

MEMORANDUM

TO: Jim Grube, P.E., Director of Transportation and County Engineer
HENNEPIN COUNTY

CC: CSAH 112 Project File

FROM: Craig Vaughn, P.E., PTOE, Senior Associate

DATE: January 25, 2013

SUBJECT: CSAH 112 RECONSTRUCTION PROJECT TRAFFIC STUDY

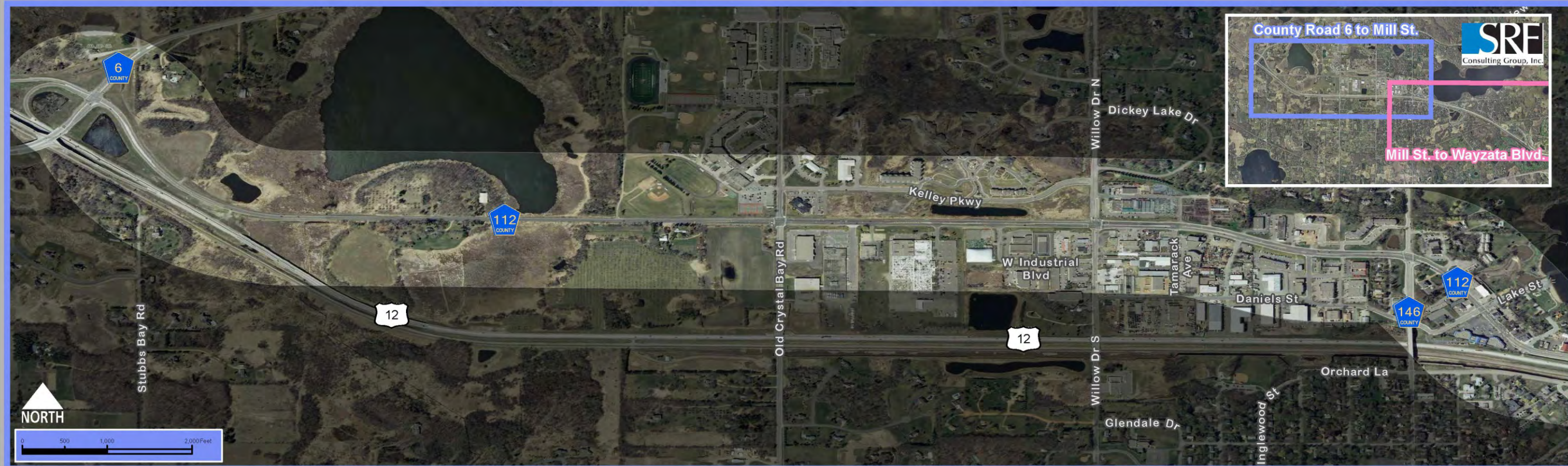
INTRODUCTION

Hennepin County is currently in the process of designing the CSAH 112 corridor with future consideration in mind. As part of the design process a traffic study was conducted to determine what geometric design considerations should be taken into account based on how the adjacent roadway network operates under existing conditions and how it will operate under future conditions. The traffic study addressed traffic operations, multimodal relationships (pedestrians and bicycles), traffic control needs and design considerations. The overall project limits of the study extend from CSAH 6 on the west end to Wayzata Boulevard on the east end (see Figure 1: Project Limits). The following sections provide a summary of the analysis conducted.

EXISTING CONDITIONS

Analyzing and assessing existing conditions in the study area establishes a baseline to project future traffic and development trends. In doing so, existing issues and conditions can be placed in context with future needs. The evaluation of existing conditions includes the following:

- Existing roadway configuration
- Data collection
- Access inventory
- Safety analysis
- Corridor capacity analysis
- Existing intersection capacity analysis



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Project Limits

CSAH 112 Reconstruction Project Traffic Study
Hennepin County

0127738
January 2013

Figure 1

Existing Roadway Configuration

The section of CSAH 112 under review extends approximately four (4) miles from CSAH 6 on the west end to Wayzata Boulevard on the east end. CSAH 112 is a two-lane undivided rural roadway with shoulders between CSAH 6 and Old Crystal Bay Road. A center median is introduced east of Old Crystal Bay Road, while maintaining the two-lane roadway configuration with dedicated right- and left-turn lanes at key intersections, up to Brown Road. East of Brown Road the roadway transitions to a three-lane section with a center two-way left-turn lane (TWLTL) up to Martha Lane. CSAH 112 is a two-lane undivided roadway with dedicated turn lanes located at select intersections between Martha Lane and Wayzata Boulevard.

Data Collection

Data collection is a key component of any traffic operations analysis project. Historical data was reviewed along the corridor to gain an understanding of the existing conditions. Intersection turning movement counts were collected by SRF Consulting Group in May 2012 during the weekday a.m. and p.m. peak periods at the following locations along CSAH 112:

- County Road 6
- Old Crystal Bay Road
- Willow Drive
- Wayzata Boulevard
- Tamarack Avenue
- Brimhall Avenue
- Shaughnessy Avenue
- Brown Road
- Lake Street
- Mill Street

The weekday a.m. peak hour was determined to be from 7:15 – 8:15 a.m. and the p.m. peak hour from 4:45 – 5:45 p.m. In addition to key intersection turning movement counts, pulse counts were collected during the appropriate peak hour at critical public/private access points along the corridor. Appendix A contains the a.m. and p.m. peak hour turning movement count data, plus some additional access locations.

