of this process are prioritized lists of intersection improvement recommendations for addressing existing and future capacity issues that have been matched to cost-effective solutions.

6.1 Intersection Improvements Considered

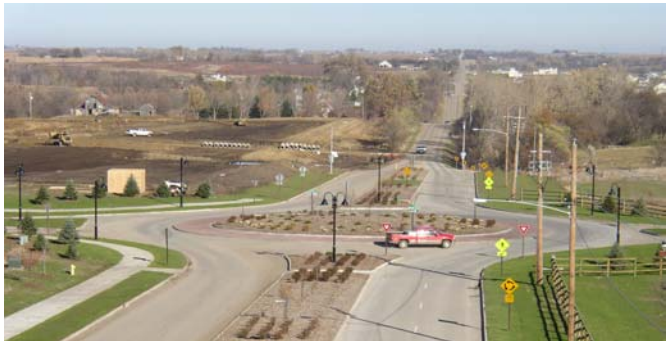
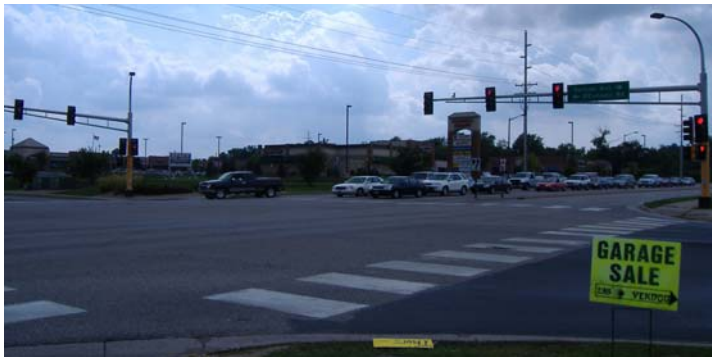
In making intersection improvement recommendations to address existing and future capacity issues at intersections identified by this screening process, the county focused on the strategies listed and shown below in Table 6-1. In addition to physical changes, the county considered access management strategies and corridor studies to address congestion and safety problems at intersections. Access management involves "planning, design and implementation of land use and transportation strategies in an effort to maintain a safe flow of traffic while accommodating the access needs of adjacent development."[1] Corridor studies incorporate analysis of multiple intersections along a corridor or within close proximity to one another and development of a customized mix of alternative strategies that best address the needs of the study area.

TABLE 6-1
Range of Intersection Improvements Considered

Type	Example
Interchange—A road junction that utilizes grade separation and ramps to permit traffic on at least one road to pass through the junction without crossing any other traffic stream. Typically used on freeways where access is only provided at interchanges. Examples: *Diamond interchange (see picture to right), single-point diamond interchange, cloverleaf interchange.*	

[1] Source: Mn/DOT Access Management Policy & Manual, January 2008

TABLE 6-1
Range of Intersection Improvements Considered

Type	Example
Grade-Separated Intersection—A road junction that utilizes a grade separation. Typically used on arterials where access is at signalized intersections where some private access is allowed. Examples: Echelon intersection (see picture to the right), center turn overpass, diverging diamond.	 Source: Applied Technology and Traffic Analysis Program Web site (Office of Traffic and Safety at the Maryland State Highway Administration and the Traffic Safety and Operations Laboratory at the University of Maryland–College Park).
Roundabout—An intersection at which traffic enters a one-way, counter-clockwise stream around a circular, central island, with yield control of all entering traffic.	
Signalized Intersection—Use of traffic signals to indicate turning right-of-way.	

6.2 Intersection Decision Process and Results Summary

The strategies shown in Table 6-1 are solutions to several, but not all intersection capacity problems. Figure 6-1 shows the association between the traffic volumes and recommended intersection improvement strategies. An interchange is only appropriate when the traffic volumes are over 50,000 total vehicles per day (vpd) (40,000 on the major roadway and at least 10,000 vehicles on the minor roadway). Also, single-lane roundabouts are only appropriate when the total volume is less than 20,000 vpd.

