

Corridor Study Report

CSAH 48 (Highland Scenic Road) - Isle Drive to College Road

Baxter, Minnesota

BAXTE 165756 | December 20, 2022

Baxter City Council Acceptance Date: December 20, 2022



Building a Better World
for All of Us®

Engineers | Architects | Planners | Scientists

Contents

1	Introduction	1
2	Existing Conditions.....	4
2.1	Crash History.....	6
2.2	Existing Traffic Volumes	8
3	Future Conditions.....	11
3.1	Future Roadway Connections	11
3.2	Background Growth.....	12
3.3	Development Trip Generation Estimates.....	12
4	Intersection Warrant Analysis.....	17
4.1	Requirements for Installation of a Traffic Signal	17
4.2	Camwood Trail/Evergreen Drive Considerations.....	17
4.3	Warrant Analysis Assumptions	18
4.4	Warrant Analysis Results	18
5	Traffic Operations Analysis	20
5.1	2022 Existing Conditions	21
5.2	2045 No Build Conditions	23
5.3	2045 Build Conditions.....	25
5.4	2045 Build Conditions (Evergreen Closed).....	28
6	TH 371 Interchange Analysis	29
7	Access Spacing.....	30
7.1	Future Access Recommendations.....	31
7.2	TH 371 Interchange Access Spacing	33
8	Conclusion	35
8.1	Recommendation	36

Contents (continued)

List of Tables

Table 1 – Intersection Crash History (2017-2021).....	7
Table 2 – Warrant Analysis Results	19
Table 3 – Level of Service Thresholds	21
Table 4 – 2022 Existing Traffic Operations	22
Table 5 – 2045 No Build Traffic Operations	24
Table 6 – 2045 Build Traffic Operations	27
Table 7 – 2045 Build Camwood Trail Traffic Operations – Evergreen Open vs. Closed.....	28

List of Figures

Figure 1 – Project Location	3
Figure 2 – Existing Roadway Conditions	5
Figure 3 – 2022 Existing Daily Volume Distribution.....	8
Figure 4 – 2022 Existing Traffic Volumes.....	10
Figure 5 – Future Land Use Plan from the City of Baxter Comprehensive Plan.....	12
Figure 6 – 2045 Trip Generation Estimates.....	14
Figure 7 – Trip Distribution & 2045 Forecast Roadway Volumes	15
Figure 8 – 2045 Forecast Traffic Volumes	16
Figure 9 – 2045 Build Roadway Conditions	26
Figure 10 – Existing CSAH 48 Access & Planned Connections.....	32
Figure 11 – TH 371 Interchange Access Spacing	34

List of Appendices

Appendix A	February 2022 Traffic Counts
Appendix B	Warrant Analysis Results
Appendix C	Traffic Operations Analysis Results
Appendix D	Preliminary Layouts
Appendix E	CAP-X Analysis Results

Corridor Study Report

CSAH 48 (Highland Scenic Road) - Isle Drive to College Road

Prepared for Crow Wing County and the City of Baxter.

1 Introduction

County State Aid Highway 48 (CSAH 48), also known as Highland Scenic Road, is expected to have significant development along the roadway within the next 10-20 years. There are also several planned future roadways that will connect on the north side of CSAH 48 as development occurs. The first new roadway connection will be Cypress Drive, which will be connected to CSAH 48 in 2023, creating a new intersection. As development in the area continues, both Hastings Road and Douglas Fir Drive are expected to connect to CSAH 48. The Hastings Road extension will connect with CSAH 48 across from Forestview Drive and the Douglas Fir Drive extension will connect across from Camwood Trail.

The purpose of this study is to determine the existing and future roadway and intersection needs along CSAH 48 between Isle Drive and College Road as development in the area continues. A high-level review of a potential interchange at Trunk Highway 371 (TH 371) was also completed as that location has been considered for an interchange in previous long-range plans.

To determine the existing and future roadway needs along CSAH 48, the following list of existing and planned future intersections were included in the study. Three additional major intersections were included along College Road to gain a better understanding of the operational impacts within the area as development continues. In addition, six other existing intersections along CSAH 48 were reviewed for safety impacts; however, these were not included in the traffic operations analysis as the existing minor street stop control will continue to operate acceptably as volumes increase (non-study intersections). **Figure 1** shows the project location, study corridor, study and non-study intersections, and planned roadway connections.

Existing CSAH 48 Study Intersections

- CSAH 48 and Isle DriveRoundabout
- CSAH 48 and TH 371 Traffic Signal
- CSAH 48 and Forestview Drive (future Hastings Rd connection) Minor Stop Control
- CSAH 48 and Scenic River Drive Minor Stop Control
- CSAH 48 and Evergreen Drive Minor Stop Control
- CSAH 48 and Camwood Trail (planned future connection)..... Minor Stop Control
- CSAH 48 and Berrywood Drive Minor Stop Control
- CSAH 48 and College Road Traffic Signal

Planned Intersections

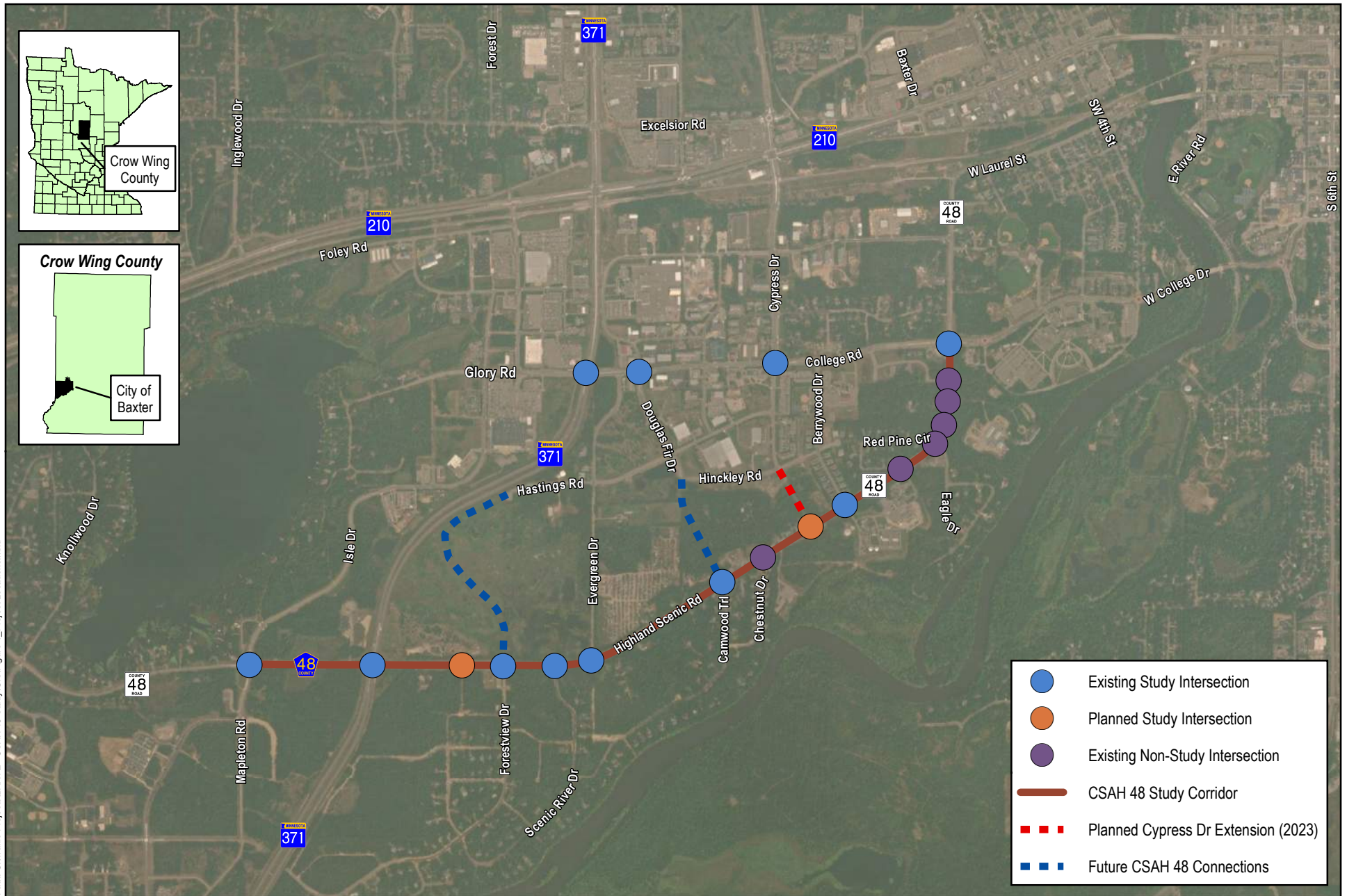
- CSAH 48 and Development Access (just east of TH 371)
- CSAH 48 and Cypress Drive

College Road Intersections

- College Road and TH 371..... Traffic Signal
- College Road and Douglas Fir Drive Minor Stop Control
- College Road and Cypress Drive.....Roundabout

Existing CSAH 48 Non-Study Intersections (not included in traffic operations analysis)

- CSAH 48 and Chesnut Drive Minor Stop Control
- CSAH 48 and Red Pine Circle (west) Minor Stop Control
- CSAH 48 and Eagle Drive..... Minor Stop Control
- CSAH 48 and Red Pine Circle (east)..... Minor Stop Control
- CSAH 48 and Minnesota Drive Minor Stop Control
- CSAH 48 and Carlos Road Minor Stop Control



		Project: BAXTE 165756 Print Date: 11/29/2022 Map by: jdanibas Projection: Crow Wing Co. Coords. Source: ESRI	PROJECT LOCATION CSAH 48 CORRIDOR STUDY Baxter, MN	Figure 1
---	---	--	---	--

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

2 Existing Conditions

CSAH 48, also known as Highland Scenic Road in the study area, is an east-west major collector roadway, which extends between Trunk Highway 210 and SW 4th Street along the southern portion of Baxter. In the project area, CSAH 48 is a 2-lane divided roadway between Isle Drive and TH 371 and is a 2-lane undivided roadway east of TH 371. Within the undivided roadway section east of TH 371, CSAH 48 generally has dedicated right turn lanes and left turn bypass lanes at all major roadway connections. Through the project area, CSAH 48 provides access to primarily residential and industrial land uses with the roadway also serving as a major route to several schools just east and west of the study area. The posted speed limit on CSAH 48 is 55 mph west of approximately Eagle Drive and 45 mph east of Eagle Drive.

TH 371 is a north-south principal arterial roadway, which extends from US Highway 10 in Little Falls, MN to US Highway 2 in Cass Lake, MN. TH 371 serves as a major regional corridor in this portion of the State and serves as the primary north-south connection for trips within the City of Baxter. TH 371 provides access to TH 210, which is the major east-west corridor in the region, as well as a significant amount of commercial development in the area. In the study area, TH 371 is a 4-lane divided roadway with dedicated left and right turn lanes at each intersection. The posted speed limit on TH 371 is 65 mph from approximately halfway between CSAH 48 and College Road to the south and 55 mph to the north.

College Road is an east-west minor arterial roadway that connects from TH 371 to the eastern Baxter City limits, where it becomes W College Drive in Brainerd. College Road serves as a primary connection between Baxter and Brainerd south of TH 210. College Road provides access to residential, industrial, and commercial land uses within the project area as well as Central Lakes College and Brainerd High School east of the project area. College Road is a 4-lane divided roadway with a continuous two-way left turn lane (TWLTL) through the project area; also known as a 5-lane roadway. The posted speed limit on College Road is 40 mph.

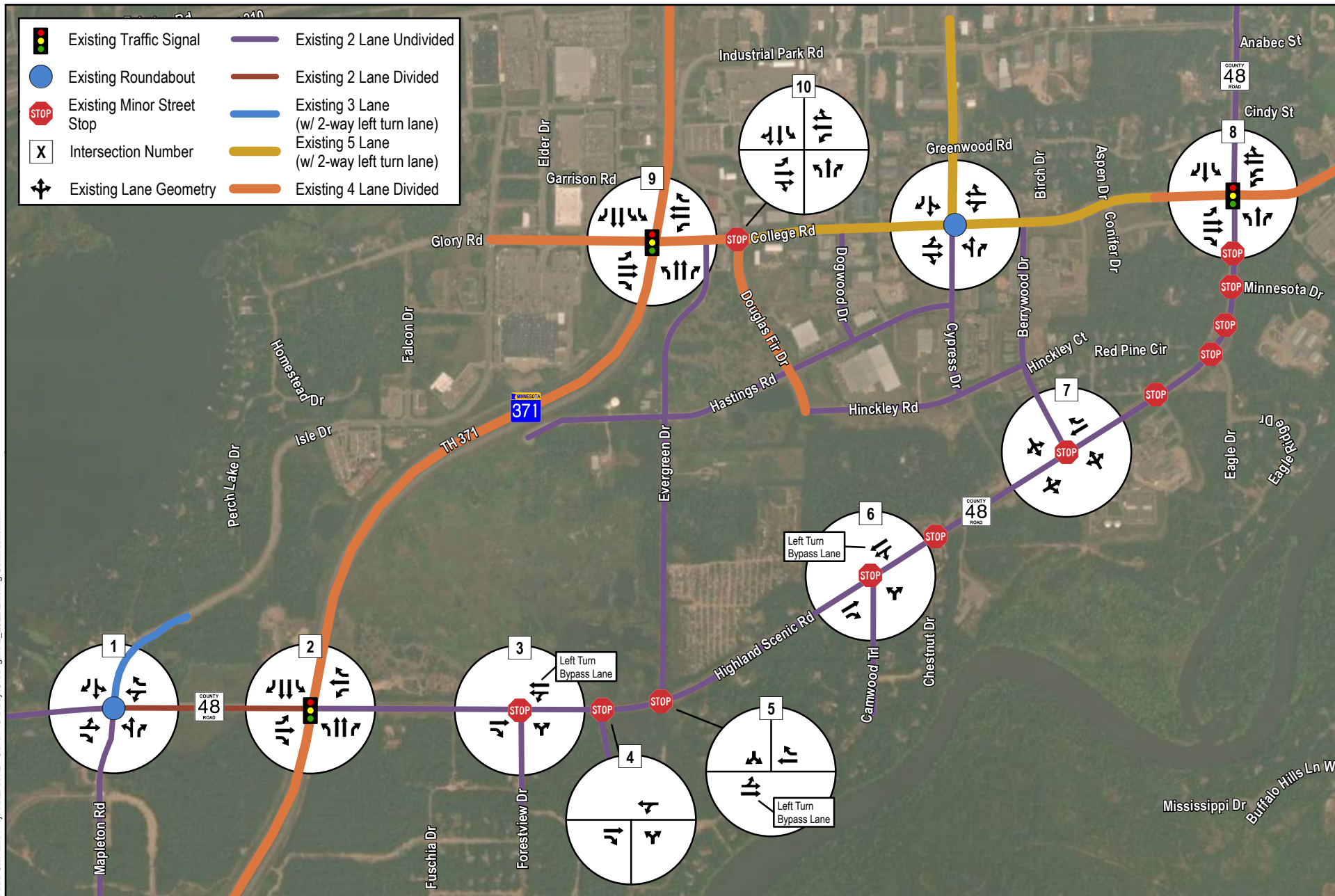
Glory Road is an east-west major collector roadway that connects Isle Drive to TH 371 across from College Road. Glory Road primarily provides access to the large commercial development on each side of the roadway with some residential land uses further west.

Isle Drive is a north-south major collector roadway that connects CSAH 48 to Glory Road. Isle Drive is a part of a series of planned roadways including Isle Drive, Foley Road, and Inglewood Drive that will serve as a parallel reliever roadway to TH 371. The purpose of a parallel reliever roadway is to increase traffic routing options and efficiency in Baxter by offering a route that may be preferred by local traffic over regional routes such as TH 371.