Access

Access plays a critical role in how roadway facilities operate. A high frequency of access along a given segment of roadway can reduce capacity and adversely affect operations. The section of CSAH 112 being reviewed is within the Metropolitan Urban Service Area (MUSA) and for analysis purposes can be considered an urban/urbanizing area in some areas. The dense commercial section between Old Crystal Bay Road and Martha Lane has a significant number of access points.

Hennepin County maintains access spacing guidelines that apply to their facilities. The Hennepin County access spacing guidance for an A-minor reliever in an urban area is at a minimum eight (8) access points per mile (660 feet), including private and public accesses. This would apply to restricted access points (partial access, i.e., right-in/right-out). Full access would be limited to one-quarter mile (1,320 feet). However, the guidance does state that “if conformance to guidelines does not appear feasible, further justification, evaluation, and analysis may be required. Formal traffic studies may be required for large projects. Other criteria are also reviewed for access requests such as entering sight distances, speeds, traffic volumes, and

other elements (truck traffic, land use activities, etc.)” The approximate four mile section of CSAH 112 being reviewed has a total of approximately 79 access points, which equates to approximately 19 access points per mile, or nearly 4.5 times greater than Hennepin County standards. Table 1 presents the existing access spacing by segment versus the Hennepin County standards. See Figure 2: Existing Corridor Access.

Table 1
Existing Public/Private Access Comparison

CSAH 112 Corridor Segment	Segment Length	Hennepin County Access Spacing Standard	Existing Access Pts/mile	Existing Access is...
CSAH 6 to Old Crystal Bay Road	1.2 mi	4-8 pts/mile	9 pts/mile	non-compliant
Old Crystal Bay Road to Brown Road	1 mi	4-8 pts/mile	21 pts/mile	non-compliant
Brown Road to Glenmoor Lane	1 mi	4-8 pts/mile	25 pts/mile	non-compliant
Glenmoor Lane to Wayzata Boulevard	0.9 mi	4-8 pts/mile	24 pts/mile	non-compliant

* Note: if 330 foot spacing were allowed 16 access points per mile would be acceptable, significantly narrowing the access compliance gap.

Safety Analysis

SRF coordinated collection of the crash data with Hennepin County and Mn/DOT’s Crash Mapping Analysis Tool (MnCMAT) to identify safety concerns along the corridor and at study intersections. Data was collected for the most recent three years, from January 1, 2009 through December 31, 2011. In order to determine the significance of the reported crashes, the associated crash rate for the study intersections and segments were also calculated. Crash rates for the key intersections and roadway segments along CSAH 112 were compared to typical crash rates for intersections and segments with similar characteristics (data reported by Hennepin County). In addition, crash types at the key intersections and roadway segments were reviewed to determine patterns and potential existing safety issues. Table 2 summarizes the crash analysis identifying the number, type and resultant crash rate.

Based on the crash data, the following safety concerns were identified:

- The key intersections of CSAH 112/Wayzata Boulevard and CSAH 112/Brown Road had higher than average crash rates. However, only the CSAH 112/Wayzata Boulevard intersection was above the critical crash rate.
- When an intersection is above the average crash rate for a similar type intersection, the critical crash rate can be computed to determine the significance of the greater than average rate. This indicates that there is a statistically significant crash issue at this intersection. Therefore, further review of the type of crashes occurring at the intersection of CSAH 112/Wayzata Boulevard and intersection characteristics was conducted.
 - This T-intersection is side-street stop control with turn lanes on each of the three approaches.
 - The majority of the crashes are rear-end and right-angle collisions. The majority of the crashes occurred during daylight hours and dry road conditions.



- Commercial, Full Access
- Commercial, Partial Access
- Public, Full Access
- Residential, Full Access



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**Table 2
Crash Summary**

CSAH 112 Intersection	Crashes		Crash Rate			Diagram							
	Total Crashes	Total Severe Crashes	Expected Crash Rate	Actual Crash Rate	Critical Crash Rate	Rear End	Side-swipe	Left Turn	Run-off Road	Right Angle	Right Turn	Head On	Other
CR 6	1	0	0.49	0.09	0.88	0	0	0	0	1	0	0	0
Old Crystal Bay Road	3	0	0.45	0.34	0.88	3	0	0	0	0	0	0	0
Willow Drive	5	0	0.43	0.39	0.77	3	0	1	0	1	0	0	0
Tamarack Avenue	0	0	0.20	0.00	0.47	0	0	0	0	0	0	0	0
Brimhall Avenue	0	0	0.29	0.00	0.61	0	0	0	0	0	0	0	0
Shaughnessy Avenue	2	0	0.29	0.17	0.59	0	0	0	0	0	1	1	0
Brown Road	6	1	0.43	0.44	0.76	2	0	0	0	3	0	1	0
Lake Street	2	0	0.40	0.16	0.73	1	1	0	0	0	0	0	0
Mill Street	1	0	0.29	0.09	0.59	0	0	0	1	0	0	0	0
Wayzata Boulevard	9	1	0.2	0.83	0.47	3	1	0	1	3	0	1	0
Total Intersection Crashes	29	2	--	--	--	12	2	1	2	8	1	3	0
CSAH 112 Segments													
CSAH 6 to Old Crystal Bay Road	1	0	0.82	0.20	1.58	0	0	0	0	0	0	1	0
Old Crystal Bay Road to Willow Drive	3	0	0.99	0.98	2.09	0	0	0	1	1	0	0	1
Willow Drive to Brown Road	0	0	0.56	0.00	1.19	0	0	0	0	0	0	0	0
Brown Road to Mill Street	0	0	0.92	0.00	1.67	0	0	0	0	0	0	0	0
Mill Street to Wayzata Boulevard	14	0	0.82	0.77	1.20	3	1	0	5	3	0	1	1
Total Segment Crashes	18	0	--	--	--	3	1	0	6	4	0	2	2