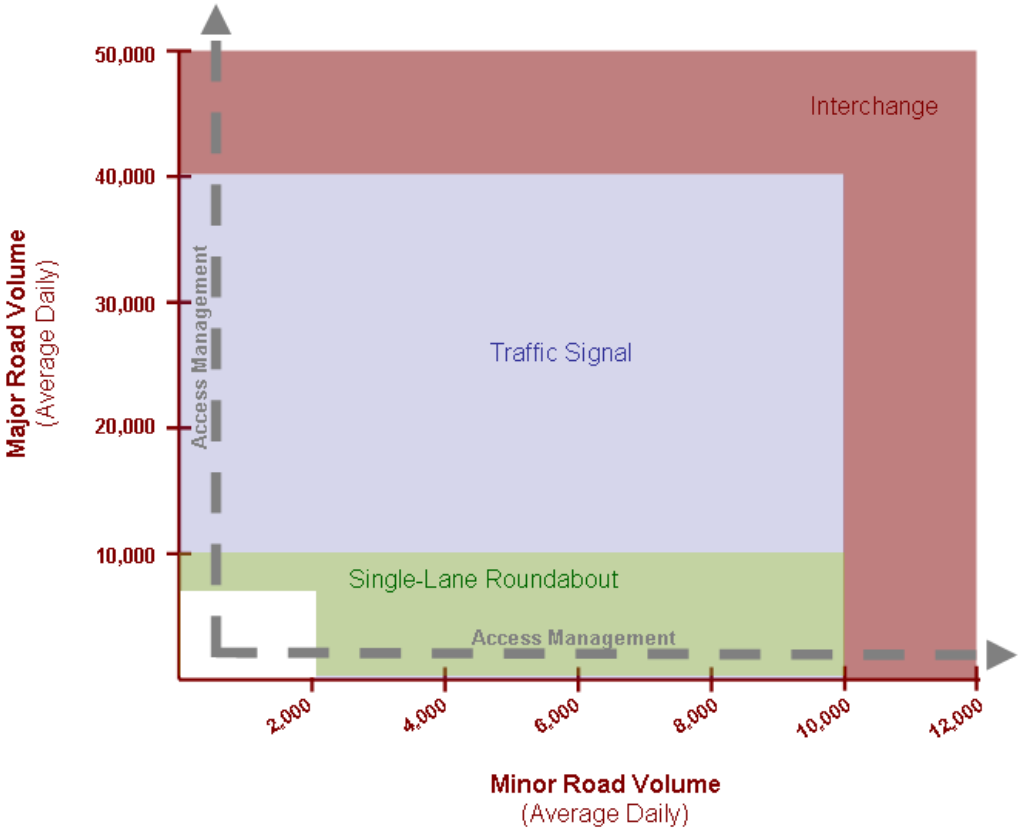
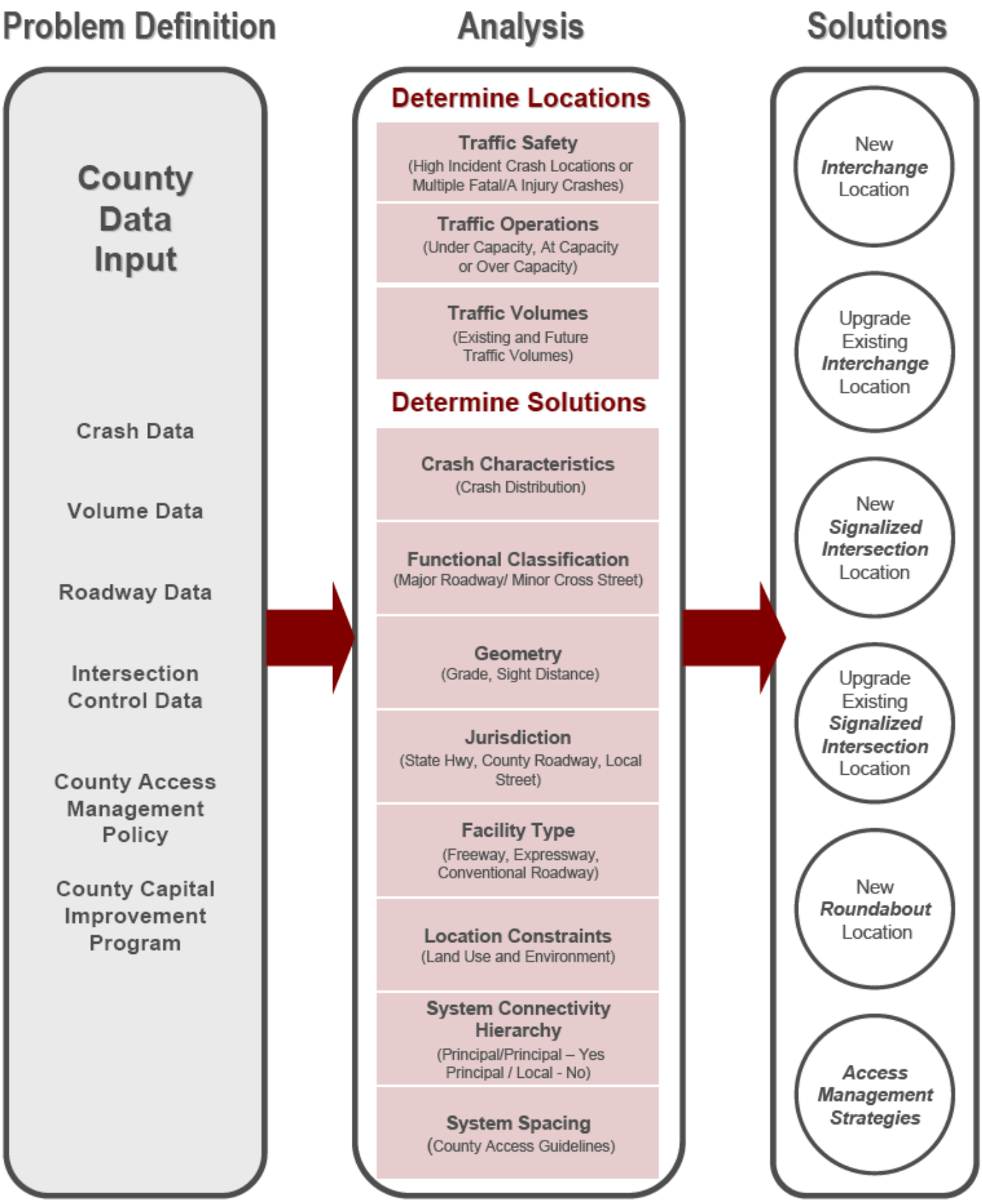