Mapleton Road (County Road 170) is an east-west major collector roadway that connects from the Crow Wing County western border to CSAH 48 at the Isle Drive roundabout in southern Baxter. The area adjacent to Mapleton Road is primarily undeveloped currently, with access to a few residential land uses as well as Baxter Elementary School and Forestview Middle School.

Upon completion of the Cypress Drive extension to CSAH 48 in 2023, Cypress Drive will serve as a parallel reliever route to TH 371 on the east side, with the purpose of increasing traffic routing options and efficiency in Baxter by offering a route that would be preferred by local traffic.

Figure 2 shows the existing conditions in the project area, including existing traffic control and roadway geometry.



		Project: BAXTE 165756 Print Date: 11/29/2022	EXISTING ROADWAY CONDITIONS CSAH 48 CORRIDOR STUDY Baxter, MN	Figure 2
		Map by: jdanibas Projection: Crow Wing Co. Coords. Source: ESRI		

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

2.1 Crash History

Five years of crash data along CSAH 48, from January 1, 2017 through December 31, 2021, was analyzed using MnDOT's crash mapping application (MnCMAT2). The type and severity of crashes were reviewed, and crash rates were calculated for each intersection along CSAH 48 between Isle Drive and College Road. Crash information for each study intersection is summarized in **Table 1**. A total of 28 crashes have occurred at intersections along CSAH 48 during the past 5 years. An additional 3 crashes occurred along CSAH 48 that are not attributed to any intersection and occurred along the segments of CSAH 48 between intersections.

The crash rate at each intersection is expressed as a number of crashes per million entering vehicles (MEV). The critical crash rate is a statistical value that is unique to each intersection and is based on vehicular exposure and the statewide average crash rate for similar intersections. An intersection with a crash rate higher than the critical rate can indicate a safety concern at the intersection and the site should be reviewed.

Crash severity is separated into five categories based on injuries sustained during the crash.

- Fatal – Crash that results in a death.
- Severity A – Crash that results in an incapacitating injury or serious injury.
- Severity B – Crash that results in a non-incapacitating injury or minor injury.
- Severity C – Crash that results in possible injury.
- Property Damage – Crash that results in property damage only; with no injuries.

The following trends were evident from all crashes along CSAH 48 (all 31 crashes):

- 24 of the 28 intersection crashes occurred at the two signalized intersections of CSAH 48/TH 371 and CSAH 48/College Road. No other intersections or segments have had more than 1 crash over the past 5 years.
- 15 of the 31 crashes (48%) were rear end crashes. Only 7 of the rear end crashes occurred along CSAH 48, all at the TH 371 intersection.
- 9 of the 31 crashes (29%) were right angle crashes, 5 of which occurred at the College Road signal.
- 19 of the 31 crashes (61%) occurred between 12 and 3 PM. An additional 10 crashes occurred between 6 and 9 AM. Leaving only 2 crashes occurring outside of those hours.
- 29 of the 31 crashes (94%) occurred between on weekdays (Monday through Friday), with only 2 crashes occurring on Saturday or Sunday.
- 27 of 31 crashes (87%) are coded as daylight hours.
- 18 of 31 crashes (58%) occurred when the roadway was dry.
 - 8 of the crashes (26%) occurred when there was snow/ice on the roadway and 5 (16%) occurred when the roadway was wet.
- There were no pedestrian or bicycle crashes.

Based on the observed crash rates in comparison to the calculated critical rates, none of the intersections have a crash rate that is above the critical rate, indicating that none of the intersections have crash rates that deviate significantly from statewide averages for similar control types.

Table 1 – Intersection Crash History (2017-2021)

CSAH 48 and:	Crash Severity					Crash Rates	
	Fatal & Severity A	Severity B	Severity C	Property Damage	Total	Intersection Rate	Critical Rate
Isle Dr	0	0	0	1	1	0.08	0.76
TH 371**	0	4	1	10	15	0.47	0.70
Forestview Dr	0	0	0	0	0	0.00	0.75
Scenic River Dr	0	0	0	0	0	0.00	0.78
Evergreen Dr	0	1	0	0	1	0.13	0.79
Camwood Trl	0	0	0	0	0	0.00	0.79
Chestnut Dr	0	0	0	0	0	0.00	0.79
Berrywood Dr	0	0	0	0	0	0.00	0.78
Red Pine Cir W	0	0	0	1	1	0.13	0.78
Eagle Dr	0	0	0	0	0	0.00	0.78
Red Pine Cir E	0	0	0	0	0	0.00	0.78
Minnesota Dr (DNR owned)	0	0	0	1	1	0.13	0.78
Carlos Rd	0	0	0	0	0	0.00	0.78
College Rd**	0	2	1	6	9	0.36	0.91
TOTAL	0	7	2	19	28	n/a	n/a
**Signalized Intersections							

As shown in **Table 1**, none of the unsignalized intersections along CSAH 48 had more than one crash over the past 5 years. The following trends are evident at the two signals along CSAH 48.

- **CSAH 48 and TH 371 (traffic signal) – 15 crashes**
 - 10 of the 15 crashes were rear end crashes. 4 of the rear ends involved eastbound vehicles and 1 involved westbound vehicles (3 northbound, 2 southbound).
 - 5 of the 15 crashes occurred when there was snow or ice on the roadway.
- **CSAH 48 and College Road (traffic signal) – 9 crashes**
 - 6 of the 9 crashes were right-angle crashes. 3 of the right-angle crashes involved vehicles disregarding the traffic signal or being unable to stop due to the weather. The other 3 involved left turning vehicles failing to yield to through vehicles.
 - 2 of the 9 crashes were rear end crashes involving westbound vehicles on College Road.

2.2 Existing Traffic Volumes

24-hour intersection turning movement counts were collected in February 2022 at all eleven existing study intersections. The AM peak hour was determined to be 7:15 to 8:15 AM and the PM peak hour was determined to be 4:15 to 5:15 PM.

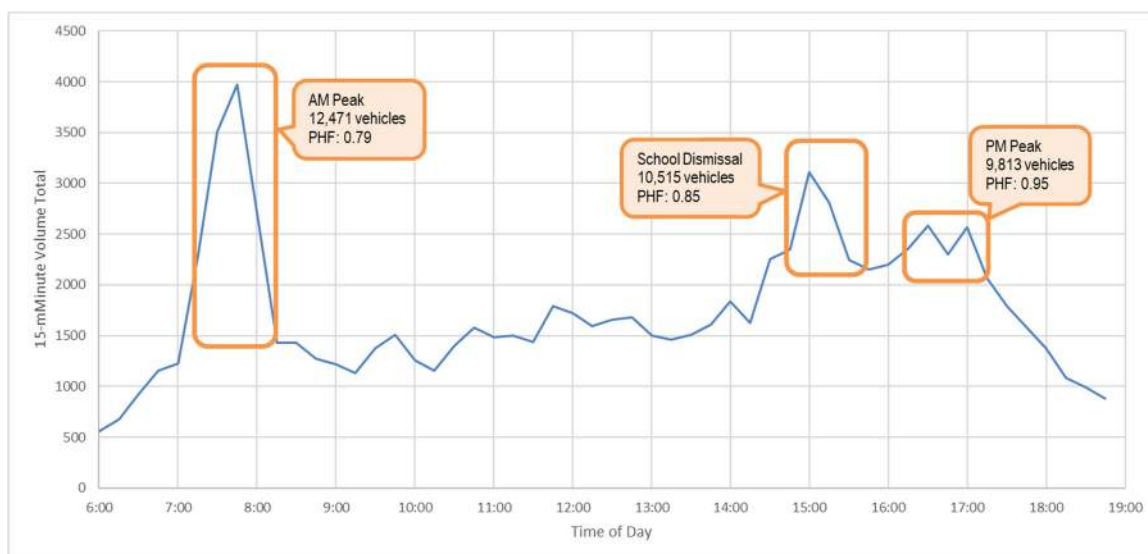
Passenger vehicles, heavy vehicles, pedestrians, and bicyclists were all counted. The intersection daily volumes show around 5% heavy vehicles on CSAH 48.

In addition to the traditional AM and PM peak hours, there is also a school dismissal peak hour (2:45 to 3:45) along CSAH 48 as the roadway is used as a primary route to access the schools east and west of the study area including Central Lakes College, Brainerd High School, Forestview Middle School, and Baxter Elementary School. While the AM peak hour has the highest 15-minute traffic demands of the day, the school dismissal has the highest 15-minute peak hour traffic demands in the afternoon and have hourly volumes that are currently higher than the PM peak hour. Therefore, the school dismissal peak hour was also analyzed as part of this study.

Currently, the AM peak hour has the highest hourly and 15-minute peak hour volumes along the roadway, most likely due to the school arrival peak period coinciding with the regular AM peak hour of the roadway. The large 15-minute peak traffic demands during the AM and school dismissal peak hour result in low peak hour factors (PHF) of 0.79 and 0.85 compared to the PM peak hour, which has a PHF of 0.95. The PHF is a measure of traffic demand fluctuations within the peak hour, it is calculated by the hourly volume during the peak hour divided by the peak 15-minute traffic volume multiplied by four (Hourly Volume / [Peak 15-min x 4]).

Figure 3 represents the summation of all traffic data collected at the eleven study intersections represented as a line graph by time of day; this is the total 15-minute demands for all intersections.

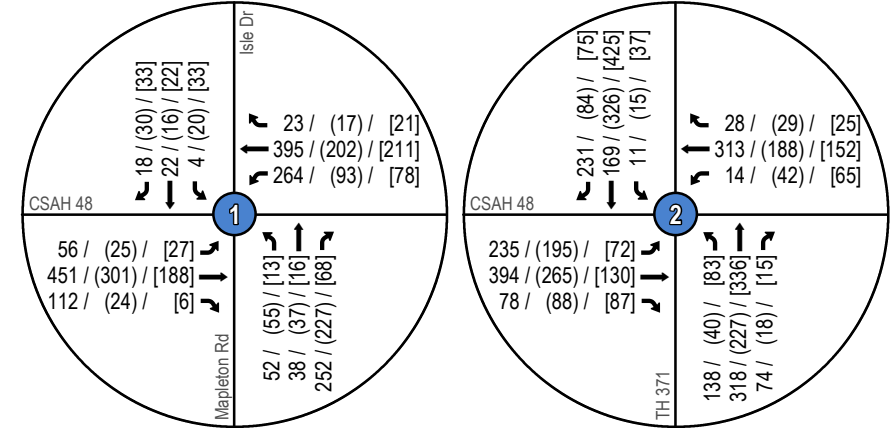
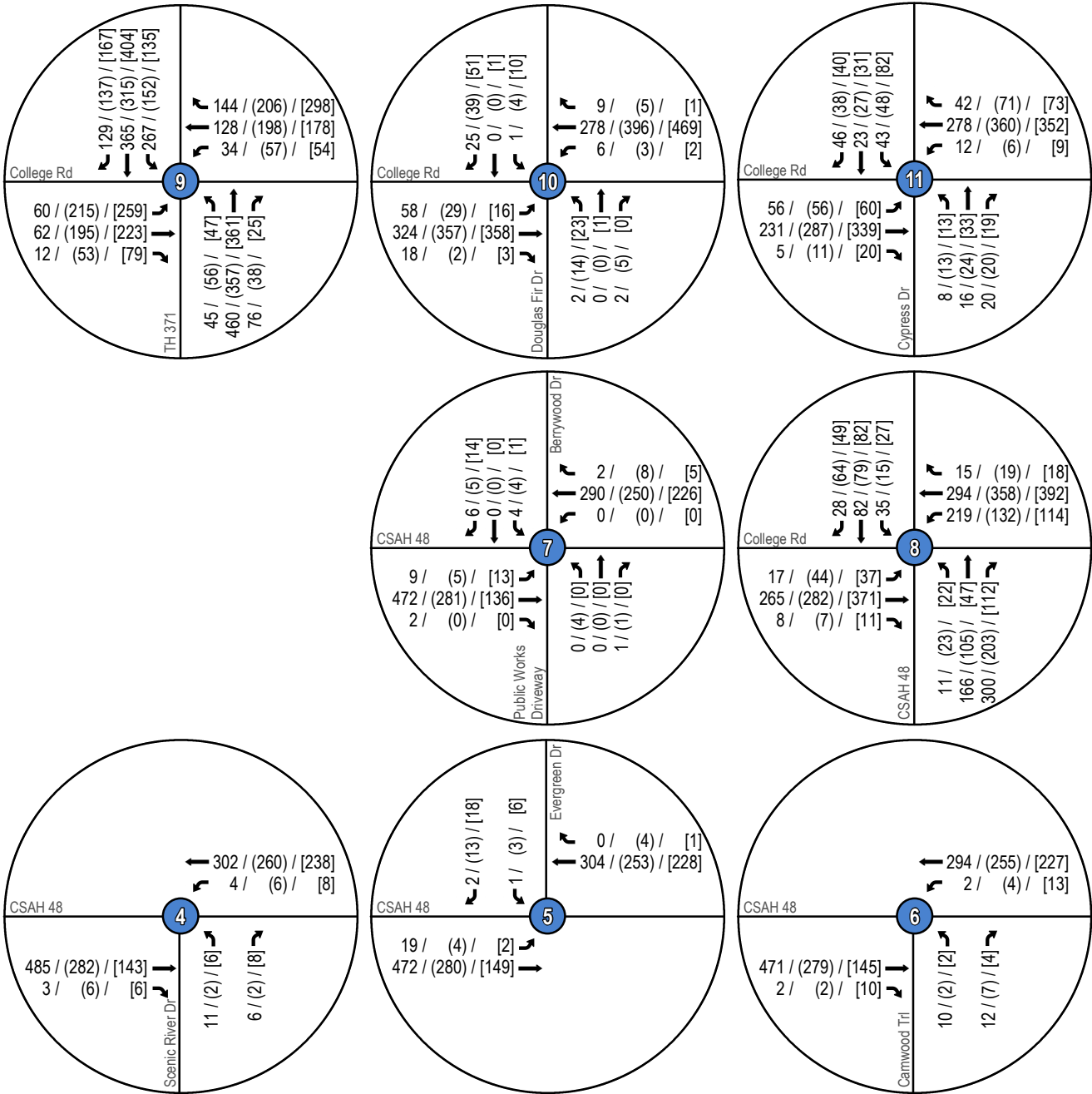
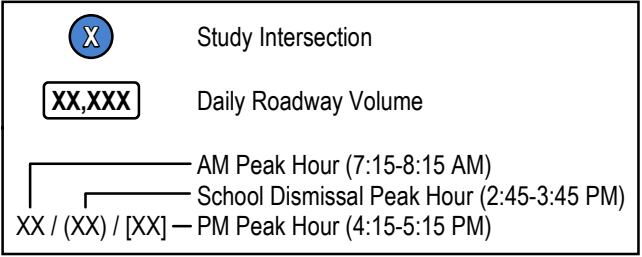
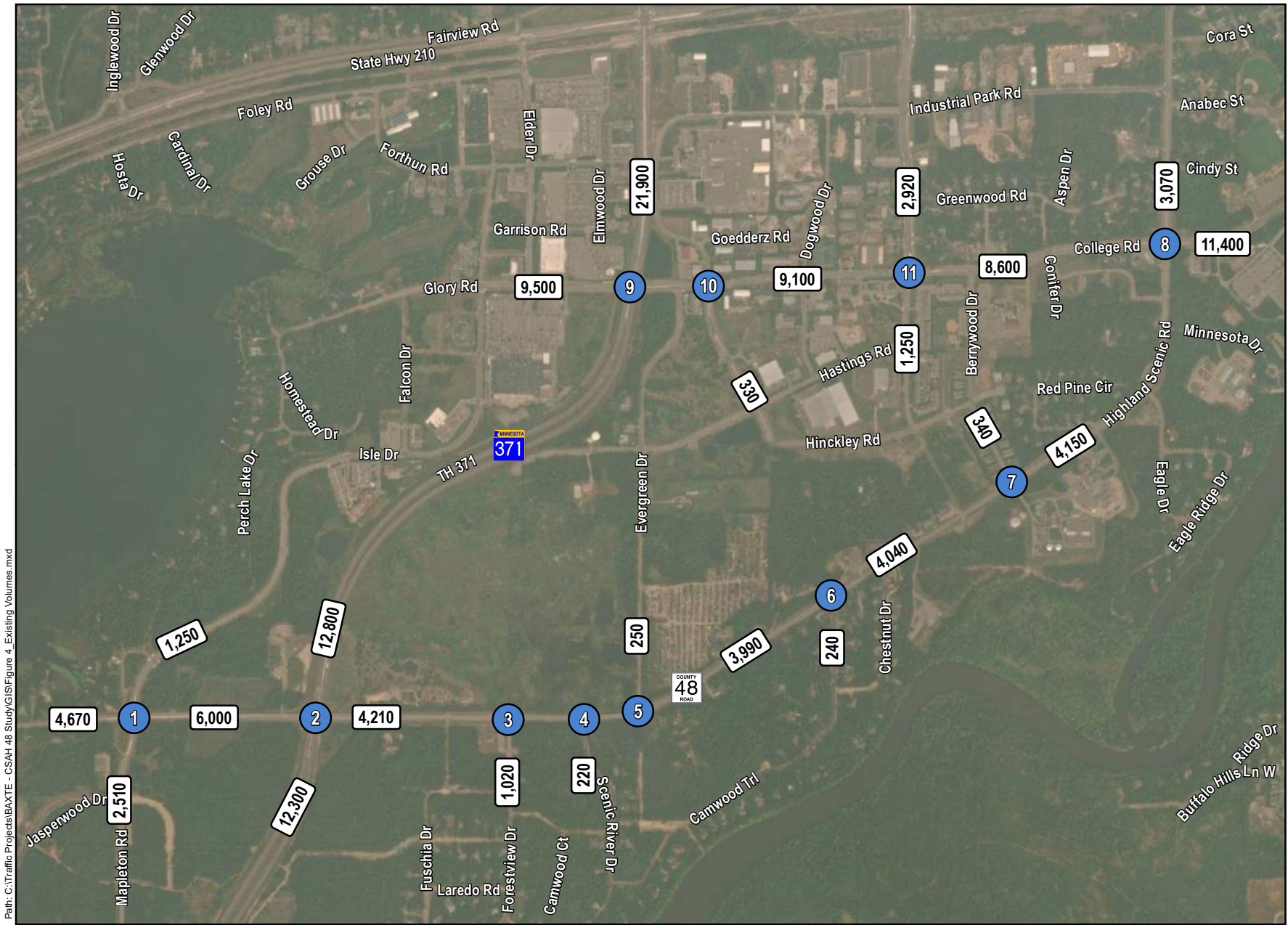
Figure 3 – 2022 Existing Daily Volume Distribution