Existing Intersection Capacity Analysis

A traffic operations review of the existing conditions was completed to determine if any operational or geometric issues exist along the CSAH 112 corridor. The key intersections listed above were analyzed. Current traffic controls include traffic signals at the following intersections: CSAH 6, Old Crystal Bay Road, Willow Drive, Brown Road, and Lake Street. The remaining intersections of Tamarack Avenue, Brimhall Avenue, Shaughnessy Avenue, Mill Street, and Wayzata Boulevard are side-street stop controlled.

Signalized intersections were analyzed using the Synchro/SimTraffic software, while unsignalized intersections were analyzed using a combination of Synchro/SimTraffic software and the Highway Capacity Manual (HCM). It should be noted that where unsignalized intersections are in close proximity to signalized intersections, the signalized intersections have a significant impact on the overall operations of the unsignalized intersections. In this situation, engineering judgment is applied to determine which software tool provides the best understanding of real world conditions. The level of service results are based on average delay per vehicle. The delay threshold values are shown in Table 3.

Table 3
Level of Service Criteria for Signalized and Unsignalized Intersections

LOS Designation	Signalized Intersection Average Delay/Vehicle (seconds)	Unsignalized Intersection Average Delay/Vehicle (seconds)
A	< 10	< 10
B	10-20	10-15
C	20-35	15-25
D	35-55	25-35
E	55-80	35-50
F	80 <	50 <

The operations analysis was conducted with select access points and their respective traffic volumes included. This provides an understanding for how the key intersections interact with the numerous access points along the corridor. Results of the existing operations analysis for the CSAH 112 corridor shown in Table 4 indicate that all key signalized intersections currently operate at an acceptable overall LOS C or better during the a.m. and p.m. peak hour with existing traffic controls and geometric layout. However, three side-street stop controlled intersections operate with a side-street delay of LOS D on the minor approach. None of the access points included in the operations analysis performed with unacceptable levels of service or significant side-street delays.

Table 4
Existing Peak Hour Capacity Analysis – CSAH 112

Intersection	Level of Service	
	A.M. Peak	P.M. Peak
CSAH 6	B	C
Old Crystal Bay Road	C	B
Willow Drive	C	C
Tamarack Avenue *	A/C	A/C
Brimhall Avenue *	A/D	A/C
Shaughnessy Avenue *	A/C	A/D
Brown Road	B	B
Lake Street	B	B
Mill Street *	A/D	A/C
Wayzata Boulevard *	A/C	A/C

* Side-street stop controlled intersection. Overall intersection delay is shown followed by the worst side-street delay.

** HCM LOS values were reported for the unsignalized intersections under this condition.

Although all key intersections operate acceptably it is worth noting areas where vehicular queues extend back from the intersection, potentially indicating an issue (existing or future potential). The following summarizes these findings:

A.M. Peak Hour Notable Queues

- Willow Drive
 - 95th percentile eastbound through queues extend back approximately 285'
- Brown Road
 - 95th percentile eastbound through queues extend back approximately 275'
 - 95th percentile westbound through queues extend back approximately 215'
- Lake Street
 - 95th percentile eastbound through queues extend back approximately 385'

P.M. Peak Hour Notable Queues

- Brown Road
 - 95th percentile westbound through queues extend back approximately 320' into the unsignalized intersection for the Lake Community Bank and the museum.
- Lake Street
 - 95th percentile westbound through queues extend back approximately 235'

TRAFFIC FORECASTS

As part of the CSAH 112 Reconstruction project, 20-year daily traffic volumes were developed from the year of opening between TH 12 at CSAH 6 and the TH 12 interchange east of Long Lake. Year 2018 was assumed for the year of opening; therefore, traffic forecasts were developed for year 2038. The year 2030 daily traffic forecasts, published in the Hennepin County Transportation System Plan (HC-TSP), were used as the basis for the development of these forecasts. The traffic forecast assumptions, methodology and results were developed in close coordination with Hennepin County staff.

Forecast Assumptions

Year 2038 daily traffic forecasts for CSAH 112 were based on the following assumptions.

- Local land use development for Orono and Long Lake was assumed consistent with the Hennepin County 2030 Travel Demand Model. These development assumptions are based on discussions with Hennepin County staff regarding past communications between Hennepin County and City staff.
- The existing and year 2030 published land use plans for Orono and Long Lake were considered current and valid (Appendix B contains the published land use plans).
- Assumed generalized trip generation rates by land use type, which is consistent with the Hennepin County Travel Demand Model.
- Based on discussions with Hennepin County staff, it is estimated that the year 2030 traffic forecasts provide a reasonable estimate for the year 2038 design year traffic forecast volumes.
- No traffic diversion from TH 12 to CSAH 112 was assumed for year 2038.