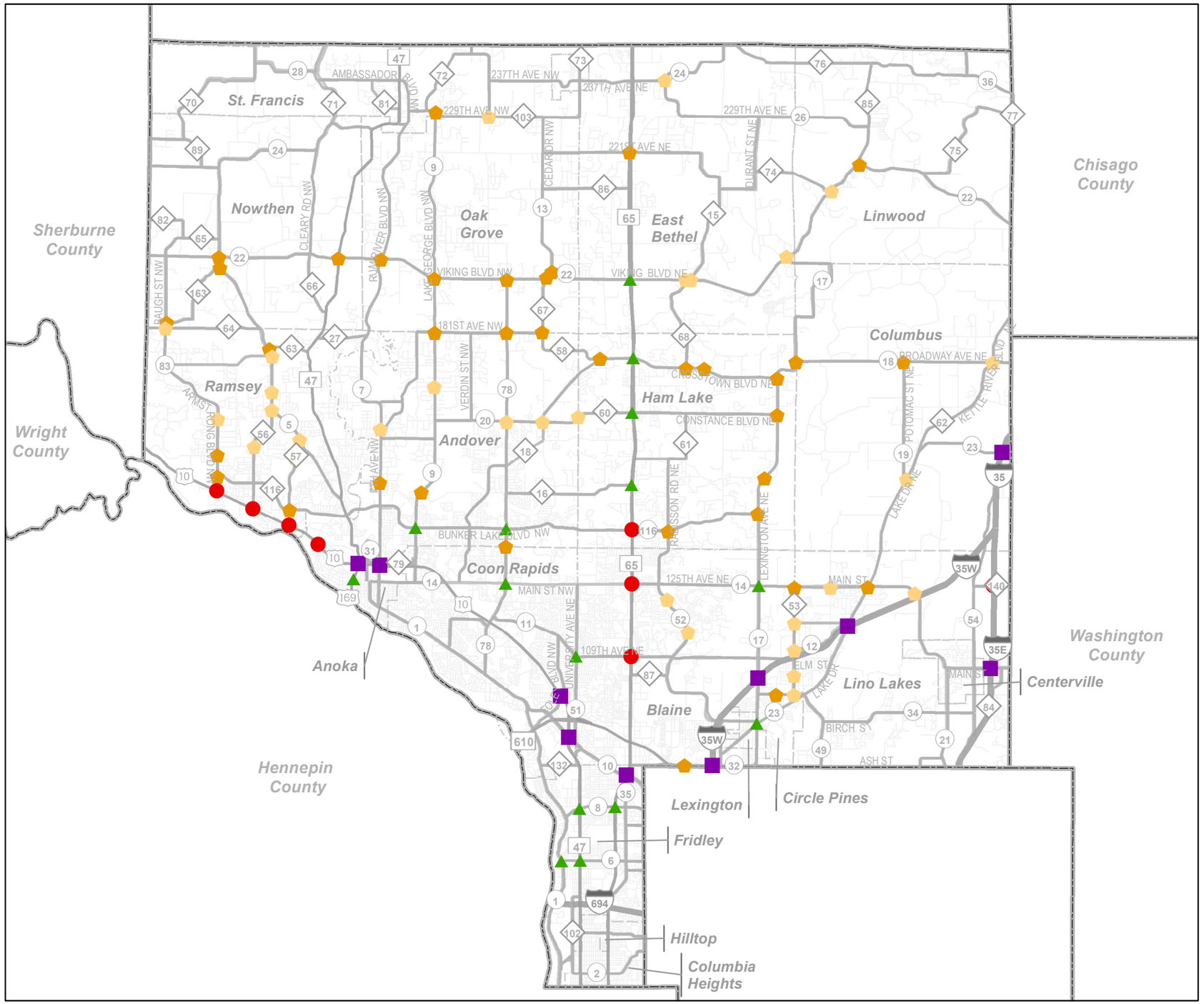
FIGURE 6-1
Appropriate Intersection Improvement Strategy based on Traffic Volume Criteria

The Intersection Decision Process used traffic volumes, intersection safety/crash data, facility type, and other criteria to determine the appropriate strategy for intersection improvements. An overview of this process is provided in Figure 6-2. The countywide review of all intersections resulted in a list of recommended future projects that when implemented, will improve traffic operations and safety. These recommendations are shown in Figure 6-3. The rest of the section documents the intersection decision process and the results for specific types of improvement alternatives.



Source: Anoka County's Intersection Decision Analysis (CH2M HILL, 2008)

Figure 6-2
Overview: Intersection Decision Process



Legend

- Grade-Separated Intersection
- New Interchange
- Upgrade Existing Interchange

New Signal Locations

- High Probability of Meeting Warrants
- Moderate Probability of Meeting Warrants

segments

- Interstates
- US Highways
- State Highways
- County State Aid Highways (CSAH)
- County Roads
- Local Roads

N

0 1.5 3 6 Miles

1 inch = 3 miles

Source: Anoka County's Intersection Decision Analysis (CH2M HILL, 2008)

Figure 6-3

Intersection Improvements

6.3 Interchanges/Grade-Separated Intersection Process Summary and Results

6.3.1 Interchange and Grade Separation Process

The process and criteria used to determine the need for new and upgraded interchanges and grade separations is summarized in Figure 6-4 and described below.