The February 2022 turning movement counts were compared to recent traffic counts in the area and the historical Average Annual Daily Traffic (AADT) information for the study roadways were determined to be slightly lower than typical volumes. Therefore, the February 2022 traffic volumes were adjusted by approximately 15% to account for seasonal fluctuations in traffic demands. The raw February 2022 traffic counts can be found in **Appendix A**.

The adjusted 2022 existing vehicle turning movement volumes for the AM, school dismissal, and PM peak hour for each study intersection are shown in **Figure 4**, as well as the daily roadway volumes.

Path: C:\Traffic Projects\BAXTE - CSAH 48 Study\GIS\Figure 4 Existing Volumes.mxd



Project: BAXTE 165756
Print Date: 11/29/2022

User Name: jdanibas
Projection: Crow Wing County Coords.
Source: ESRI

2022 EXISTING TRAFFIC VOLUMES

CSAH 48 CORRIDOR STUDY

Baxter, MN

Figure
4

3 Future Conditions

This study focuses on determining the roadway and intersection improvements necessary to provide acceptable traffic operations along CSAH 48 as development continues. There are currently several undeveloped areas along CSAH 48 as well as several areas that could be redeveloped over the next 20+ years. As previously mentioned, there are also several planned roadway connections to CSAH 48 that will be constructed as development of the area continues.

3.1 Future Roadway Connections

There are three roadway connections to CSAH 48 that were previously planned in the *2015 Baxter Comprehensive Plan*.

The first of the roadway connections is Cypress Drive, which will be connected to CSAH 48 in 2023, creating a new intersection along CSAH 48. Upon completion of the Cypress Drive extension to CSAH 48, Cypress Drive will serve as a parallel reliever route to TH 371, with the purpose of increasing traffic routing options and efficiency in Baxter by offering a route on the east side of TH 371 that would be preferred by local traffic over TH 371. This intersection is planned to be a single lane roundabout for safety, speed control, and improved efficiency for vehicles using Cypress Drive as a parallel reliever roadway.

Upon completion of the Cypress Drive extension, some traffic will shift to Cypress Drive to use it as a parallel reliever roadway. When Cypress Drive was extended north to TH 210 in 2019, the traffic volume increased by approximately 1,500 vehicles per day (vpd) based on the most recent daily traffic counts. For the 2045 forecast volumes along CSAH 48, it was assumed that approximately 1,000 vpd will reroute to Cypress Drive along CSAH 48 to use it as a parallel reliever roadway.

The other two roadway connections are the extension of Hastings Road and Douglas Fir Drive to CSAH 48. These roadway extensions will both be development driven and will be completed to provide access to development along the north side CSAH 48. The Hastings Road extension will connect with CSAH 48 across from Forestview Drive and the Douglas Fir Drive extension will connect across from Camwood Trail.

In addition to the roadway connections, a development access is planned on the north side of CSAH 48 approximately 1/8 mile west of Forestview Drive to provide access to a future commercial development. The access is proposed to be a ¾ access due to the proximity to the existing TH 371 signal and the footprint of the possible future interchange at TH 371.

For all 2045 future analysis, the Cypress Drive, Hastings Road, Douglas Fir Drive, and ¾ access development connections were all included.

A ¾ access is planned to on the south side of CSAH 48 between TH 371 and Forestview Drive, just east of the planned development access. In the short term, the access will be used, in conjunction with a new frontage road, to provide access to the Lake Area Christian Church. As the area on the south side of CSAH 48 continues to develop, the access could connect to Fuschia Drive to provide another access to the future residential development. This ¾ access point was not included in this study and the traffic operations analysis because it will initially only provide access to the church and a future connection to Fuschia Drive would only improve traffic operations for vehicles accessing the residential development on the south side of CSAH 48, without changing the recommended roadway improvements.

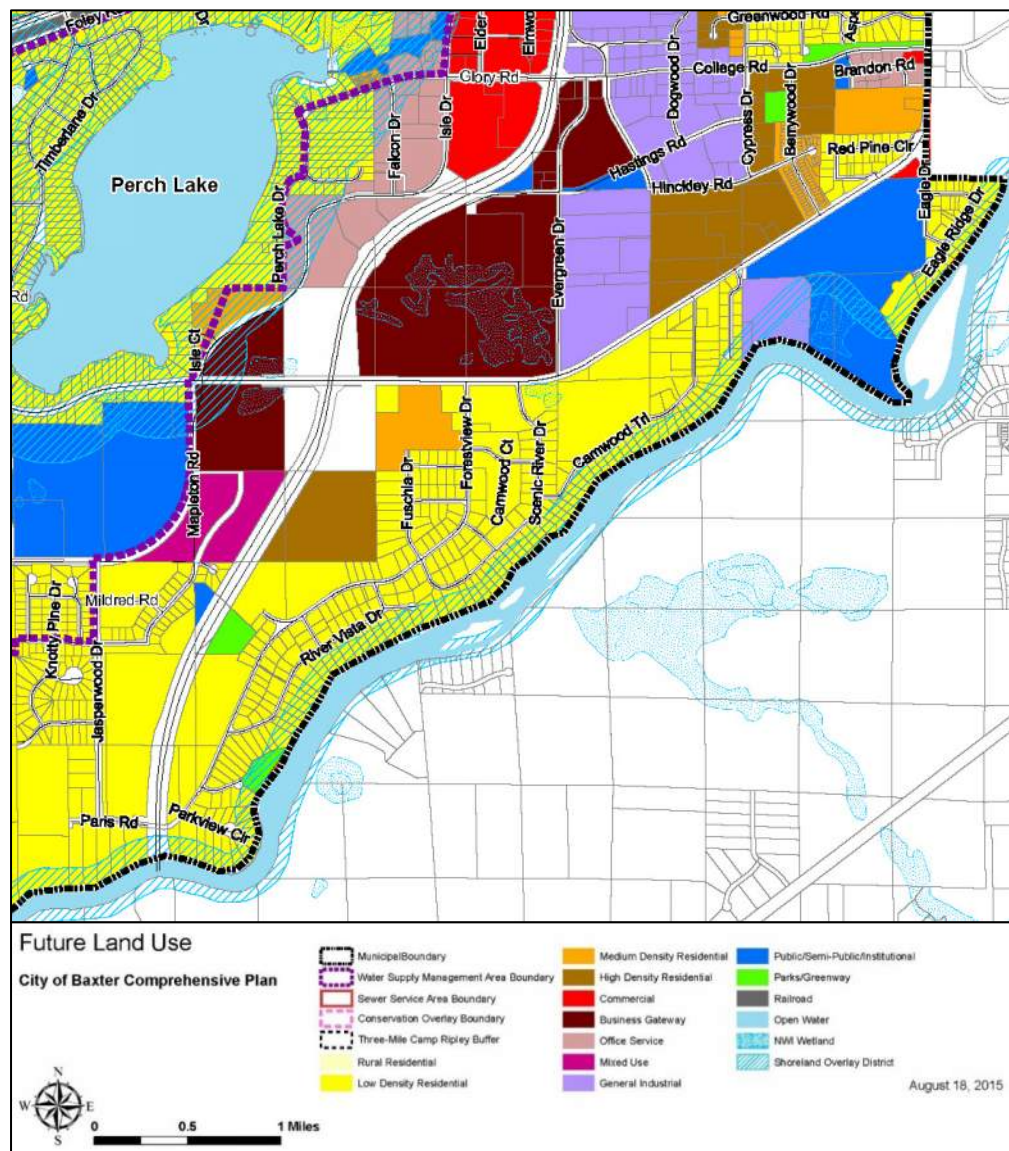
3.2 Background Growth

To forecast background traffic growth through 2045 along the project roadways, historical AADTs from MnDOT's Traffic Mapping Application were reviewed. Based on the historical traffic volumes, TH 371 has been growing at a rate of approximately 1.5% per year and the majority of the other study area roadways have been decreasing or had minimal growth. Therefore, the existing TH 371 through volumes were grown at a rate of 1.5% per year and the remaining study roadways were grown at a minimal 0.5% per year.

3.3 Development Trip Generation Estimates

Based on the *City of Baxter Comprehensive Plan*, the areas adjacent to CSAH 48 are expected to have a significant amount of development/redevelopment over the next 20+ years. **Figure 5** shows the future land use plan for the project area from the *City of Baxter Comprehensive Plan*.

Figure 5 – Future Land Use Plan from the City of Baxter Comprehensive Plan



The Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition was used to estimate the trips generated by the future developments in the area for the 2045 future conditions. Several potential development plans within the area were also used to aid in projecting future traffic demands in the area. Trip generation estimates were completed for the AM peak hour, school dismissal peak hour, and PM peak hour. Daily trip generation estimates were also completed and distributed over 24 hours using ITE's daily trip distribution information for each land use type for use in future traffic control warrant analysis along CSAH 48.

Figure 6 shows the sixteen development areas used to estimate future traffic demands along CSAH 48 as well as the general land use sizes and total daily trips generated by each area. In total, the following total development quantity was assumed in the project area for the 2045 future traffic demands.

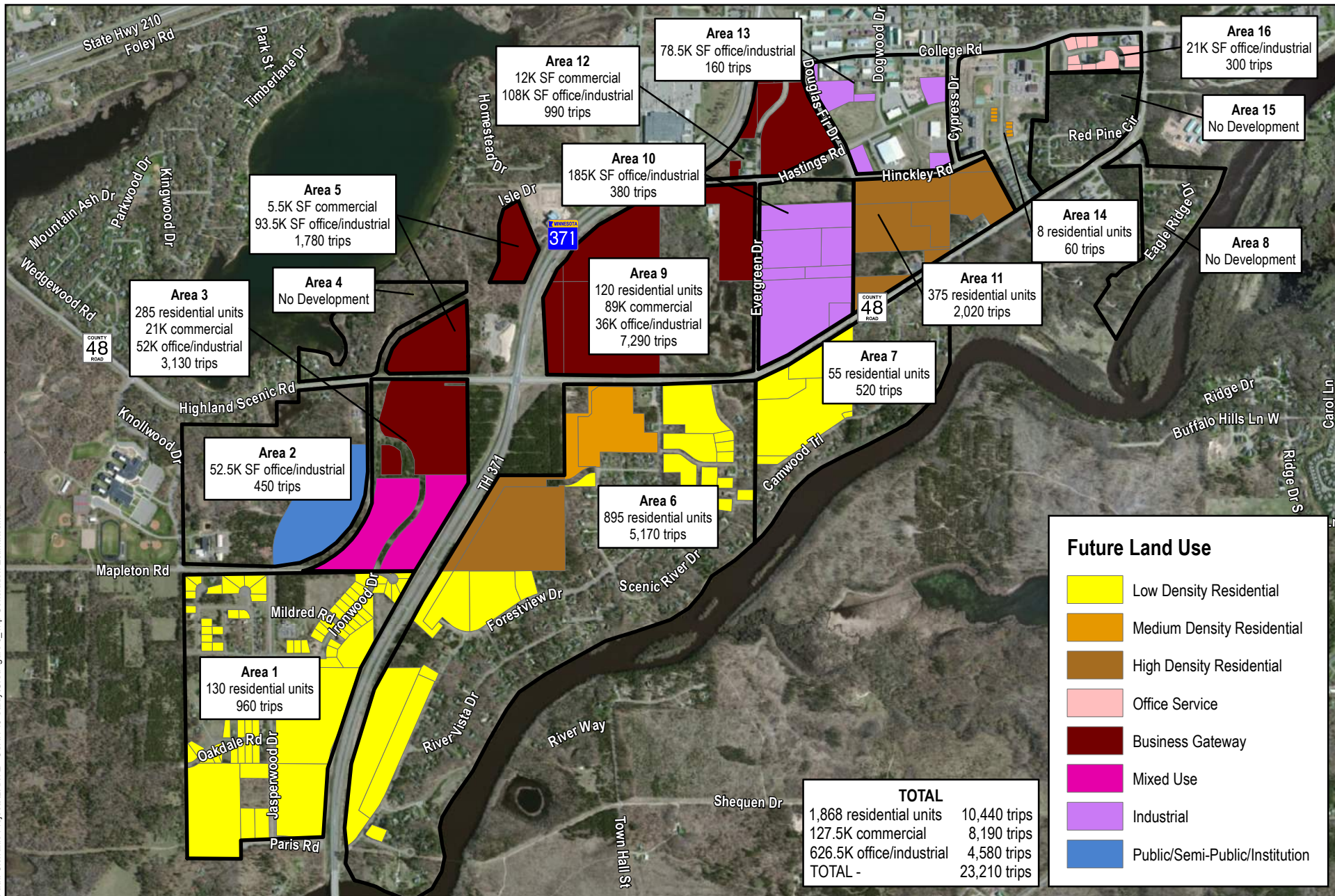
- | | |
|---|---------------------------|
| • 1,868 residential units – | 10,440 daily trips |
| • 127,500 square feet commercial development – | 8,190 daily trips |
| • 626,500 square feet office/industrial development – | 4,580 daily trips |
| • Total Trips – | 23,210 daily trips |

The estimated trips generated by the development were distributed to the project area roadway network based on existing traffic demands and potential origins/destinations for future trips both regionally and within the Baxter/Brainerd area.