Forecast Methodology

Daily traffic forecasts for CSAH 112 were developed based on the following methodology.

- Hennepin County year 2012 ADTs and MnDOT year 2010 AADTs were reviewed and used as the base values.
- The magnitude of growth in vehicle trips between year 2010 and year 2030 was estimated based on corridor development data, trip rates and land use plans.
- Vehicle trips were reduced as appropriate to account for corridor area trips that would not use or cross CSAH 112.
- Year 2010 to year 2030 vehicle trip growth was allocated to all approaches along the corridor based on Hennepin County land use development allocation and potential parcel redevelopment identified in the City land use plans.
- Distributed traffic growth through the CSAH 112 corridor based on existing turning movements and potential land use development locations.
- Traffic growth was added to existing published AADTs to develop year 2030 daily traffic forecasts.
- The year 2030 traffic forecasts were assumed as a reasonable estimate of the year 2038 design year traffic forecast volumes.

Forecast Results

Year 2038 daily traffic forecasts for the CSAH 112 corridor are presented in Figure 3 (Year 2038 Forecast Daily Traffic Volumes). Hennepin County staff has reviewed and approved these forecast results for use in the CSAH 112 traffic operations analysis and subsequent corridor design. It should be noted that the traffic forecasts presented here are not an exact match to the HC-TSP year 2030 forecast volumes. The forecast volumes east of Brown Road (19,100 vpd) are lower than the HC-TSP forecasts, but consistent with currently anticipated growth and traffic patterns in the area. As part of the detailed traffic operations analysis, the impact of small increases in forecast traffic volume was considered in order to assess potential reserve capacity. Appendix C contains the resultant year 2038 a.m. and p.m. peak hour turning movement volumes.

YEAR 2038 NO BUILD CONDITIONS

The year 2038 no build condition represents a transportation system with the current roadway design, intersection geometry and future traffic volumes.

Segment Capacity Analysis

Future no build traffic volumes were reviewed to identify potential capacity deficiencies in the corridor. As a planning-level exercise, average daily traffic capacity ranges for different facility types were used to evaluate the corridor's ability to accommodate future traffic volumes along CSAH 112. These volume ranges are based on guidance from the Highway Capacity Manual and professional engineering judgment. The maximum capacity of any roadway design is a theoretical measure that can be affected by its functional classification, traffic peaking, vehicle classification, access spacing, intersection geometry, speed and other roadway characteristics.

As shown in Table 5, year 2038 daily traffic volumes are expected to exceed the roadway capacity along CSAH 112 between Brown Road and Wayzata Boulevard. Since this is a planning-level exercise, an operations analysis at the key intersections was conducted to determine how the key intersections and segments would handle future no build peak hour volumes. Results of this analysis are summarized in the following section.

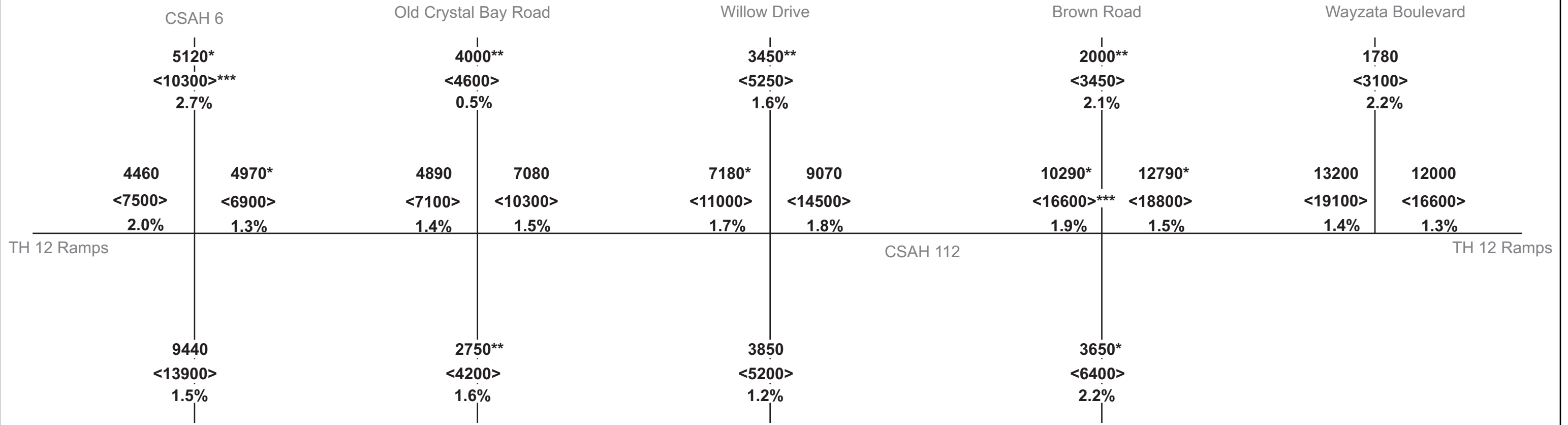
Table 5
Year 2038 Segment Daily Capacity (AADT)