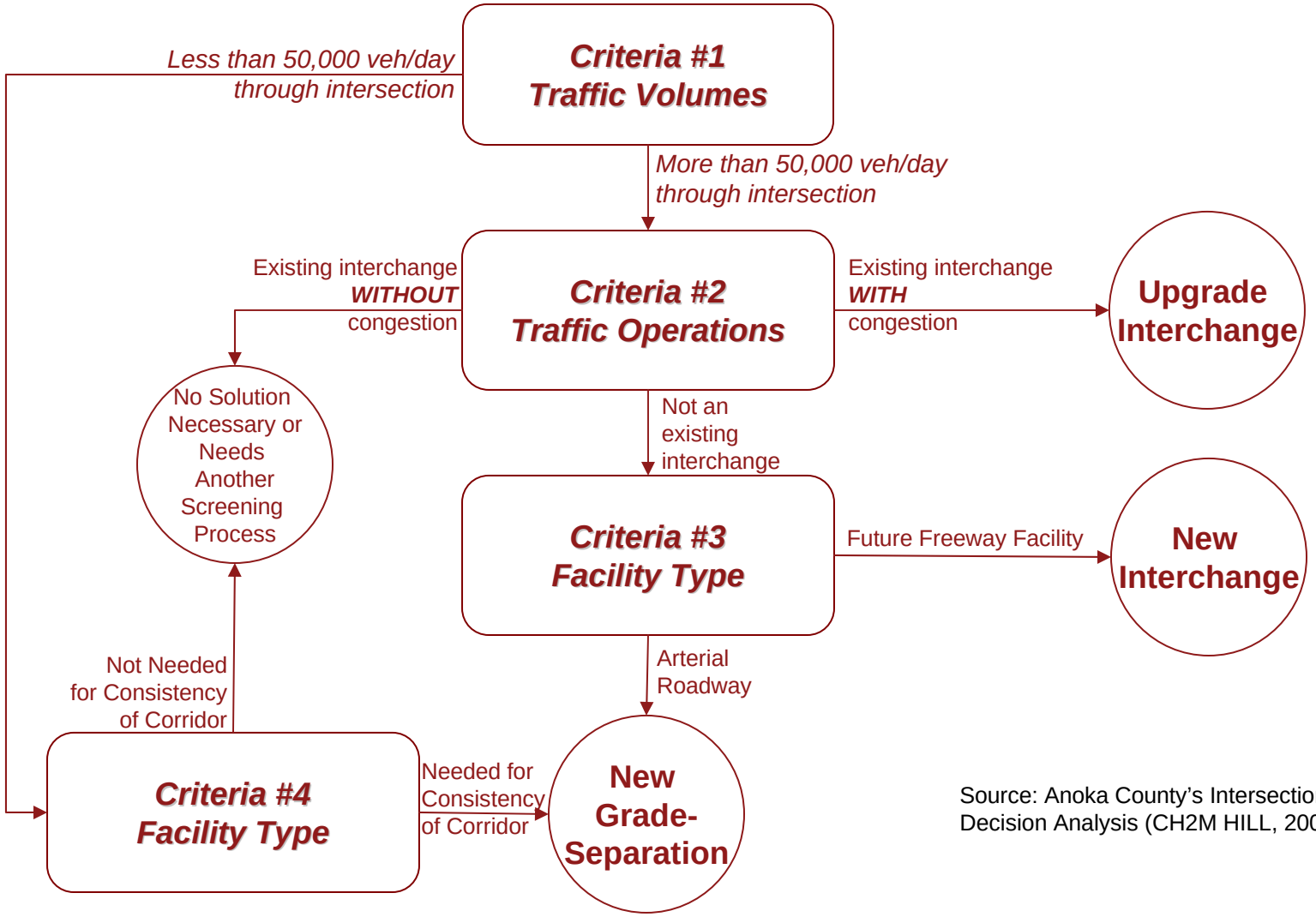
1) **Interchange/Grade-Separated Intersection Criterion #1, Traffic Volumes—**Using traffic volumes at locations where grade separations have recently been built as a general guideline, the county determined those intersections with average daily traffic (total on both roadways) of greater than 50,000 vpd should be considered for an interchange or a grade-separated intersection. At more than 50,000 vpd, it becomes difficult to coordinate traffic signals while also providing an acceptable level of service (LOS). Locations with more than 50,000 vpd were moved into Criterion #2. Locations that had less than 50,000 vpd were moved to Criterion #4, and were considered for interchanges or grade-separations only if the main roadway is, or is planned to be, a freeway.

2) **Interchange/Grade-Separated Intersection Criterion #2, Traffic Operations**—This step identified locations with operational issues at existing interchanges or it was anticipated to have future operational issues based on projected traffic volumes. These locations were automatically recommended for interchange upgrade improvements (see Table 6-2). Locations that met Criterion #1 (more than 50,000 vpd at the intersection) but did not have an existing interchange, were moved to Criterion #3.

TABLE 6-2
Interchange Upgrade Locations by Intersection

1. CSAH 10 & TH 47/University Ave.	6. I-35 & CSAH 23/Lake Dr.
2. CSAH 10 & TH 65/Central Ave.	7. I-35W & CSAH 17/Lexington Ave.
3. US 10 & US 169/TH 47/Ferry St.	8. I-35W & CSAH 23/Lake Dr. South
4. US 10 & CSAH 7/7th Ave.	9. I-35W & CSAH 23/Lake Dr. North
5. I-35E & CSAH 14/Main St.	

Note: The intersection at US 10 and West Main St. in Anoka met Criterion #2, however, was removed from the list because of the proximity to the interchanges at US 10 and US 169/TH 47/Ferry St. and to US 10 and CSAH 7/7th Ave.