The following trip distribution used to distribute trips to the roadway network to forecast 2045 traffic demands along each roadway and at each study intersection.

- | | |
|------------------------------------|------------|
| • To/from north on TH 371 – | 35% |
| • To/from south on TH 371 – | 15% |
| • To/from west on CSAH 48 – | 10% |
| • To/from north on CSAH 48 – | 5% |
| • To/from south on Mapleton Rd – | 5% |
| • To/from west on Glory Rd – | 10% |
| • To/from north on Cypress Drive – | 10% |
| • To/from east on W College Dr – | 15% |

Figure 7 shows the trip distribution for the new trips and compares the daily roadway volumes for 2022 existing and 2045 forecast within the study area. The 2045 forecast traffic demands for the AM, school dismissal, and PM peak hour at each study intersection are shown in **Figure 8**, as well as the daily roadway volumes.



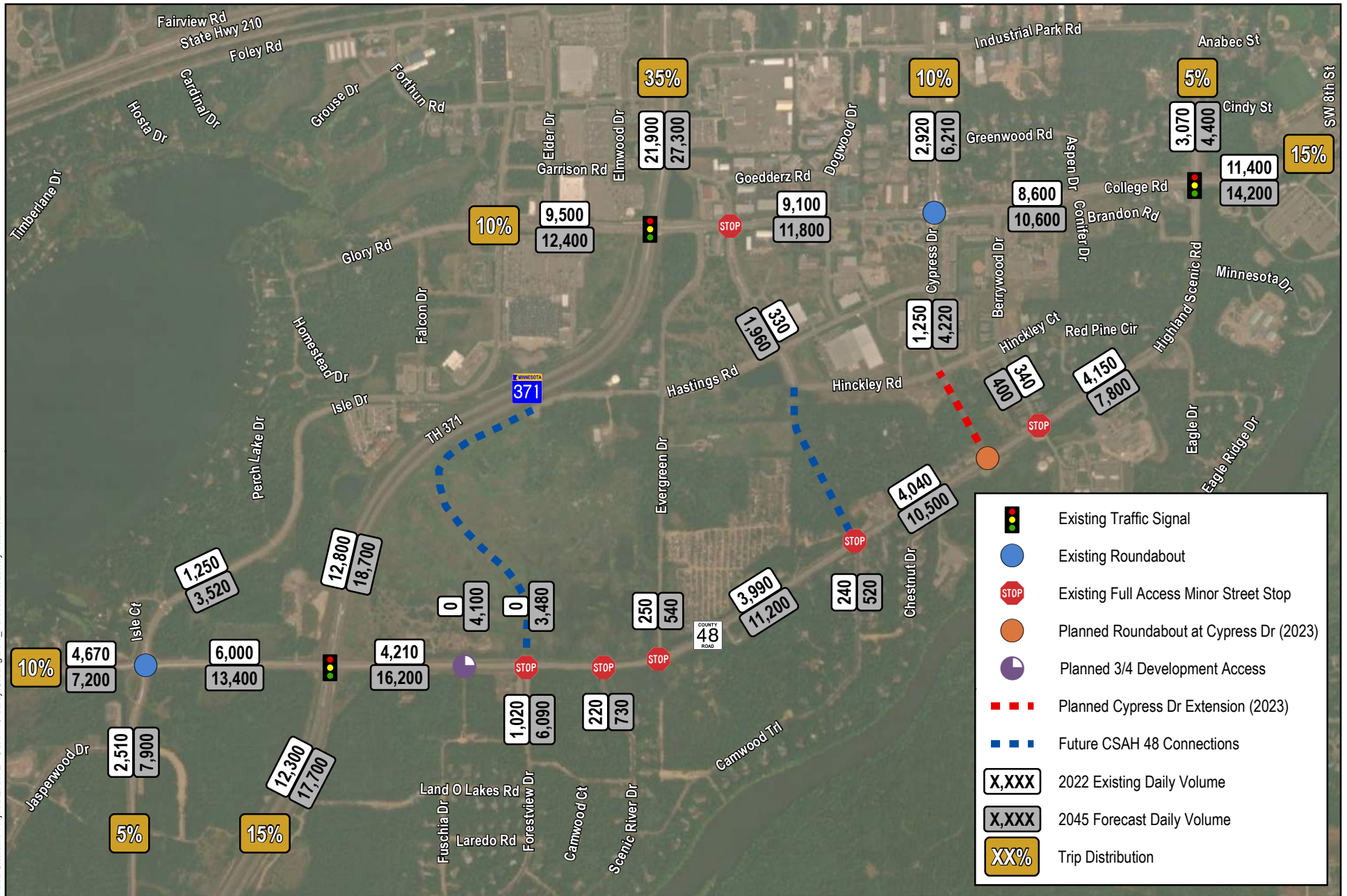
2045 TRIP GENERATION ESTIMATES
CSAH 48 CORRIDOR STUDY
Baxter, MN

Figure
6



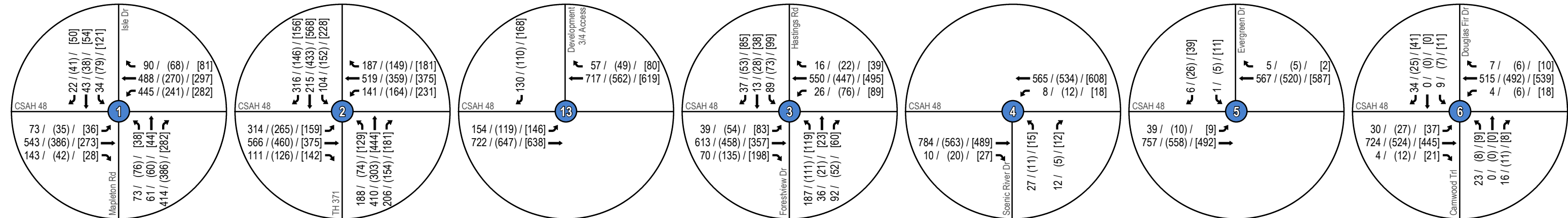
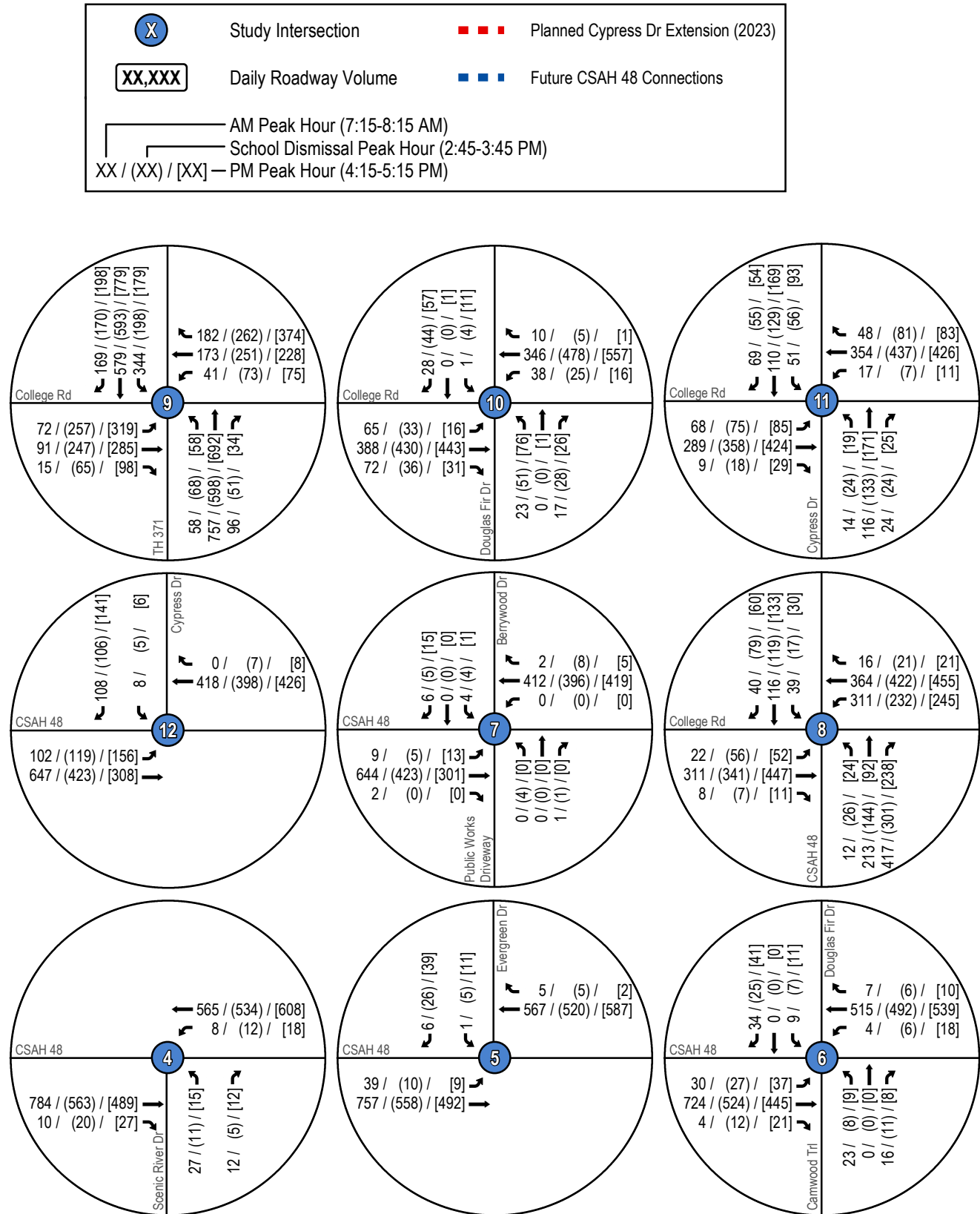
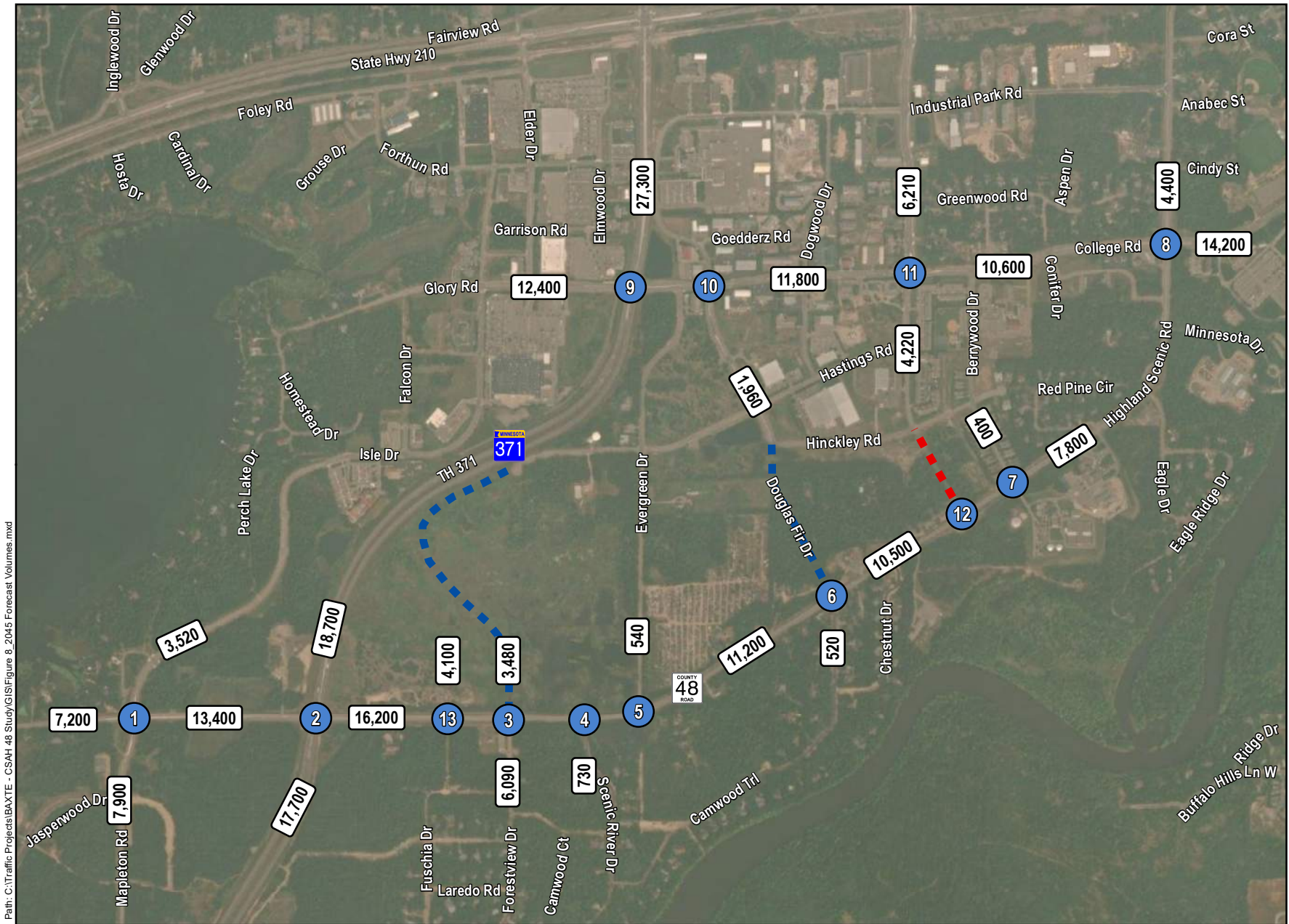
Project: BAXTE 165756
Print Date: 11/29/2022

Map by: jdanibas
Projection: Crow Wing Co. Coords.
Source: ESRI



This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

Path: C:\Traffic Projects\BAXTE - CSAH 48 Study\GIS\Figure 8 2045 Forecast Volumes.mxd





Project: BAXTE 165756
Print Date: 11/29/2022

User Name: jdanibas
Projection: Crow Wing County Coords.
Source: ESRI

2045 FORECAST TRAFFIC VOLUMES

CSAH 48 CORRIDOR STUDY

Baxter, MN

Figure 8

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

4 Intersection Warrant Analysis

The Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD) provides guidance on when it may be appropriate to use all-way stop or signal control at an intersection. This guidance is provided in the form of “warrants”, or criteria, and engineering analysis of the intersection’s design factors to determine when all-way stop or signal control may be justified. Meeting a control warrant at an intersection does not in itself require the installation of a particular control type. The particular control type also requires an engineering analysis of the intersection’s design in order for it to be justified. A roundabout is considered to be warranted if traffic volumes meet the criteria for either all-way stop or traffic signal control.

Warrant analysis was completed for the major intersections within the project area that are not currently traffic signal or roundabout controlled. All of the existing traffic signals and roundabouts are expected to remain in place. Therefore, warrant analysis for the existing and 2045 future conditions was completed for the following intersections:

- CSAH 48 and Forestview Drive (including the future Hastings Road connection).
- CSAH 48 and Evergreen Drive.
- CSAH 48 and Camwood Trail (including the future Douglas Fir Drive connection).
- CSAH 48 and Cypress Drive (2045 only).
- College Road and Douglas Fir Drive.