Segment along CSAH 112	Facility Type	Daily Capacity Ranges (AADT)*	2038 Traffic Volumes
CSAH 6 to Old Crystal Bay Road	Two-lane undivided rural	14,000 – 15,000	6,900 – 7,100
Old Crystal Bay Road to Brown Road	Two-lane divided with turn lanes	14,000 – 17,000	10,300 – 16,600
Brown Road to Martha Lane	Three-lane urban	14,000 – 17,000	18,800
Martha Lane to Wayzata Boulevard	Two-lane undivided rural	14,000 – 15,000	19,100

* Derived from the Highway Capacity Manual 2000



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LEGEND

- XX - Year 2012 Daily Traffic Volumes
- * Source: Hennepin County April 2012 Daily Traffic Count
- ** Source: MnDOT 2010 Traffic Flow Maps
- <XX> - Year 2038 Daily Traffic Forecasts
- *** Source: Hennepin County Transportation Systems Plan
- XX% - Yearly Growth Rate



Intersection Operations Analysis

Similar to the existing conditions, the year 2038 no build operations analysis was conducted with select access points and their respective traffic volumes included. Results of the operations analysis for the CSAH 112 corridor shown in Table 6 indicate that all key signalized intersections are expected to operate at an acceptable overall LOS D or better during the a.m. and p.m. peak hour with existing traffic controls and geometric layout. However, four side-street stop controlled intersections operate with a side-street delay of LOS D or worse on the minor approach. Furthermore, an additional five (5) of the access points included in the operations analysis performed with significant side-street delays (LOS E or worse).

Table 6
Year 2038 No Build Peak Hour Capacity Analysis – CSAH 112

Intersection	Level of Service	
	A.M. Peak	P.M. Peak
CSAH 6	D	D
Old Crystal Bay Road	C	C
Willow Drive	D	C
Tamarack Avenue *	A/B	A/C
Brimhall Avenue *	A/E	A/C
Shaughnessy Avenue *	A/E	A/E
Brown Road	C	C
Lake Street	B	B
Mill Street *	A/D	B/F
Wayzata Boulevard *	A/C	C/F

* Side-street stop controlled intersection. Overall intersection delay is shown followed by the worst side-street delay.

** All SimTraffic LOS values were reported for the unsignalized intersections under this condition.

Although all key intersections operate at an overall acceptable level of service it is worth noting areas where vehicular queues extend back from the intersection, potentially indicating an issue. The following summarizes these findings:

A.M. Peak Hour Notable Queues

- CSAH 6
 - 95th percentile northbound through queues extend back approximately 340'
- Old Crystal Bay Road
 - 95th percentile eastbound through queues extend back approximately 440'
- Willow Drive
 - 95th percentile eastbound through queues extend back approximately 865', blocking access to CSAH 112 along Industrial Boulevard
 - The average queue associated with this approach is approximately 450'
 - 95th percentile southbound left-turn queues extend back approximately 375', blocking one access point along Willow Drive

- 95th percentile northbound through queues extend back approximately 380', blocking numerous site access points and Industrial Boulevard immediately south of CSAH 112
- Brown Road
 - 95th percentile eastbound through queues extend back approximately 575', blocking access onto CSAH 112 for one access point
 - 95th percentile westbound through queues extend back approximately 250'
- Lake Street
 - 95th percentile eastbound through queues extend back approximately 665', blocking numerous site access points

P.M. Peak Hour Notable Queues

- CSAH 6
 - 95th percentile eastbound right-turn queues (exiting TH 12) extend back approximately 955'
 - 95th percentile westbound through-queues extend back approximately 330';
 - 95th percentile southbound through queues extend back approximately 585'
- Old Crystal Bay Road
 - 95th percentile westbound through queues extend back approximately 375'
- Willow Drive
 - 95th percentile westbound through queues extend back approximately 385'
- Brown Road
 - 95th percentile westbound through queues extend back approximately 825', blocking numerous site access points (nearly to Lake Street)
 - The average queues associated with this is approximately 300'
- Lake Street
 - 95th percentile eastbound through queues extend back approximately 230', blocking three (3) access points
 - 95th percentile westbound through queues extend back approximately 1,000', blocking numerous site access points (back through Mill Street)
 - The average queues associated with this is approximately 200'
- Wayzata Boulevard
 - 95th percentile westbound queues extend back approximately 640', blocking two (2) access points along Wayzata Boulevard
 - The average queues associated with this is approximately 265'

CORRIDOR DESIGN IMPLICATIONS

The traffic operations analysis results and notable queue information documented herein have potential implications on how the reconstructed CSAH 112 corridor should be designed. These results have been discussed with the project steering committee. The consensus among the project partners and the steering committee is that the corridor width cannot expand beyond its existing width due to the property acquisition that would be needed. The area of the corridor that will see the most impact during the peak periods is Brown Road to Mill Street. Traffic volumes are projected to exceed the planning level capacity thresholds for a three-lane road through this area. However, the peak period volumes are very directional and the key intersections will operate with acceptable levels of service during these times. Therefore, the roadway between Brown Road and Mill Street can operate acceptably as a three-lane roadway. Intersections controlled with side-street stop-control signs will have difficulty accessing the roadway.