Source: Anoka County's Intersection Decision Analysis (CH2M HILL, 2008)

Figure 6-4
Interchange/Grade-Separation Decision Process Flow Chart

3) Interchange/Grade-Separated Intersection Criterion #3, Facility Type (freeway or non-freeway)—Criterion #3 considered the future main roadway type (freeway, arterial, or conventional roadway) or intersections. Interchanges are only appropriate on freeways, while grade-separated intersections are usually considered appropriate for signalized arterials or conventional roadways. Generally, interchanges are not placed on signalized arterials because an interchange on a signalized corridor would not meet driver expectations. The list of new interchange locations is provided in Table 6-3; future grade-separated intersections are in Table 6-4.

TABLE 6-3
New Interchange Locations by Intersection

1. US 10 & CSAH 83/Armstrong Blvd.	5. TH 65 & CSAH 116/Bunker Lake Blvd.
2. US 10 & CSAH 57/Sunfish Lake Blvd.	6. TH 65 & CSAH 14/Main St./125th Ave. NE
3. US 10 & Thurston Ave.	7. TH 65 & CSAH 12/109th Ave.
4. US 10 & CSAH 56/Ramsey Blvd.	

TABLE 6-4
New Grade-Separated Intersection Locations

1. US 169 & MSA 143/Main St.
2. CSAH 116/Bunker Lake Blvd. & CSAH 78/Hanson Blvd.
3. CSAH 78/Hanson Blvd. & CSAH 14/Main St.
4. CSAH 116/Bunker Lake Blvd. & CSAH 9/Round Lake Blvd.
5. CSAH 51/University Ave. & CSAH 12/Northdale Blvd./109th
6. TH 65 & CSAH 8/Osborne Road
7. CSAH 1/East River Road & CSAH 6/Mississippi St.
8. TH 47/University Ave. & CSAH 6/Mississippi St.
9. TH 47/University Ave. & CSAH 8/Osborne Road
10. CSAH 17/Lexington Ave. & CSAH 23/Lake Dr.
11. CSAH 17/Lexington Ave. & CSAH 14/Main St.

3) **Interchange/Grade-Separated Intersection Criterion #4, Facility Type (Consistency)**—Criterion #4 is for the small number of locations that have the potential need to be upgraded based on consistency with roadway type (the rest of the intersections along the roadway are to be upgraded to an interchange and the main roadway will become a freeway), and not because of future volume needs. The four TH 65 county road intersections north of CSAH 116/Bunker Lake Boulevard (listed in Table 6-5) should be considered for grade-separated intersections or interchanges. Even though traffic volumes for this area of TH 65 are projected to be slightly less than 50,000 vpd, grade-separated intersections or interchanges are recommended based on the planned upgrade of this segment of TH 65 to a freeway, including an interchange at CSAH 116/Bunker Lake Boulevard.

TABLE 6-5
New Grade-Separated Intersection/Interchange Locations

TH 65 & CSAH 22/Viking Blvd.
TH 65 & CSAH 18/Crosstown Blvd.
TH 65 & CR 60/Constance Blvd.
TH 65 & CR 16/Andover Blvd.

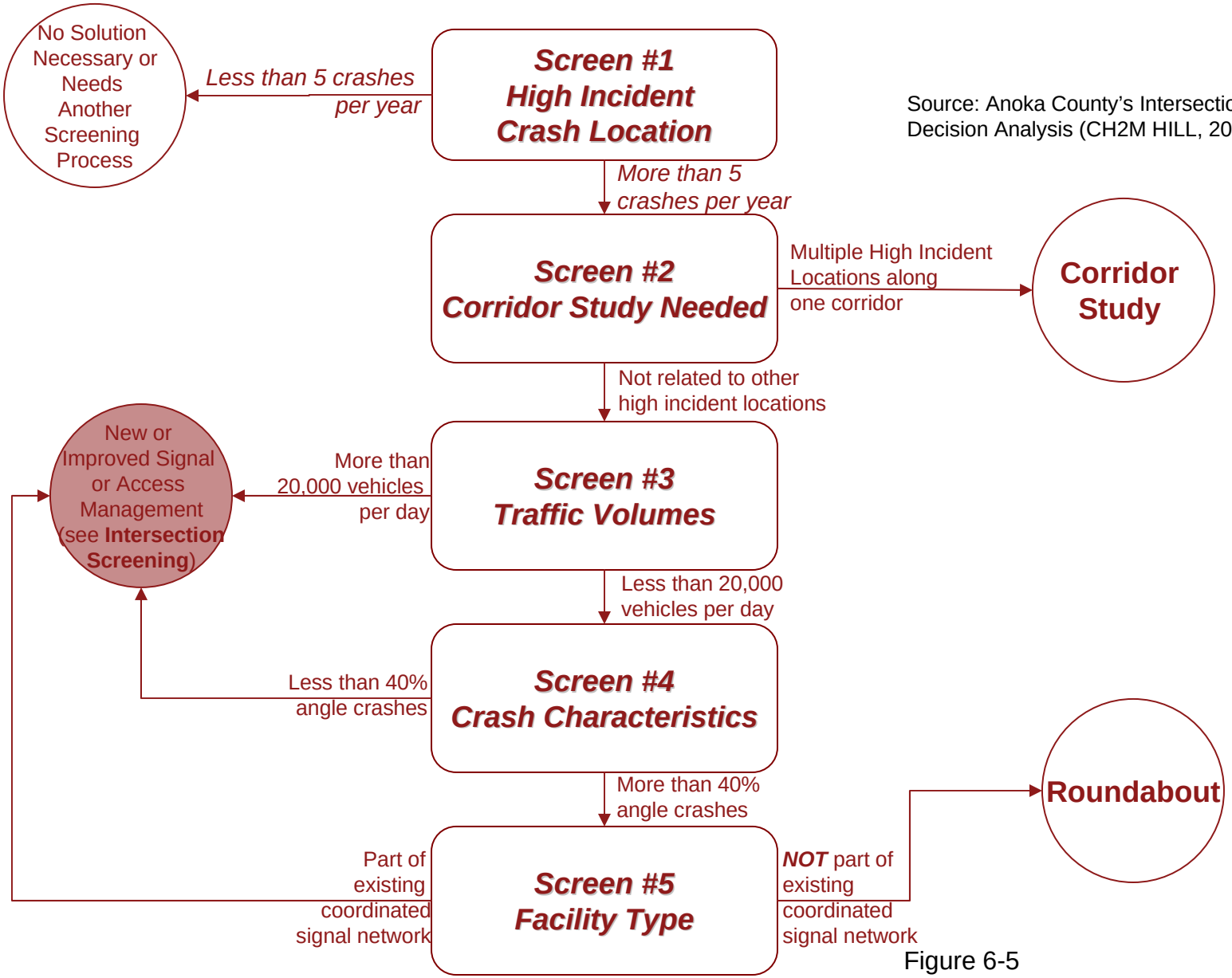
6.4 Roundabout/Corridor Study Process Summary and Results