4.1 Requirements for Installation of a Traffic Signal

For traffic signal installation, MnDOT typically requires volume thresholds for Warrant 1 to be satisfied, which requires 8-hours of combined major approach volumes and the highest minor street approach volume to meet MnMUTCD thresholds. These thresholds vary with the number of approach lanes on the major and minor street. Other warrants may be used as indicators of a need to consider traffic control change; an engineering study that considers factors, including warrants, should be performed to determine the optimum type of control at an intersection. Warrant 2 (four hour) and Warrant 3 (peak hour) were also included in the analysis for the study intersections.

4.2 Camwood Trail/Evergreen Drive Considerations

Based on the discussions with the City, Evergreen Drive may be closed at CSAH 48 as the area develops due to its connection to CSAH 48 on a curve in the roadway. To analyze the changes if Evergreen Drive were to be closed, warrant analysis was completed with the Evergreen Drive traffic shifted to the Camwood Trail/Douglas Fir Drive intersection.

4.3 Warrant Analysis Assumptions

MnDOT guidelines suggest that for the purpose of warrant analysis, 100% of right turning traffic from the minor leg should be removed because right turning vehicles are typically able to enter the traffic stream with minimal delay or conflict; the right turning traffic would not require a traffic signal to reduce delay or improve safety. In certain circumstances (i.e. high right turn volume, minimum mainline gaps, etc.), MnDOT procedures allow for the inclusion of 50% of the minor street right turning traffic in the analysis. The MnDOT guidance states “if right turning volume exceeds 70% of its potential capacity for any hour for each approach, 50% of the right turning volume for all hours should be added back in.”

- Based upon MnDOT guidance, the analysis of each intersection includes removal of 100% of the right turning traffic on the minor approaches.

MnDOT guidelines suggest that the warrant thresholds may also be reduced based on the roadway speeds and population of the city the intersection is within. If either major approach to the intersection has a posted speed, or 85th percentile speed, that exceeds 40 mph, then a reduction to 70% threshold volumes is allowed. If the population of the city is less than 10,000 people, a reduction to 70% threshold volumes is allowed.

- Based upon MnDOT guidance, the analysis of the CSAH 48 intersections includes the reduction based on speed as CSAH 48 has a posted speed limit of 55 mph between TH 371 and Eagle Drive
- Based upon MnDOT guidance, the analysis of the intersection of College Road at Douglas Fir Drive includes the reduction based on speed because the speed limit on College Road is 40 mph, and it can be reasonably assumed that the 85th percentile speed is at least 41 mph.

4.4 Warrant Analysis Results

Based on the existing traffic volumes, all of the existing minor stop-controlled intersections do not meet the all-way stop warrant or any traffic signal warrant and should retain their existing minor street stop intersection control.

Based on the 2045 future volumes, the intersection of CSAH 48 and Forestview Drive meets the all-way stop warrant and traffic signal warrants 1, 2, and 3, indicating that a traffic control change will likely be necessary at the intersection to serve the increased traffic as development continues.

Based on the 2045 future volumes, the below intersections do not meet the all-way stop warrant or any signal warrant.

- CSAH 48 and Evergreen Drive.
- CSAH 48 and Camwood Trail.
- CSAH 48 and Camwood Trail (with Evergreen closed).
- CSAH 48 and Cypress Drive.
- College Road and Douglas Fir Drive.

Based on input from the project team, a roundabout at the intersection of CSAH 48 and Cypress Drive will still be considered, despite not meeting traffic control warrants as it has other benefits for both the CSAH 48 and Cypress Drive corridors such as traffic calming (speed reduction), safety, and improved efficiency for vehicles using Cypress Drive as a parallel reliever roadway.

Table 2 provides the all-way stop and traffic signal warrant summary for the 2022 existing and 2045 future volume conditions. Complete all-way stop and traffic signal analysis can be found in **Appendix B**.

Table 2 – Warrant Analysis Results

Scenario	Intersection	All-way Stop Warrant	Traffic Signal Warrants		
			Warrant 1 (8 Hour)	Warrant 2 (4 hour)	Warrant 3 (Peak Hour)
2022 Existing	CSAH 48 and Forestview Dr	Not Met	Not Met	Not Met	Not Met
		0 of 8 hours	1 of 8 hours	0 of 4 hours	0 of 4 hours
	CSAH 48 and Evergreen Dr	Not Met	Not Met	Not Met	Not Met
		0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 4 hours
	CSAH 48 and Camwood Trl	Not Met	Not Met	Not Met	Not Met
		0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 4 hours
	College Rd and Douglas Fir Dr	Not Met	Not Met	Not Met	Not Met
		0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 4 hours
2045 Future	CSAH 48 and Forestview Dr	MET	MET	MET	MET
		16 of 8 hours	12 of 8 hours	8 of 4 hours	5 of 1 hours
	CSAH 48 and Evergreen Dr	Not Met	Not Met	Not Met	Not Met
		0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 4 hours
	CSAH 48 and Camwood Trl	Not Met	Not Met	Not Met	Not Met
		0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 4 hours
	Camwood Trl (Evergreen Closed)	Not Met	Not Met	Not Met	Not Met
		0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 4 hours
	CSAH 48 and Cypress Dr	Not Met	Not Met	Not Met	Not Met
		1 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 4 hours
	College Rd and Douglas Fir Dr	Not Met	Not Met	Not Met	Not Met
		1 of 8 hours	1 of 8 hours	0 of 4 hours	0 of 4 hours

5 Traffic Operations Analysis

Traffic operations analysis was conducted to determine the level of service (LOS), delay, and queueing information for the AM, school dismissal, and PM peak hour conditions.

The following scenarios were analyzed as part of this study:

- **2022 Existing Conditions**
 - Existing traffic volumes, intersection geometry, and traffic control.
- **2045 No Build Conditions**
 - 2045 forecast traffic volumes.
 - No geometric or traffic control changes.
- **2045 Build Conditions**
 - 2045 forecast traffic volumes.
 - Recommended build geometrics and traffic control to provide acceptable traffic operations.
- **2045 Build Conditions (Evergreen Closed)**
 - 2045 forecast traffic volumes.
 - Evergreen Drive access to CSAH 48 closed; Evergreen Drive traffic moved to the Camwood Trail intersection.
 - Recommended build geometrics and traffic control to provide acceptable traffic operations.

LOS is a qualitative rating system used to describe the efficiency of traffic operations at an intersection. Six LOS are defined, designated by letters A through F. LOS A represents the best operating conditions (no congestion), and LOS F represents the worst operating conditions (severe congestion). For the study intersection it was assumed that a LOS D or better, for all approaches and the overall intersection, represent acceptable operating conditions. Some approaches may operate at LOS E and some movements may operate at LOS F at the TH 371 signals due to the long cycle length.

LOS for intersections is determined by the average control delay per vehicle. The range of control delay for each LOS is different for signalized and unsignalized intersections. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will experience greater delays than an unsignalized intersection. Driver tolerance for delay is greater at a signal than at a stop sign; therefore, the LOS thresholds for each LOS category are lower for unsignalized intersections than for signalized intersections. **Table 3** shows the LOS thresholds for signalized and unsignalized intersections.

Table 3 – Level of Service Thresholds

Level of Service	Average Vehicle Delay (sec/veh)	
	Signalized Intersection	Unsignalized (Stop or Roundabout) Intersection
A	0 to 10	0 to 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

All traffic operations analyses for signalized and stop controlled intersections were performed using the Synchro/SimTraffic (Version 11) software package. The results reported in this analysis are an average of 10 runs in SimTraffic 11. All roundabout operations analysis was performed using the HCS 2022 software. The HCS software utilizes the equations and calculations from the Highway Capacity Manual.

For all new major access points/roadway connections along CSAH 48 for the 2045 future scenarios, dedicated left and right turn lanes are expected to be provided at a minimum, unless the intersection is roundabout controlled.

The summary traffic operations analysis tables in the following sections do not include the three intersections outside of CSAH 48, as no geometric or traffic control changes are required under the existing or 2045 conditions. Each of these intersections operate acceptably under 2022 existing conditions and all 2045 future scenarios. Full operational analysis result tables and reports for all intersections can be found in **Appendix C**.

5.1 2022 Existing Conditions

Under the existing conditions, each intersection has adequate capacity to handle the existing traffic demands with each intersection operating at LOS C or better during the AM and PM peak hours. There are some longer delays and queues at the intersections of CSAH 48/Isle Drive and CSAH 48/TH 371 during the 15-20 minute school arrival and dismissal peaks.

Table 4 represents that AM, school dismissal, and PM peak hour traffic operations under the 2022 existing conditions. The three College Road intersections west of CSAH 48 are not included in the table; each intersection operates acceptably under 2022 existing conditions and the operations analysis results for these intersections can be found in **Appendix C**.

Table 4 – 2022 Existing Traffic Operations

Intersection	Approach	AM Peak Hour		School Dismissal Peak Hour		PM Peak Hour	
		Approach (delay / LOS)	Intersection (delay / LOS)	Approach (delay / LOS)	Intersection (delay / LOS)	Approach (delay / LOS)	Intersection (delay / LOS)
CSAH 48 and Isle Dr (Roundabout) ¹	EB	13.8 / B	14.4 / B	6.7 / A	7.1 / A	4.8 / A	4.6 / A
	WB	17.0 / C		6.1 / A		4.9 / A	
	NB	11.3 / B		9.0 / A		4.0 / A	
	SB	6.9 / A		4.5 / A		4.0 / A	
CSAH 48 and TH 371 (Traffic Signal)	EB	30.5 / C	31.6 / C	20.3 / C	21.7 / C	20.4 / C	21.1 / C
	WB	50.3 / D		27.3 / C		27.1 / C	
	NB	25.9 / C		21.2 / C		18.4 / B	
	SB	24.7 / C		20.4 / C		21.0 / C	
CSAH 48 and Forestview Dr (Minor Stop)	EB	7.4 / A	5.5 / A	7.7 / A	4.6 / A	4.8 / A	2.6 / A
	WB	1.0 / A		0.8 / A		0.7 / A	
	NB	11.0 / B		6.5 / A		4.7 / A	
CSAH 48 and Scenic River Dr (Minor stop)	EB	1.0 / A	1.2 / A	0.9 / A	0.8 / A	0.4 / A	0.6 / A
	WB	0.9 / A		0.7 / A		0.6 / A	
	NB	11.5 / B		4.0 / A		4.3 / A	
CSAH 48 and Evergreen Dr (Minor Stop)	EB	0.7 / A	1.1 / A	0.6 / A	1.1 / A	0.3 / A	1.1 / A
	WB	1.6 / A		1.4 / A		1.3 / A	
	SB	6.7 / A		4.3 / A		3.2 / A	
CSAH 48 and Camwood Trl (Minor Stop)	EB	2.4 / A	2.2 / A	2.2 / A	1.7 / A	0.9 / A	1.0 / A
	WB	1.4 / A		1.0 / A		1.0 / A	
	NB	7.7 / A		3.9 / A		3.7 / A	
CSAH 48 and Berrywood Dr (Minor Stop)	EB	3.3 / A	2.5 / A	2.4 / A	1.7 / A	1.3 / A	1.1 / A
	WB	1.1 / A		0.8 / A		0.8 / A	
	NB	4.0 / A		6.0 / A		0.0 / A	
	SB	6.9 / A		4.3 / A		3.1 / A	
CSAH 48 and College Rd (Traffic Signal)	EB	17.9 / B	15.4 / B	14.8 / B	12.9 / B	12.1 / B	11.8 / B
	WB	16.8 / B		13.5 / B		11.4 / B	
	NB	12.6 / B		10.4 / B		9.6 / A	
	SB	14.4 / B		12.8 / B		15.1 / B	
1 Roundabout traffic operations analyses were completed using HCS 2022 software							

5.2 2045 No Build Conditions

With significant development expected in the study area by 2045, the increased traffic volumes create delay and queuing issues at several intersections. The 2045 No Build delay and queuing issues during the AM, school dismissal, and PM peak hours are summarized below:

AM Peak Hour

- The eastbound and westbound approaches to the existing roundabout at the intersection of CSAH 48 and Isle Drive operate at LOS E.
- The eastbound and westbound approaches to the existing traffic signal at the intersection of CSAH 48 and TH 371 operate at LOS F.
 - The eastbound maximum queue extends approximately 1,425 feet, which almost reaches the Isle Drive roundabout.
 - The westbound maximum queue extends beyond Forestview Drive, creating operational issues at the proposed development $\frac{3}{4}$ access and Forestview Drive.
- The southbound and westbound approaches to the intersection of CSAH 48 and the development $\frac{3}{4}$ access operate at LOS F and LOS E, respectively; these delay issues are due to the queued vehicles from the CSAH 48 and TH 371 signal.
- The northbound and southbound approaches to the minor stop-controlled intersection of CSAH 48 and Forestview Drive operate at LOS F.

School Dismissal Peak Hour

- The eastbound and westbound approaches to the traffic signal at the intersection of CSAH 48 and TH 371 operate at LOS F and LOS E, respectively.
 - The eastbound maximum queue extends approximately 1,425 feet, which almost reaches the Isle Drive roundabout.
- The northbound and southbound approaches to the minor stop-controlled intersection of CSAH 48 and Forestview Drive operate at LOS F and LOS E, respectively.

PM Peak Hour

- The northbound and southbound approaches to the minor stop-controlled intersection of CSAH 48 and Forestview Drive operate at LOS F.

Table 5 represents that AM, school dismissal, and PM peak hour traffic operations under the 2045 No Build conditions. The three College Road intersections west of CSAH 48 are not included in the table; each intersection operates acceptably under 2045 No Build conditions and the operations analysis results for these intersections can be found in **Appendix C**.