Access management in this same area should be improved to mitigate the side-street delays that were observed under existing and year 2038 conditions. The mainline queues will still occur during the peak hours, but vehicles accessing the roadway will cause less friction and if the side-street access is only restricted (i.e., right-in/right-out), some access will still be provided. The two access points immediately east of the CSAH 112/Brown Road intersection (the Lake Community Bank/Western Hennepin County Pioneer site access) should be restricted to right-in/right-out only access.

The next area of the corridor that is most notable is the segment east of Martha Lane. This segment of CSAH 112 should be designed to include right- and left-turn lanes at the key intersecting roadways or trip generators. These turn lanes will improve safety and mobility by removing these turning vehicles from the through lanes while they decelerate to make their movements, in turn reducing the risk of a crash and reducing corridor delay traveling through. The CSAH 112/Wayzata Boulevard intersection should be designed to increase the angle of incidence for westbound traffic as they approach CSAH 112 (cause traffic to approach CSAH 112 as close to a 90-degree angle as possible).

Based on the existing and year 2038 operations analysis the western portion of the corridor will function well with the current configuration. The existing roadway section west of Old Crystal Bay Road can remain the same as it is today (two-lane road with shoulders and turn lanes at the intersections). The existing roadway section between Old Crystal Bay Road and Willow Drive can remain the same as it is today (two-lane road with shoulders, turn lanes at the intersections and center medians as necessary).

The roadway section between Willow Drive and Brown Road is currently a two-lane divided roadway with turn lanes striped or developed at access points. The year 2038 traffic volumes are within the range of a three-lane roadway section; right-turn lanes are currently striped at the access points along this segment of the corridor. Therefore, striping this segment as a three-lane roadway with continuous right-turn lanes in each direction will benefit its functionality.

Traffic Signal Warrant Review

The existing traffic signals along the corridor were reviewed from a volume standpoint to determine if they continue to be warranted. The following assumptions were used to perform this preliminary analysis:

- The a.m. and p.m. peak hour counts were used for the warrant analysis
- To establish a full eight (8) hours for the warrant analysis 50 percent of the p.m. peak hour volume was used as the lowest eighth hour
- The cross street right-turn volumes were removed from the calculations where exclusive turn lanes are provided, and reduced by 50 percent when the right turns are shared with a through lane

Based on the preliminary warrant review the traffic signals at CSAH 6, Old Crystal Bay Road and Willow Drive should not be removed because they meet the peak hour warrant for at least one hour under existing conditions. The traffic signals at Brown Road and Lake Street require additional review with a full warrant analysis performed using a new 12 hour tube count due to being close to the peak hour threshold under existing conditions.

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Appendix A
Existing A.M. and P.M. Peak Hour
Turning Movement Counts















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 Map - CR 112 Corridor Study