The process used to consider roundabouts as a potential solution to address intersection capacity issues is summarized in Figure 6-5 and described below. From this analysis, locations that would benefit from a Corridor Study were also determined and are listed in Table 6-6. A detailed listing of the locations and screening for Roundabouts and Corridor Studies can be found in Appendix E, Roundabout Decision Process Screening Summary.

Roundabout/Corridor Study Criterion #1: High-Incident Crash Locations—The county identified 51 locations on county roadways that experienced more than 25 crashes in a five year period (2002–2006). Guidelines indicate that these high-incident crash locations would experience a crash reduction benefit through implementation of a roundabout.[2] High-incident crash locations were moved forward to Criterion #2.

Roundabout/Corridor Study Criterion #2: Corridor/Area Studies in Select Locations—Corridor or area studies were recommended for roadways with multiple high-incident crash locations, especially if the problem crash locations were in close proximity to one another. The corridors, listed in Table 6-6, include 27 of the 51 locations discussed above. Corridor/area studies will determine any correlation between the high-incident crash locations and include a review to determine an appropriate improvement plan, which may include roundabouts.

[2] Source: MnMUTCD, May 2005, Chapter 4C.8, Warrant 7, Crash Experience.



Source: Anoka County's Intersection Decision Analysis (CH2M HILL, 2008)

Figure 6-5
Roundabout/Corridor Study Decision Process Flow Chart

TABLE 6-6
Recommended Corridor and Area Study Locations

Roadway	Extent
CSAH 17/Lexington Ave. and CSAH 23/Lake Dr.	See East-Central Sub-area on Figure 5-1 and discussion and graphics in Section 7.0
CSAH 24/Bridge St.	See St. Francis Sub-area on Figure 5-1 and discussion and graphics in Section 7.0
CSAH 51 Area Study	Extension to CSAH 13
CSAH 1/Coon Rapids Blvd.	CSAH 7/7th Ave. to TH 610 (CSAH 1 Corridor Study to begin in early 2009)
CSAH 1/East River Rd. Corridor Study	CR 3 to I-694
CSAH 9 and CSAH 14/Main St to CSAH 20/157th St.	See West-Central Sub-area on Figure 5-1 and discussion and graphics in Section 7.0
CSAH 10 Corridor Study	TH 47 to County Line
CSAH 11/Foley Blvd. Corridor Study	CSAH 1 to CSAH 12/Northdale Blvd.

Twenty-four of the 51 high-incident crash intersections were located on a corridor that did not have a concentration of other high-incident crash intersections. These locations were moved into Criterion #3.

Roundabout/Corridor Study Criterion #3: Impact of Traffic Volumes on High-Incident Crash Locations—Locations with more than 20,000 vpd would meet standards for needing a signal, and require a multi-lane roundabout to accommodate capacity. The county, at this time, chooses not to implement multiple-lane roundabouts since they are not currently widely implemented within the Twin Cities Metro Area and are not fully tested. Twenty-two of the twenty-four remaining locations that had traffic volumes over 20,000 vpd were moved into the signalized intersection decision process described in Section 6.5. New or improved traffic signal or access management strategies were recommended for intersections with more than 20,000 vpd (see the intersection screening discussion below).

A roundabout with one lane in each direction would accommodate traffic volumes of less than 20,000 vpd. Two high-incident crash intersections that also accommodate less than 20,000 vpd were moved forward into Criterion #4.

Roundabout/Corridor Study Criterion #4: Crash Characteristics—Intersections where more than 40 percent of the crashes are angle crashes (right angle and left turn) would benefit most from implementation of a roundabout. The expected crash distribution for angle crashes is around 32 percent.[3] One location had an angle crash distribution of 58 percent and was moved onto Criterion #5. The other location had 36 percent angle crashes and was moved into the signalized intersection decision process, because a roundabout would not provide a substantial safety benefit.