Table 5 – 2045 No Build Traffic Operations

Intersection	Approach	AM Peak Hour		School Dismissal Peak Hour		PM Peak Hour	
		Approach (delay / LOS)	Intersection (delay / LOS)	Approach (delay / LOS)	Intersection (delay / LOS)	Approach (delay / LOS)	Intersection (delay / LOS)
CSAH 48 and Isle Dr (Roundabout) ¹	EB	44.3 / E	39.1 / E	11.8 / B	12.4 / B	8.8 / A	8.1 / A
	WB	46.3 / E		9.5 / A		8.2 / A	
	NB	24.1 / C		17.7 / C		7.6 / A	
	SB	10.4 / B		7.2 / A		7.7 / A	
CSAH 48 and TH 371 (Traffic Signal)	EB	99.0 / F	83.6 / F	99.1 / F	60.6 / E	47.5 / D	46.6 / D
	WB	136.2 / F		55.6 / E		45.7 / D	
	NB	51.9 / D		39.2 / D		45.4 / D	
	SB	41.9 / D		35.0 / D		47.7 / D	
CSAH 48 and Development (3/4 Access)	EB	7.0 / A	31.0 / D	8.3 / A	5.6 / A	5.0 / A	3.8 / A
	WB	35.7 / E		2.1 / A		1.2 / A	
	SB	182.4 / F		6.7 / A		8.4 / A	
CSAH 48 and Forestview Dr (Minor Stop)	EB	2.1 / A	88.8 / F	1.7 / A	21.0 / C	2.1 / A	47.6 / E
	WB	20.2 / C		2.6 / A		3.7 / A	
	NB	820.2 / F		131.3 / F		301.5 / F	
	SB	94.2 / F		42.2 / E		102.3 / F	
CSAH 48 and Scenic River Dr (Minor stop)	EB	1.4 / A	3.5 / B	1.4 / A	1.5 / A	1.3 / A	1.5 / A
	WB	4.9 / A		1.3 / A		1.4 / A	
	NB	23.6 / C		10.2 / B		8.9 / A	
CSAH 48 and Evergreen Dr (Minor Stop)	EB	0.9 / A	1.6 / A	0.6 / A	1.5 / A	0.6 / A	1.9 / A
	WB	2.5 / A		2.2 / A		2.4 / A	
	SB	6.6 / A		7.1 / A		8.4 / A	
CSAH 48 and Camwood Trl (Minor Stop)	EB	2.6 / A	3.0 / A	4.3 / A	3.4 / A	3.6 / A	3.1 / A
	WB	2.1 / A		1.7 / A		2.1 / A	
	NB	17.9 / C		14.2 / B		12.4 / B	
	SB	7.3 / A		7.6 / A		6.8 / A	
CSAH 48 and Cypress Dr (Minor Stop)	EB	2.4 / A	2.4 / A	2.9 / A	2.3 / A	3.0 / A	2.5 / A
	WB	1.4 / A		0.7 / A		0.8 / A	
	SB	5.7 / A		5.0 / A		6.1 / A	
CSAH 48 and Berrywood Dr (Minor Stop)	EB	1.0 / A	1.4 / A	1.4 / A	2.5 / A	1.1 / A	2.6 / A
	WB	1.7 / A		3.4 / A		3.6 / A	
	NB	3.9 / A		10.6 / B		0.0 / A	
	SB	7.7 / A		8.0 / A		5.8 / A	
CSAH 48 and College Rd (Traffic Signal)	EB	19.9 / B	16.8 / B	18.1 / B	15.5 / B	17.3 / B	15.8 / B
	WB	19.3 / B		16.9 / B		16.4 / B	
	NB	12.7 / B		11.9 / B		11.2 / B	
	SB	14.8 / B		14.2 / B		17.6 / B	

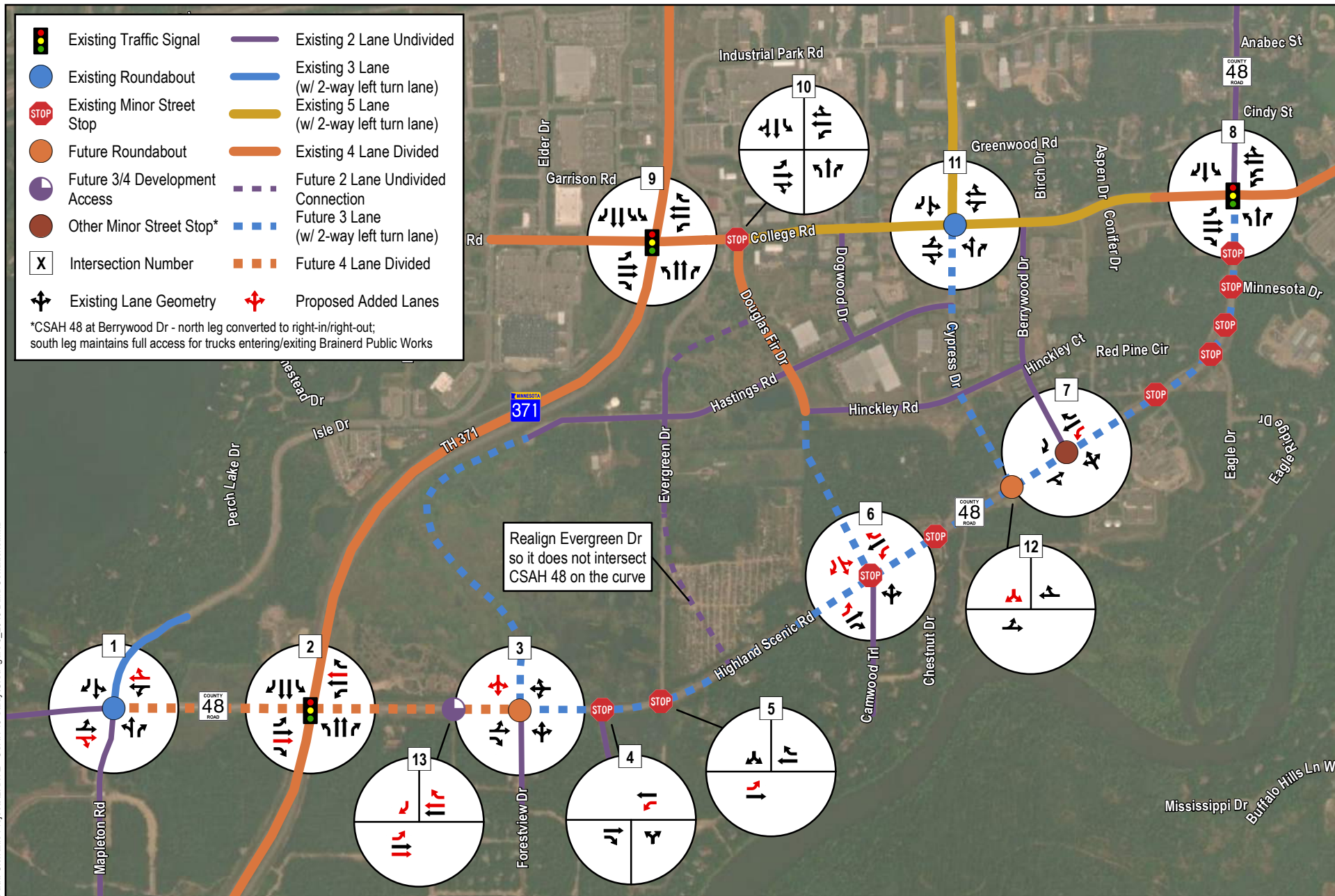
¹ Roundabout traffic operations analyses were completed using HCS 2022 software

5.3 2045 Build Conditions

The 2045 Build traffic operations analysis was an iterative process to analyze and determine the necessary improvements to maintain acceptable traffic operations. Based on the analysis, the below roadway improvements are recommended. With the below improvements, each approach and intersection operate at LOS D or better during the AM, school dismissal, and PM peak hours. The recommended 2045 Build conditions are shown in **Figure 9**. A preliminary layout showing the proposed improvements along CSAH 48 can be found in **Appendix D**.

- Expand the existing roundabout at the intersection of CSAH 48 and Isle Drive to be an unbalanced (2x1) roundabout with 2 approach lanes for both eastbound and westbound.
- Expand CSAH 48 to be a 4-lane divided roadway from just west of Isle Drive to Forestview Drive.
 - With the roadway expansion, there will be two eastbound and westbound through lanes at the intersections of CSAH 48 and TH 371 and CSAH 48 and the development $\frac{3}{4}$ access.
- Convert the existing minor stop-controlled intersection of CSAH 48 and Forestview Drive into a single lane roundabout.
 - The 4-lane divided section on CSAH 48 in the eastbound direction will drop at the roundabout as a dedicated right turn lane.
 - The 4-lane divided section on CSAH 48 in the westbound direction will start just west of the roundabout at Forestview Drive.
- Expand CSAH 48 to be a 3-lane roadway with a continuous two-way left turn lane (TWLTL) between Forestview Drive and College Road.
 - The continuous TWLTL will provide a dedicated left turn lane for each intersection and access point along CSAH 48.
- Realign Evergreen Drive to the east so that it does not intersect CSAH 48 on the existing curve. This would improve intersection spacing along the corridor and allow for development on each side of the realigned roadway.
- Construct the new intersection of CSAH 48 and Cypress Drive as a single lane roundabout.
 - MnMUTCD warrants are not met at the intersection, but a roundabout is recommended for safety, to reduce vehicle speeds, and to provide efficient travel along Cypress Drive, which is planned as a parallel reliever to TH 371
- A right-in/right-out (RI/RO) access is recommended for the north leg of the CSAH 48 and Berrywood Drive intersection due to the proximity to the Cypress Drive roundabout. The south leg is recommended to remain full access to provide full access for trucks in and out of the Brainerd Public Works facility.
- Provide dedicated right turn lanes where they currently exist along CSAH 48 and at all new roadway connections, including the planned development $\frac{3}{4}$ access.
- Construct the Hastings Road, Douglas Fir Drive, and Cypress Drive extensions as 3-lane roadways with continuous TWLTLs.

Table 6 represents that AM, school dismissal, and PM peak hour traffic operations under the 2045 Build conditions. The three College Road intersections west of CSAH 48 are not included in the table; each intersection operates acceptably under 2045 Build conditions and the operations analysis results for these intersections can be found in **Appendix C**.



		Project: BAXTE 165756 Print Date: 12/13/2022	2045 BUILD ROADWAY CONDITIONS CSAH 48 CORRIDOR STUDY Baxter, MN	Figure 9
		Map by: jdanibas Projection: Crow Wing Co. Coords. Source: ESRI		

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

Table 6 – 2045 Build Traffic Operations

Intersection	Approach	AM Peak Hour		School Dismissal Peak Hour		PM Peak Hour	
		Approach (delay / LOS)	Intersection (delay / LOS)	Approach (delay / LOS)	Intersection (delay / LOS)	Approach (delay / LOS)	Intersection (delay / LOS)
CSAH 48 and Isle Dr (Roundabout) ¹	EB	15.2 / C	14.3 / B	7.6 / A	9.8 / A	6.5 / A	6.6 / A
	WB	10.3 / B		6.3 / A		5.7 / A	
	NB	21.1 / C		16.2 / C		7.4 / A	
	SB	11.0 / B		7.5 / A		8.1 / A	
CSAH 48 and TH 371 (Traffic Signal)	EB	45.1 / D	41.2 / D	31.8 / C	32.1 / C	36.4 / D	37.0 / D
	WB	42.6 / D		30.8 / C		34.2 / C	
	NB	40.3 / D		33.8 / C		38.8 / D	
	SB	34.8 / C		32.3 / C		38.3 / D	
CSAH 48 and Development (3/4 Access)	EB	7.6 / A	4.6 / A	9.2 / A	5.6 / A	4.9 / A	3.6 / A
	WB	1.1 / A		1.2 / A		0.9 / A	
	SB	5.9 / A		4.9 / A		9.0 / A	
CSAH 48 and Forestview Dr (Roundabout) ¹	EB	10.4 / B	14.5 / B	9.2 / A	9.9 / A	6.8 / A	9.3 / A
	WB	16.6 / C		10.7 / B		11.7 / B	
	NB	21.2 / C		10.3 / B		8.1 / A	
	SB	11.1 / B		9.4 / A		10.9 / B	
CSAH 48 and Scenic River Dr (Minor stop)	EB	3.3 / A	3.5 / A	2.2 / A	1.9 / A	1.6 / A	1.7 / A
	WB	2.0 / A		1.2 / A		1.4 / A	
	NB	31.0 / D		14.3 / B		9.7 / A	
CSAH 48 and Evergreen Dr (Minor Stop)	EB	0.9 / A	1.5 / A	0.7 / A	1.5 / A	0.5 / A	1.8 / A
	WB	2.2 / A		2.0 / A		2.4 / A	
	SB	8.2 / A		7.5 / A		7.2 / A	
CSAH 48 and Camwood Trl (Minor Stop)	EB	2.4 / A	2.8 / A	4.4 / A	3.5 / A	3.4 / A	3.0 / A
	WB	1.9 / A		1.5 / A		1.9 / A	
	NB	21.3 / C		16.8 / C		14.4 / B	
	SB	7.3 / A		9.9 / A		8.0 / A	
CSAH 48 and Cypress Dr (Roundabout) ¹	EB	11.8 / B	10.1 / B	8.8 / A	8.0 / A	6.1 / A	6.6 / A
	WB	8.0 / A		7.4 / A		7.3 / A	
	SB	6.5 / A		6.1 / A		6.1 / A	
CSAH 48 and Berrywood Dr (Minor Stop)	EB	0.6 / A	1.2 / A	0.7 / A	2.0 / A	0.3 / A	2.3 / A
	WB	2.1 / A		3.3 / A		3.5 / A	
	NB	3.5 / A		6.6 / A		0.0 / A	
	SB	6.1 / A		5.5 / A		5.7 / A	
CSAH 48 and College Rd (Traffic Signal)	EB	20.5 / C	17.1 / B	18.0 / B	15.5 / B	17.7 / B	16.0 / B
	WB	20.6 / C		17.0 / B		17.1 / B	
	NB	12.4 / B		11.7 / B		10.8 / B	
	SB	15.0 / B		14.8 / B		16.9 / B	

¹ Roundabout traffic operations analyses were completed using HCS 2022 software

5.4 2045 Build Conditions (Evergreen Closed)

Based on discussions with the City, a 2045 Build traffic operations analysis was completed with Evergreen Drive closed to determine the impact on the Camwood Trail/Douglas Fir Drive intersection if Evergreen Drive no longer connected to CSAH 48. With the Evergreen Drive access closed to CSAH 48, all Evergreen Drive trips were shifted to the Camwood Trail/Douglas Fir Drive intersection.

Based on the analysis, the increase in trips using the Douglas Fir Drive Extension would result in minimal increase in delay at the intersection during the AM, school dismissal, and PM peak hours. The intersection is expected to continue to operate acceptably with Evergreen Drive open or closed, with the worst approach operating at LOS C or better during the AM, school dismissal, and PM peak hour.

Table 7 compares AM, school dismissal, and PM peak hour traffic operations under the 2045 Build conditions with the Evergreen Drive access to CSAH 48 open and closed.

Table 7 – 2045 Build Camwood Trail Traffic Operations – Evergreen Open vs. Closed

CSAH 48 and Camwood Trl Intersection Scenario	Approach	AM Peak Hour		School Dismissal Peak Hour		PM Peak Hour	
		Approach (delay / LOS)	Intersection (delay / LOS)	Approach (delay / LOS)	Intersection (delay / LOS)	Approach (delay / LOS)	Intersection (delay / LOS)
Evergreen Drive Access Open	EB	2.4 / A	2.8 / A	4.4 / A	3.5 / A	3.4 / A	3.0 / A
	WB	1.9 / A		1.5 / A		1.9 / A	
	NB	21.3 / C		16.8 / C		14.4 / B	
	SB	7.3 / A		9.9 / A		8.0 / A	
Evergreen Drive Access Closed	EB	2.7 / A	3.2 / A	4.4 / A	3.7 / A	3.6 / A	3.6 / A
	WB	2.0 / A		1.7 / A		2.2 / A	
	NB	22.4 / C		17.0 / C		16.2 / C	
	SB	8.6 / A		9.4 / A		9.2 / A	

6 TH 371 Interchange Analysis

Based on the traffic operations analysis and planned development in the area over the next 20+ years, the existing at-grade signal at the intersection of CSAH 48 and TH 371 is expected to begin approaching its capacity. Therefore, a high-level analysis was conducted to assess a grade-separated interchange at the intersection of CSAH 48 and TH 371.

A screening of potential alternatives for the intersection of CSAH 48 and TH 371 was completed using Federal Highway Administration's (FHWA) CAP-X tool. The tool provides high-level volume to capacity ratio (V/C) information for a range of alternative intersection designs and grade separated designs. For the purposes of this study, the CAP-X analysis for this intersection focused on grade-separated alternatives.

It is unlikely a grade separated interchange would be constructed at this intersection without other major regional changes in the area. This would involve traffic control along TH 371 to the north, including a grade separated interchange at the intersection of TH 371 and TH 210. As part of a potential TH 371/TH 210 or CSAH 48/TH 371 interchange, it is possible that College Road/Glory Road would become a grade separated overpass, without access for vehicles on/off of TH 371. Therefore, the CAP-X analysis for a potential interchange at CSAH 48/TH 371 included the forecast 2045 traffic volumes for CSAH 48 as well as the turning traffic from the intersection of College Road and TH 371.

Based on the CAP-X analysis under 2045 traffic demands, all grade-separated alternatives would have a volume to capacity ratio (V/C) of 0.65 or less and would function better than the existing at-grade intersection, which has a V/C of 0.86. FHWA generally considers anything with a V/C of less than 0.75 as operating well below capacity, while anything between 0.75 and 1.0 to be approaching capacity. The results of the CAP-X analysis can be found in **Appendix E**.