Appendix B
Published Land Use Plans for
Orono and Long Lake

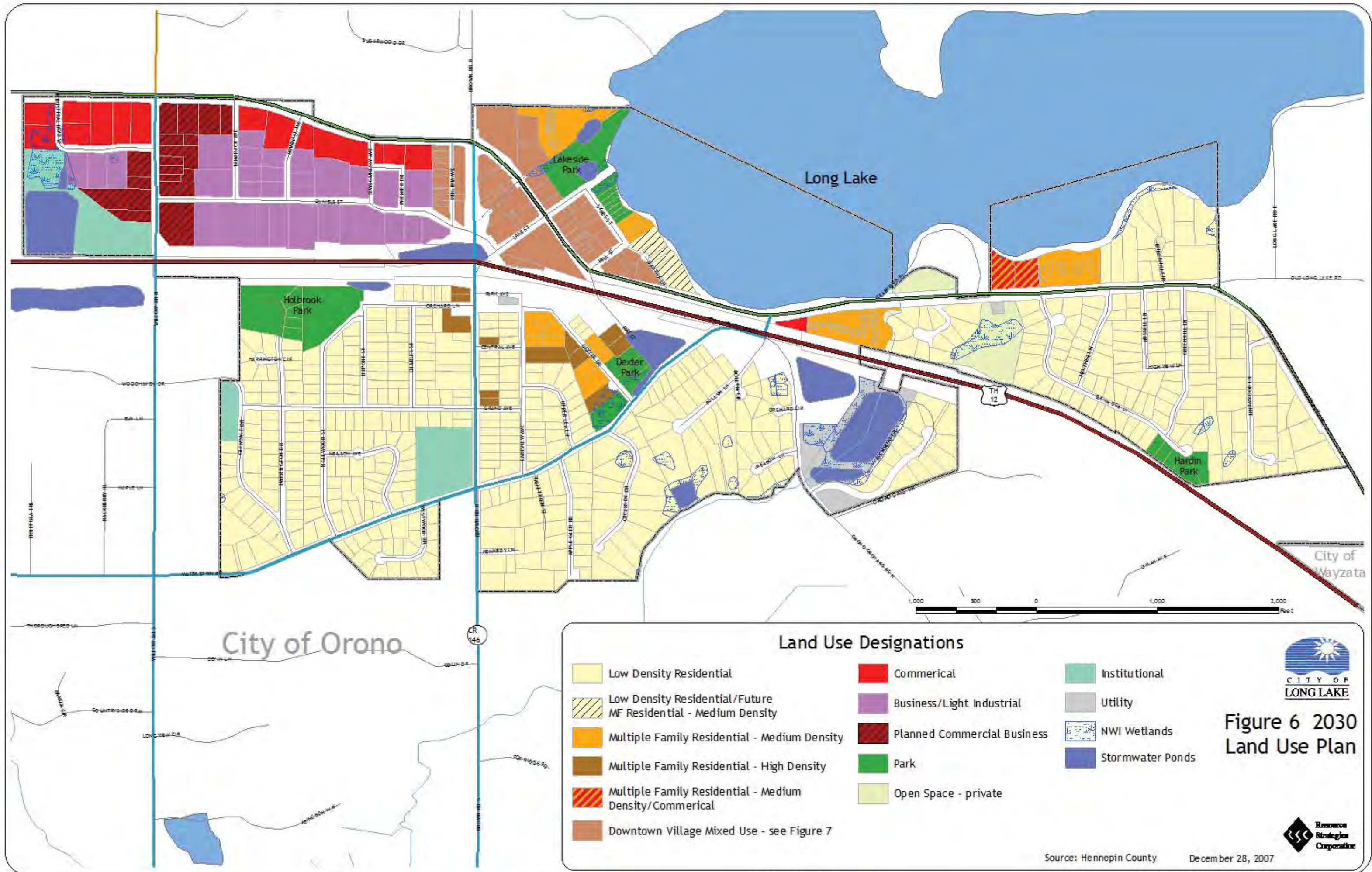


Figure 6 2030 Land Use Plan

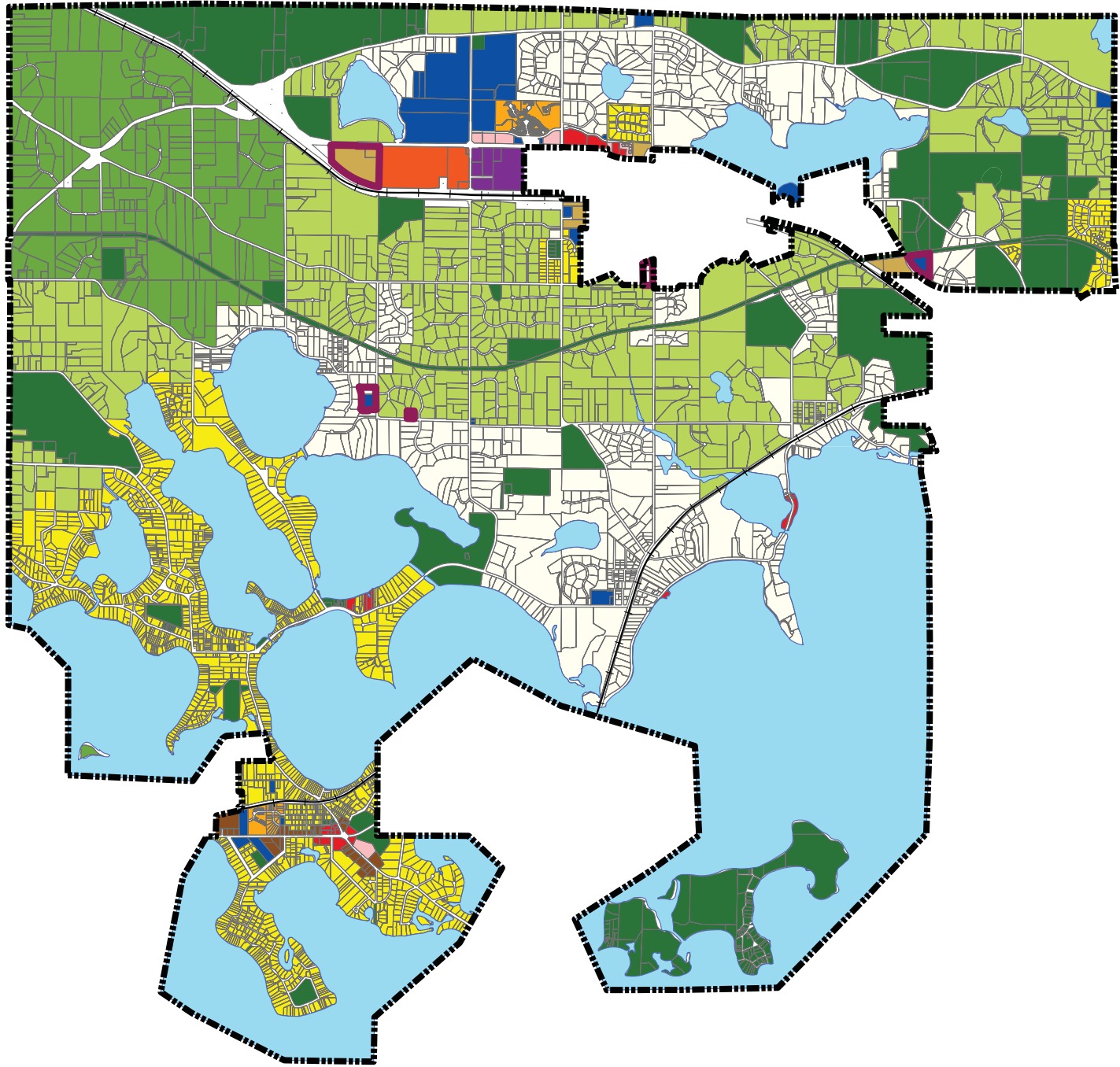
Source: Hennepin County

December 28, 2007



2030 Land Use Plan

City of Orono Minnesota



Future Land Use Categories

- Rural (1 unit/5 ac)
- Rural Residential (1 unit/2 ac)
- Low Density Residential (0.5-2 units/ac)
- Low-Medium Density Residential (2-3 units/ac)
- Medium Density Residential (3-7 units/ac)
- Medium-High Density Residential (7-10 units/ac)
- High Density Residential (10-15 units/ac)
- Mixed Use Residential (6-15 units/ac)
- Commercial
- Office
- Industrial