[3] Source: Mn/DOT Office of Traffic, Safety, and Technology, Traffic Fundamental Handbook, August 2008.

Roundabout/Corridor Study Criterion #5: Facility Type—Generally, roundabouts are not recommended intersection types on roadways with coordinated signal systems because they interfere with the coordination that requires vehicles to arrive at the signal in platoons to maintain efficiency of the system. While this does not preclude a roundabout from being built within a coordinated system of signals, it needs to be carefully considered and modeled before it is implemented. Therefore, roundabouts were only considered for isolated intersections for this exercise but could still be suggested during a Corridor Study.

6.4.1 Roundabout/Corridor Study Results

After carrying out the roundabout decision process, no intersections were identified as being optimal for roundabout implementation at isolated locations. This does not preclude any roundabouts from being implemented based on future Corridor Study recommendations (see Table 6-6 for the locations where a Corridor Study was recommended).

6.5 Signalized Intersection Process Summary and Results

The process used to consider signalized intersections as a potential solution to address intersection capacity and safety issues is summarized in Figure 6-6 and described below. The selection of new signalized intersection locations was based on existing and forecasted traffic volumes and high crash locations.

Signalized Intersection Criterion #1: Traffic Volumes (Main Roadway)—The main roadway of an intersection should have traffic volumes of greater than 10,000 vpd to meet the minimum standard, or warrant for a traffic signal.[4] Unsignalized intersections where the main roadway has more than 10,000 vpd were moved into Criterion #2.

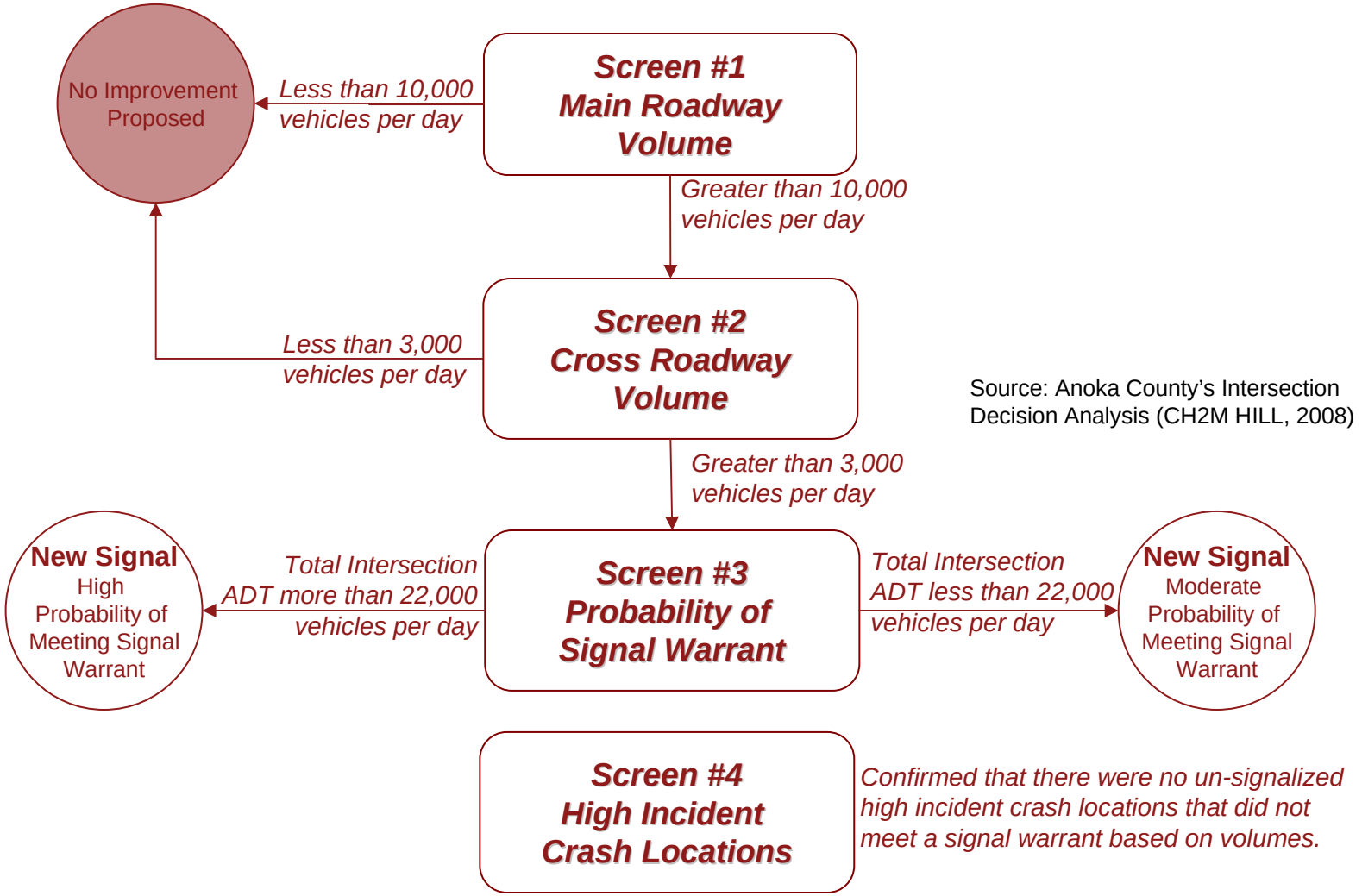
Signalized Intersection Criterion #2: Traffic Volumes (Cross Roadway)—The roadway crossing a main road (with more than 10,000 vpd) would need to have traffic volumes of at least 3,000 vpd to meet signal warrants.[5] Intersections meeting Criterion #1 and Criterion #2 were moved into Criterion #3.