7 Access Spacing

To determine the optimal spacing for accesses along the CSAH 48 corridor, the *Crow Wing County Highway Department Policy on Access Management for Roads Under County Jurisdiction*, the *2015 City of Baxter Comprehensive Plan*, and *MnDOT Access Management Manual* were reviewed. Below is a summary of access guidelines from each document for CSAH 48, which is classified as a major collector roadway.

Crow Wing County

- 660 feet (1/8 mile) spacing for Priority 1 (ADT > 5,000) roadways for both 2-lane and 4-lane roadway full movement connections.
- This applies only to street connections, and not driveways or business accesses.

City of Baxter

- CSAH 48 is designated as a major collector roadway.
- 1/4 mile spacing for major and minor collector roadway intersections.
- 1/8 mile spacing for low volume roadways and residential driveways.
- 1/8 or 1/16 mile spacing for commercial driveway; depending on speed, traffic volume, sight distance, etc.

MnDOT

- CSAH 48 was analyzed as an urban/urbanizing collector roadway.
- 1/8 mile for primary full movement intersections.
- No defined spacing guideline for secondary (reduced access) intersections.

All three documents generally have the same policy with access along CSAH 48 recommended at 1/8 mile spacing. The roadway is under Crow Wing County jurisdiction; therefore, their access spacing guidelines were used to review the corridor.

Figure 10 shows the existing and planned access locations along the CSAH 48 corridor. Below is a summary of the existing access in the approximately 2.4-mile segment of CSAH 48.

- 2 existing traffic signals – TH 371 and College Road.
- 1 roundabout – Isle Drive.
- 11 full access minor street stop roadway connections – Forestview Drive, Scenic River Dr, Evergreen Dr, Camwood Trail, Chesnut Drive, Berrywood Drive, Red Pine Circle (west), Eagle Drive, Red Pine Circle (east), Minnesota Drive, and Carlos Road.
- 16 full access private accesses.

West of Evergreen Drive, CSAH 48 generally meets the spacing guidelines as Isle Drive, TH 371, Forestview Drive, Scenic River Drive, and Evergreen Drive all have approximately 1/8 mile or more spacing, with minimal residential/business access.

Between Evergreen Drive and Berrywood Drive, the local roadway connections are generally spaced by 1/8 mile or more; however, this section of CSAH 48 includes 12 of the 16 private accesses along the study corridor. Five of the 12 private access points provide access to either 4+ homes or a business/church. The remaining 7 private accesses are for single homes. While most of the private accesses should have very low volumes during most of times, the lack of

existing turn lanes at these accesses (especially left turn lanes) can lead to increased congestion and safety issues as vehicles slow to turn into these access points.

East of Berrywood Drive, there are minimal private accesses; however, the local street accesses between Red Pine Circle and Carlos Road are generally spaced at 1/16 mile or less. The lack of existing left turn lanes at these closely spaced intersections can lead to increased congestion and safety issues as vehicles slow to turn into these access points.

7.1 Future Access Recommendations

As development in the study area continues, there are 4 new roadway connections/accesses planned along CSAH 48, which are described below and shown in **Figure 10**:

- **Cypress Drive Extension** – Cypress Drive is being extended in 2023 as part of development along Cypress Drive. Cypress Drive will connect to the north side of CSAH 48 approximately 600 feet west of Berrywood Drive.
- **Hastings Road Extension** – north side of CSAH 48 at the existing Forestview Drive 3-legged intersection, creating a new 4-legged intersection. This connection will be completed as the area north of CSAH 48 is developed.
- **Development $\frac{3}{4}$ Access** - north side of CSAH 48 approximately 1/8 mile west of Forestview Drive to provide access to a future commercial development. The access is proposed to be a $\frac{3}{4}$ access due to the proximity to the existing TH 371 signal and the possible future TH 371 interchange.
- **Douglas Fir Drive Extension** – north side of CSAH 48 at the existing Camwood Trail 3-legged intersection, creating a new 4-legged intersection. This connection will be completed as the area north of CSAH 48 is developed.

All of the future connections to CSAH 48 are expected to meet Crow Wing County's 1/8 mile spacing requirements. Berrywood Drive is slightly less than 1/8 mile from Cypress Drive and the north leg of the intersection is recommended to be converted to right-in/right-out (RI/RO). The south leg is recommended to remain full access to provide full access for trucks in and out of the Brainerd Public Works facility.

Based on the existing access along the corridor, there are limited opportunities to eliminate/consolidate any of the existing access locations, especially in the area between Evergreen Drive and Berrywood Drive. As development of the areas continues, Crow Wing County and the City of Baxter should look to limit the new private connection to CSAH 48 and instead provide connections to the supporting local roadway network (i.e. Hastings Road, Douglas Fir Drive, Cypress Drive, etc.). The City and County should also look for opportunities to consolidate the existing private access points where feasible. The proposed 3-lane roadway section with a continuous TWLTL will improve operations and safety along the corridor by providing a dedicated left turn lane for each access location.



		Project: BAXTE 165756 Print Date: 11/29/2022 Map by: jdanibas Projection: Crow Wing Co. Coords. Source: ESRI	EXISTING CSAH 48 ACCESS & PLANNED CONNECTIONS CSAH 48 CORRIDOR STUDY Baxter, MN	Figure 10
--	--	--	--	--

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

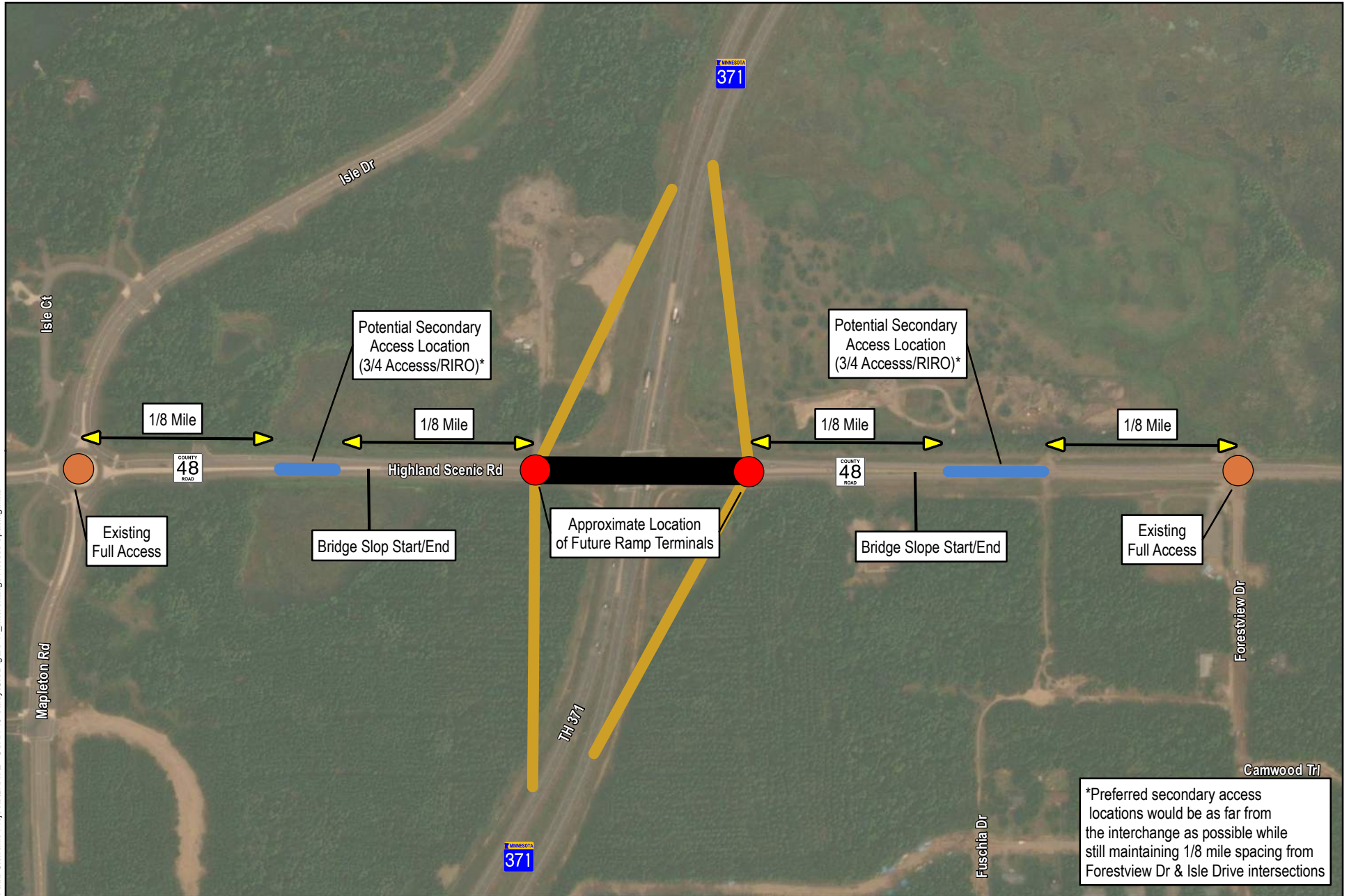
7.2 TH 371 Interchange Access Spacing

As was discussed previously, a grade separated interchange at CSAH 48/TH 371 is part of the *City of Baxter Comprehensive Plan*. While an interchange at this location most likely will not occur in the next 10 to 20 years, it is important for the County and City to plan the access along CSAH 48 with a future interchange in mind.

An interchange at TH 371 along CSAH 48 would require CSAH 48 to be raised approximately 22 feet to go over TH 371. To achieve this, CSAH 48 would need to be raised above the existing profile approximately 900 feet on either side of TH 371. It is important to keep any future roadway connections or development accesses outside of the area where CSAH 48 would need to be raised to prevent major access reconstruction.

The two ramp terminals for the interchange would likely be located approximately 360 feet on either side of TH 371 and would likely need to be signalized or under roundabout control. Based on Crow Wing County's access spacing guidelines, the nearest intersection/access to the ramp terminals could be approximately 1/8 mile away. However, the first access on either side of TH 371 would likely need to be a traffic signal or roundabout if full access were allowed, which may impact queueing at traffic operations at the interchange. Therefore, it is recommended that the first full access intersection be the Isle Drive and Forestview Drive intersections, with a secondary access (3/4 access or RIRO) located at least 1/8 mile from the interchange ramp terminals and Isle Drive or Forestview Drive. The preference would be for the secondary access locations to be as far from the interchange as possible while still maintaining 1/8 mile spacing from the Isle Drive and Forestview Drive intersections.

Figure 11 shows the general layout of an interchange at TH 371, the ramp terminal locations, existing intersection locations, bridge slope start/end points, and potential secondary access locations.



*Preferred secondary access locations would be as far from the interchange as possible while still maintaining 1/8 mile spacing from Forestview Dr & Isle Drive intersections

	 0 250 500 Ft	Project: BAXTE 165756 Print Date: 11/29/2022	TH 371 INTERCHANGE ACCESS SPACING CSAH 48 CORRIDOR STUDY Baxter, MN	Figure 11
		Map by: jdanibas Projection: Crow Wing Co. Coords. Source: ESRI		

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

8 Conclusion

CSAH 48, also known as Highland Scenic Road, is expected to have significant development along the roadway within the next 10-20 years. There are also several planned roadways that will connect on the north side of CSAH 48 as development occurs. The first of the new roadway connections is Cypress Drive, which will be connected to CSAH 48 in 2023, followed by the Hastings Road and Douglas Fir Drive extensions. As development of the area continues, there are roadway and intersection improvements that will be needed to serve existing and future traffic demands.

Based on the *City of Baxter Comprehensive Plan*, the areas adjacent to the CSAH 48 study corridor will develop over the next 10-20 years to include approximately 1,870 residential units, 127,500 SF of commercial development, and 626,500 SF of office/industrial development. The significant amount of development will result approximately 23,000 new trips in and out of the area each day.

Based on the warrant analysis for the 2045 forecast traffic volumes, the only existing minor stop-controlled intersection that is expected to warrant a traffic control change is the intersection of CSAH 48 and Forestview Drive, which will have a new southbound approach from the Hastings Road extension. Traffic operations analysis confirmed that a traffic control change will be necessary at this intersection.

Based on the traffic operations analysis, the existing roundabout at the intersection of CSAH 48 and Isle Drive will have capacity issues during the AM peak hour under 2045 traffic demands. The intersection will need to be expanded to an unbalanced (2x1) intersection to accommodate the 2045 traffic demands.

Based on the traffic operations analysis, the existing intersection of CSAH 48 and TH 371 will have long delays and queues under 2045 traffic demands with a single through lane eastbound and westbound. Based on the traffic operations analysis and forecast daily roadway volumes, CSAH 48 should be expanded to a 4-lane divided roadway from just west of Isle Drive to Forestview Drive.

The intersection of CSAH 48 and Cypress Drive was analyzed as both a minor stop controlled intersection and a roundabout despite not meeting traffic control warrants. Both minor stop control and roundabout control are expected to provide acceptable traffic operations through 2045. A roundabout is recommended at the intersection as it has other benefits for both the CSAH 48 and Cypress Drive corridors such as traffic calming (speed reduction), safety, and improved efficiency for vehicles using Cypress Drive as a parallel reliever roadway.

A high-level analysis of a potential interchange at the intersection of CSAH 48 and TH 371 was completed using FHWA's CAP-X tool. Based on the CAP-X analysis under 2045 traffic demands, all grade-separated alternatives would have a volume to capacity ratio (V/C) of 0.65 or less and would function better than the existing at-grade intersection which has a V/C of 0.86. FHWA generally considers anything with a V/C of less than 0.75 as operating well below capacity, while anything between 0.75 and 1.0 to be approaching capacity.

A review of the existing and future access along CSAH 48 was completed to determine whether the Crow Wing County recommended 1/8 mile spacing for intersections is met and to look for opportunities for future access consolidation.

All of the future connections to CSAH 48 are expected to meet Crow Wing County's 1/8 mile spacing requirements. Berrywood Drive is only slightly less than 1/8 mile from Cypress Drive and the north leg of the intersection is recommended to be converted to right-in/right-out (RI/RO). The south leg is recommended to remain full access to provide full access for trucks in and out of the Brainerd Public Works facility.

Based on the existing access along the corridor, there are limited opportunities to eliminate/consolidate any of the existing access locations, especially in the area between Evergreen Drive and Berrywood Drive. As development of the area continues, Crow Wing County and the City of Baxter should look to limit the new private connections to CSAH 48 and instead provide connections to the supporting local roadway network (i.e. Hastings Road, Douglas Fir Drive, Cypress Drive, etc.). The proposed 3-lane roadway section with a continuous TWLTL will improve operations and safety along the corridor by providing a dedicated left turn lane for each access location.

Three College Road intersections west of CSAH 48 were analyzed as part of this study. Each intersection is expected to operate acceptably with the existing intersection control and geometry through 2045. The College Road intersections west of CSAH 48 are listed below:

- College Road/Glory Road and TH 371.
- College Road and Douglas Fir Drive.
- College Road and Cypress Drive.

8.1 Recommendation

Based upon the analysis of the CSAH 48 (Highland Scenic Road) corridor between Isle Drive and College Road, the following roadway and intersection improvements are recommended. The proposed improvements were categorized as either short-term, mid-term, and long-term needs. A preliminary layout showing the proposed short- and mid-term improvements along CSAH 48 can be found in **Appendix D**.

8.1.1 Short-term Improvements (2023)

The following improvements are being planned for 2023 when the Cypress Drive extension to CSAH 48 is completed.