- Park, Recreational, and Open Space
- Institutional
- Proposed MUSA
- Open Water
- Parcel
- Railroad
- City Limits



NAC NORTHWEST ASSOCIATED CONSULTANTS, INC.
NACD - Office: 1800 Central Expressway, Suite 202, Golden Valley, MN 55412
 Telephone: 763.231.2000 Fax: 763.231.2081 glenn@nacplanning.com

Source: Bonestroo, Northwest Associated Consultants. Date: June 16, 2010.

Appendix C
Year 2038 A.M. and P.M. Peak Hour
Turning Movement Volumes



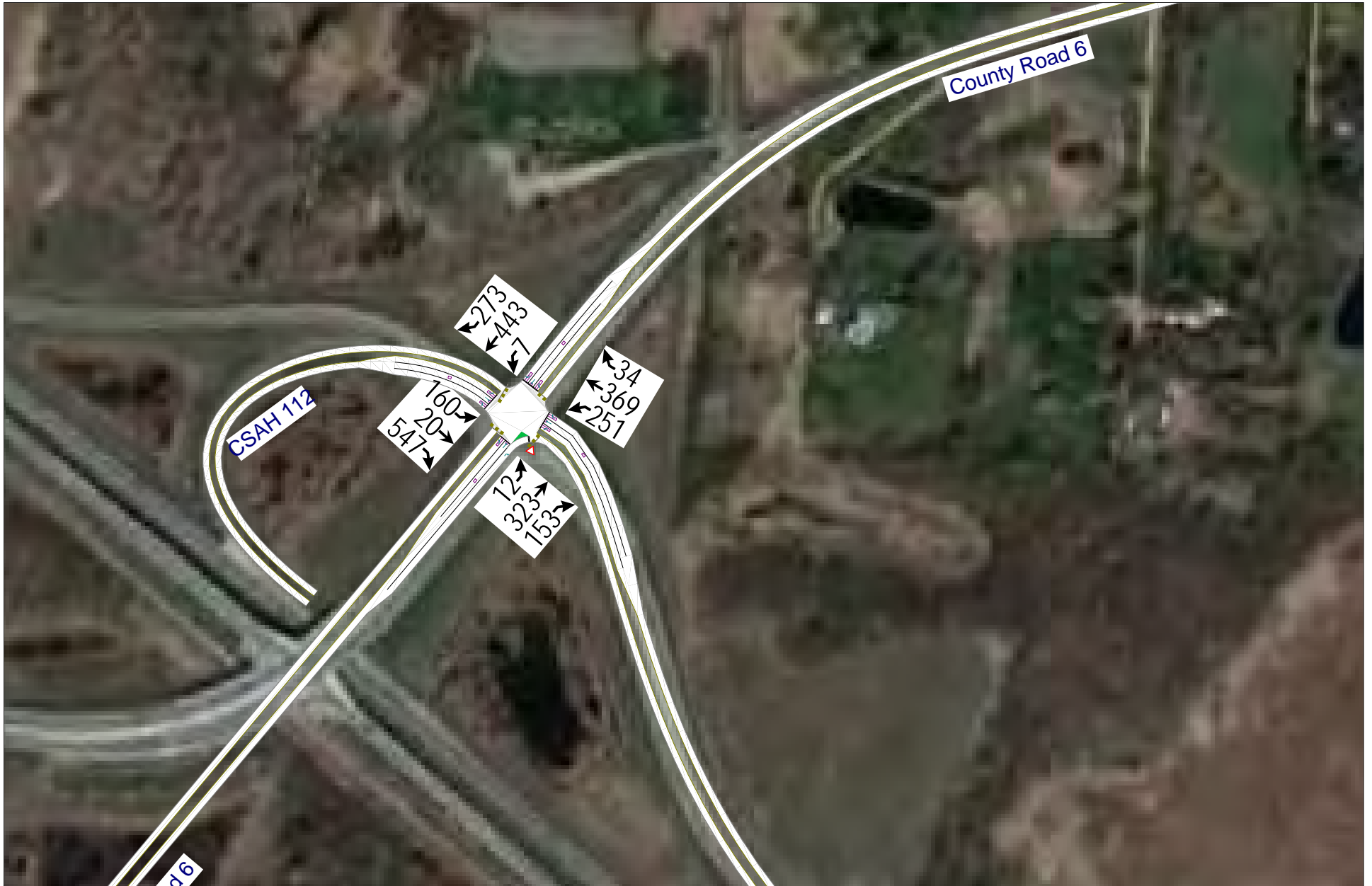


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 Map - CR 112 Corridor Study











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Map - CR 112 Corridor Study