Signalized Intersection Criterion #3: Traffic Volumes (Probability of Signal Warrant)—Locations meeting the first two criteria were ranked on probability of meeting signal warrants based on the total amount of traffic (major roadway daily volumes plus the minor roadway volumes). Intersections with more than 22,000 vpd have high probability of meeting signal warrants in the future. Intersections with volumes of 13,000–22,000 vpd have moderate probability of meeting signal warrant.[6]

[4] Source: MnMUTCD, May 2005 and unpublished Mn/DOT Research. Traffic engineers have established minimum conditions, or warrants, to assist in determining the need for a traffic signal at an intersection. Warrants were established to ensure that the advantages outweigh the disadvantages prior to installing a traffic signal, and also to provide consistency with the implementation of traffic signals. Warrants identify the minimum conditions under which a signal should be installed.

[5] Source: MnMUTCD, May 2005 and unpublished Mn/DOT Research.

[6] Source: MnMUTCD, May 2005.



Source: Anoka County's Intersection Decision Analysis (CH2M HILL, 2008)

Figure 6-6
Signalized Intersection Decision Process Flow Chart

Signalized Intersection Criterion #4: High-Incident Crash Locations—After identifying locations that met traffic volume signal warrants, the county reviewed all high-incident intersections (where more than 25 crashes occurred from 2002-2006) to determine if any high crash intersections were not addressed in the previous decision processes (either through interchange/grade-separated intersection, roundabout/corridor study or signalized intersections). The county confirmed that there were no unsignalized, high-incident crash locations that did not meet a signal warrant based on traffic volumes.

The process described above resulted in the county recommending that signals be considered at the intersections listed in Table 6-7. Prior to installing signals at any of the intersections listed above, the county will thoroughly evaluate the effectiveness of the signal in addressing intersection deficiencies.

6.6 Next Steps

The intersection recommendations made in this section were carried forward into Section 7.0, Evaluation Process and Recommendations, which looks beyond intersections, and documents the results of the county's efforts to develop and prioritize projects for the entire Anoka County transportation system. Capacity projects considered in Section 7.0 include:

- Intersection improvements from the lists developed in this section,
- Widening roadways by adding lanes based on travel demand results summarized in Section 5.0, and
- Improving the supporting roadway network by making new roadway connections.

TABLE 6-7
Signalized Intersection Results

Road	Intersection	Warrant Probability	Road	Intersection	Warrant Probability
CSAH 116	CR 52	High	CSAH 23	CR 19	Moderate
CSAH 116	CR 57	High	CSAH 24	CR 103	Moderate
CSAH 12	CR 53	Moderate	CSAH 24	CSAH 26	Moderate
CSAH 14	CR 53	High	CSAH 24	CSAH 9	High
CSAH 14	4th Ave	Moderate	CSAH 5	CR 163	High
CSAH 14	Rondeau Lake Rd	Moderate	CSAH 5	CR 63 (North)	High
CSAH 17	CR 60	High	CSAH 5	CR 63 (South)	Moderate
CSAH 17	149th	High	CSAH 5	CR 57	Moderate
CSAH 17	CSAH 116	High	CSAH 56	Alpine Dr.	Moderate
CSAH 18	CR 19	High	CSAH 56	CSAH 5	Moderate
CSAH 18	CSAH 17 (North)	High	CSAH 56	167th Ave.	Moderate
CSAH 18	CSAH 17 (South)	High	CSAH 58	CR 67	High
CSAH 18	CR 68	High	CSAH 58	CSAH 78	High
CSAH 18	E. Lake Netta Dr	High	CSAH 7	CR 58	Moderate
CSAH 18	CSAH 58	High	CSAH 7	147th Ave.	High
CSAH 18	CSAH 62	Moderate	CSAH 78	133rd	High
CSAH 20	Crosstown Blvd	Moderate	CSAH 78	CSAH 20	Moderate
CSAH 20	University Ave	Moderate	CSAH 83	161st Ave.	Moderate
CSAH 22	CSAH 5	High	CSAH 83	Alpine Dr.	High
CSAH 22	TH 47	High	CSAH 83	CSAH 116	High
CSAH 22	CSAH 7	High	CSAH 9	CSAH 58	High
CSAH 22	CSAH 9	High	CSAH 9	MSA 116/168th	Moderate
CSAH 22	CSAH 78	High	CSAH 9	MSA 108/Coon Creek Dr.	High
CSAH 22	CR 67 (South)	High	CR 49	Lever St.	High
CSAH 22	CR 67 (North)	High	CR 52	Cloud Dr.	Moderate
CSAH 22	CR 15	Moderate	CR 52	Tournament Players Pkwy	Moderate
CSAH 22	CR 74	Moderate	CR 53	CR 49	Moderate
CSAH 22	CSAH 85	High	CR 53	105th/Gladstone	Moderate
CSAH 22	CR 163	High	CR 53	CR 153	Moderate
CSAH 22	CR 64	Moderate	CR 57	Alpine Dr.	Moderate
CSAH 22	CR 68	Moderate	TH 65	CR 74	High
CSAH 22	CSAH 17	Moderate			