- Construct the Cypress Drive extension as a 3-lane roadway with a continuous two-way left turn lane (TWLTL).
- Construct the new intersection of CSAH 48 and Cypress Drive as a single lane roundabout.
 - MnMUTCD warrants are not met at the intersection, but a roundabout is recommended for safety, to reduce vehicle speeds, and to provide efficient travel along Cypress Drive, which is planned as a parallel reliever to TH 371.
- Convert the north leg of the intersection of CSAH 48 and Berrywood Drive to right-in/right-out (RI/RO). The south leg is recommended to remain full access to provide full access for trucks in and out of the Brainerd Public Works facility.

8.1.2 Mid-Term Improvements (5-20 years)

The following improvements should be made over the next 5 to 20 years as development of the area continues or as CSAH 48 is reconstructed.

- Construct the Hastings Road and Douglas Fir Drive extensions as needed for development. Construct each extension as a 3-lane roadway with continuous TWLTLs.
- Expand the roundabout at the intersection of CSAH 48 and Isle Drive to be an unbalanced (2x1) roundabout with 2 approach lanes both eastbound and westbound.
- Expand CSAH 48 to be a 4-lane divided roadway from just west of Isle Drive to Forestview Drive.
 - With the roadway expansion, there will be two eastbound and westbound through lanes at the intersections of CSAH 48 and TH 371 and CSAH 48 and the development $\frac{3}{4}$ access.
- Construct a $\frac{3}{4}$ access approximately 1/8 mile west of Forestview Drive to split traffic to the development on the north side of CSAH 48 between two access points ($\frac{3}{4}$ access and Forestview Drive).
 - This access would meet Crow Wing County's access spacing guidelines even with a potential future interchange.
- With construction of the CSAH 48 improvements between TH 371 and Forestview Drive, construct a $\frac{3}{4}$ access for the south side of CSAH 48 just east of the $\frac{3}{4}$ access for the development on the north side of CSAH 48.
 - In the short term, the access will be used, in conjunction with a new frontage road, to provide access to the Lake Area Christian Church.
 - As the area on the south side of CSAH 48 continues to develop, the access could connect to Fuschia Drive to provide another access to the future residential development.
- Convert the existing minor stop-controlled intersection of CSAH 48 and Forestview Drive into a single lane roundabout.
 - The 4-lane divided section on CSAH 48 in the eastbound direction will drop at the roundabout as a dedicated right turn lane.
 - The 4-lane divided section on CSAH 48 in the westbound direction will start just west of the roundabout at Forestview Drive.
- Expand CSAH 48 to be a 3-lane roadway with a continuous two-way left turn lane (TWLTL) between Forestview Drive and College Road.
 - The continuous TWLTL will provide a dedicated left turn lane for each intersection and access point along CSAH 48.
- Consider realigning Evergreen Drive to the east so that it does not intersect CSAH 48 on the existing curve. This would improve intersection spacing along the corridor and allow for development on each side of the realigned roadway.
- Limit new private connections to CSAH 48 and instead provide connections to the supporting local roadway network (i.e. Hastings Road, Douglas Fir Drive, Cypress Drive, etc.).
- Look for opportunities to consolidate the existing private access points where feasible.

8.1.3 Long-Term Improvements (20+ years)

The construction of a grade-separated interchange at the current at-grade intersection of CSAH 48 and TH 371 is not likely to occur until 20+ years from now. It is unlikely a grade separated interchange would be constructed at this intersection without other major changes to the intersection control along TH 371 to the north, including a potential grade separated interchange at the at-grade intersection of TH 371 and TH 210.

Based on the CAP-X analysis of an interchange under 2045 traffic demands, all grade-separated alternatives would have a volume to capacity ratio of 0.65 or less and would function better than the existing at-grade intersection.

Appendix A

February 2022 Traffic Counts

Location: CSAH 48 (Highland Scenic Rd) at Isle Drive
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Isle Drive				CSAH 48				Ironwood Dr				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	4
0:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	3
1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
1:45	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	3
2:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
3:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
3:15	0	0	0	0	1	0	0	0	0	0	0	1	0	0	3	0	0	5
3:30	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	3
3:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
4:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	3
4:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
4:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45	0	0	0	0	0	1	0	0	0	0	1	2	0	0	1	0	0	5
5:00	0	0	0	0	0	1	0	0	0	0	0	1	0	0	5	0	0	7
5:15	0	0	1	0	0	3	0	0	0	0	0	2	0	0	5	0	0	11
5:30	0	0	0	0	2	0	0	0	0	0	1	0	0	0	2	0	0	5
5:45	0	0	1	0	6	5	0	0	0	0	0	2	0	0	9	0	0	23
6:00	0	0	0	0	0	7	1	0	0	0	1	4	0	2	9	1	0	25
6:15	1	1	0	0	3	5	4	0	0	0	0	4	0	2	13	2	0	35
6:30	0	0	0	0	5	7	0	0	0	0	0	5	0	2	18	0	0	37
6:45	0	0	1	0	9	16	2	0	1	0	6	0	2	34	2	0	73	
7:00	0	1	2	0	8	21	1	0	0	1	19	0	5	30	4	0	92	
7:15	0	3	3	0	41	58	4	0	0	4	15	0	7	53	15	0	203	
7:30	0	8	4	0	88	119	7	0	14	12	73	0	9	98	45	0	477	
7:45	3	7	3	0	78	129	9	0	16	9	83	0	19	135	33	0	524	
8:00	1	4	8	0	45	72	3	0	19	11	69	0	19	109	13	0	373	
8:15	3	2	5	0	7	33	2	0	2	5	16	0	8	59	1	0	143	
8:30	3	1	1	0	6	10	2	0	1	3	12	0	2	10	3	0	54	
8:45	4	0	3	0	3	15	5	0	0	0	7	0	2	18	3	0	60	
9:00	1	1	4	0	3	16	5	0	0	2	9	0	5	14	0	0	60	
9:15	0	3	5	0	4	11	2	0	0	1	11	0	4	12	0	0	53	
9:30	1	0	5	0	4	12	6	0	1	5	3	0	5	14	1	0	57	
9:45	6	3	3	0	4	8	6	0	2	3	5	0	5	13	3	0	61	
10:00	0	2	3	0	3	10	4	0	1	1	6	0	3	5	0	0	38	
10:15	3	4	3	0	4	14	3	0	0	0	2	0	0	12	1	0	46	
10:30	3	2	1	0	3	10	3	0	2	1	12	0	4	11	0	0	52	
10:45	2	3	4	0	2	32	4	0	1	3	8	0	4	21	0	0	84	
11:00	2	0	5	0	5	12	2	0	0	2	8	0	2	9	2	0	49	
11:15	4	2	4	0	4	11	7	0	0	2	5	0	4	9	0	0	52	
11:30	2	1	4	0	6	9	4	0	0	3	4	0	4	12	0	0	49	
11:45	3	2	6	0	15	18	2	0	2	2	5	0	2	15	0	0	72	
12:00	2	1	5	0	8	15	9	0	2	4	7	0	0	8	1	0	62	
12:15	3	2	4	0	6	10	1	0	1	1	7	0	6	12	2	0	55	
12:30	1	1	4	0	8	15	7	0	0	3	0	0	3	15	2	0	59	
12:45	1	4	4	0	3	17	1	0	0	4	5	0	1	12	0	0	52	
13:00	1	4	4	0	4	9	4	0	0	2	8	0	5	6	2	0	49	
13:15	3	3	1	0	6	17	2	0	1	0	10	0	4	18	3	0	68	
13:30	3	3	7	0	14	17	3	0	1	2	4	0	1	9	1	0	65	
13:45	3	2	5	0	9	22	7	0	1	2	5	0	2	10	1	0	69	
14:00	1	8	4	0	12	23	1	0	1	1	6	0	2	20	6	0	85	
14:15	1	2	6	0	25	30	2	0	0	1	4	0	0	13	2	0	86	
14:30	1	5	12	0	58	39	1	0	2	1	7	0	5	18	9	0	158	
14:45	2	7	9	0	34	48	7	0	15	10	80	0	7	113	11	0	343	
15:00	6	4	3	0	25	34	1	0	29	15	72	0	11	67	6	0	273	
15:15	5	1	10	1	11	34	4	0	3	4	20	0	3	51	2	0	148	
15:30	4	2	4	0	10	32	3	0	2	3	25	0	1	32	2	0	120	
15:45	4	2	7	0	13	15	3	0	4	4	16	0	6	28	0	0	102	

Location: CSAH 48 (Highland Scenic Rd) at Isle Drive
Count Date: 2/9/2022
Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Isle Drive				CSAH 48				Ironwood Dr				CSAH 48				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	8	7	8	0	12	36	2	0	5	1	11	0	3	27	1	0	121
16:15	3	4	11	0	13	32	1	0	4	4	11	0	0	28	0	0	111
16:30	10	5	6	0	12	42	4	0	3	2	25	0	10	53	2	0	174
16:45	6	4	2	0	17	37	9	0	1	3	8	0	6	37	2	0	132
17:00	6	5	6	0	21	30	3	0	2	3	10	0	5	21	0	0	112
17:15	4	4	9	0	7	25	4	0	0	4	13	0	2	16	0	1	88
17:30	3	2	5	1	12	24	4	0	0	0	6	0	1	16	0	1	73
17:45	2	0	2	0	9	15	2	0	0	0	7	0	1	10	0	0	48
18:00	2	1	3	0	7	21	1	0	0	0	4	0	2	10	1	0	52
18:15	0	1	5	0	6	17	0	0	0	0	0	0	2	7	2	0	40
18:30	3	4	3	0	7	11	1	0	0	2	5	0	4	6	0	0	46
18:45	3	2	8	0	2	6	0	0	0	1	5	0	1	5	0	0	33
19:00	2	0	2	0	5	14	3	0	0	1	3	0	2	5	0	0	37
19:15	2	2	0	0	6	6	1	0	1	0	8	0	1	10	0	0	37
19:30	1	1	3	0	2	3	1	0	1	2	17	0	0	9	0	0	40
19:45	0	0	0	0	9	10	0	0	0	0	1	0	0	1	0	0	21
20:00	1	1	6	0	3	12	0	0	0	0	2	0	1	3	1	0	30
20:15	1	1	0	0	3	9	0	0	0	1	6	0	2	9	3	0	35
20:30	0	1	0	0	3	4	0	0	0	1	5	0	0	14	2	0	30
20:45	1	0	0	0	6	7	0	0	0	0	1	0	0	4	0	0	19
21:00	3	1	0	0	1	9	0	0	0	0	0	0	0	4	0	0	18
21:15	1	0	0	0	3	5	0	0	0	0	1	0	0	5	0	0	15
21:30	0	0	0	0	3	11	0	0	0	0	4	0	0	7	0	0	25
21:45	0	0	2	0	2	1	0	0	0	0	3	0	0	3	0	0	11
22:00	0	1	2	0	2	4	1	0	0	0	0	0	0	3	0	0	13
22:15	0	0	1	0	1	2	0	0	0	0	1	0	0	0	0	0	5
22:30	0	0	0	0	0	2	0	0	0	0	1	0	0	3	0	0	6
22:45	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
23:00	0	0	0	0	1	1	0	0	0	0	1	0	0	3	0	0	6
23:15	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3
23:30	0	0	0	0	0	4	0	0	0	0	0	0	0	3	0	0	7
23:45	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	4
Total	148	149	252	2	786	1451	181	0	141	155	835	0	221	1527	193	2	5593
Cars+ Trucks	146	149	251	2	713	1418	180	0	141	154	762	0	219	1492	186	2	5811
	2	0	1	0	73	33	1	0	0	1	73	0	2	35	7	0	228
% Trucks	1.4	0.0	0.4	0.0	9.3	2.3	0.6	0.0	0.0	0.6	8.7	0.0	0.9	2.3	3.6	0.0	4.1
	0.5				4.4				6.5				2.3				

Location: CSAH 48 (Highland Scenic Rd) at TH 371
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	TH 371				CSAH 48				TH 371				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	0	4	1	0	1	1	0	0	0	4	0	0	0	0	0	1	0	12
0:15	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3
0:30	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
0:45	0	3	0	0	1	0	1	0	0	2	0	0	0	0	0	0	0	7
1:00	0	3	0	0	1	0	0	0	1	1	0	0	0	1	1	0	0	8
1:15	1	3	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	6
1:30	0	1	0	0	0	1	0	0	1	2	0	0	1	0	0	0	0	6
1:45	0	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6
2:00	0	1	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	4
2:15	0	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	4
2:30	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
2:45	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	4
3:00	0	2	0	0	1	0	0	0	1	4	0	0	0	0	0	1	0	9
3:15	0	5	0	0	0	0	0	0	1	3	0	0	0	0	1	3	0	13
3:30	0	5	1	0	0	1	0	0	0	4	0	0	0	0	0	1	0	12
3:45	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	3
4:00	0	2	0	0	0	0	0	0	0	5	0	0	0	0	0	1	0	8
4:15	0	5	0	0	0	0	0	0	0	4	0	0	0	0	2	2	0	13
4:30	0	8	0	0	1	1	0	0	0	6	1	0	0	0	0	0	0	17
4:45	0	2	0	0	0	0	0	0	1	11	0	0	0	0	2	1	0	17
5:00	0	10	0	0	0	1	0	0	0	7	1	0	3	1	2	0	0	25
5:15	0	9	0	0	3	1	1	0	2	12	3	0	1	3	3	0	0	38
5:30	1	16	0	0	1	0	1	0	2	20	2	0	0	3	0	0	0	46
5:45	0	21	4	0	0	7	0	0	2	12	3	0	1	4	6	0	0	60
6:00	1	23	1	0	2	5	2	0	1	22	2	0	4	7	2	0	0	72
6:15	1	32	2	0	1	4	3	0	6	30	3	0	1	3	14	0	0	100
6:30	1	35	5	0	1	3	3	0	5	47	5	0	2	6	14	0	0	127
6:45	0	46	9	0	1	7	7	0	13	45	7	0	7	16	17	0	0	175
7:00	0	31	9	0	4	7	4	0	13	70	14	0	10	22	14	0	0	198
7:15	0	51	38	0	5	39	5	0	28	84	18	0	8	39	19	0	0	334
7:30	0	36	67	0	3	105	12	0	49	76	24	0	56	88	21	0	0	537
7:45	6	28	74	0	1	101	7	0	39	76	17	0	82	132	14	0	0	577
8:00	5	41	41	0	5	53	3	0	16	61	11	0	78	88	20	0	0	422
8:15	2	42	13	0	7	17	2	0	11	69	15	0	24	39	17	0	0	258
8:30	0	44	4	0	5	5	5	0	8	60	9	0	8	11	9	0	0	168
8:45	5	41	5	0	3	10	7	0	10	84	8	0	1	13	13	0	0	200
9:00	0	57	11	0	3	7	1	0	5	51	9	0	8	11	7	0	0	170
9:15	3	57	4	0	5	9	4	0	5	68	3	0	7	7	9	0	0	181
9:30	2	52	2	0	2	13	6	0	6	61	8	0	3	8	7	0	0	170
9:45	1	60	4	0	4	10	5	0	6	53	4	0	4	7	9	0	0	167
10:00	5	67	5	0	3	6	3	0	4	66	4	0	5	7	4	0	0	179
10:15	1	59	1	0	1	11	4	0	9	72	4	0	4	7	6	0	0	179
10:30	2	60	3	0	9	5	6	0	9	73	4	0	7	9	10	0	0	197
10:45	5	70	6	0	1	22	8	0	11	55	2	0	7	9	12	0	0	208
11:00	1	80	3	0	5	9	2	0	4	62	4	0	2	14	5	0	0	191
11:15	2	60	2	0	5	12	5	0	9	63	6	0	3	9	7	0	0	183
11:30	1	75	9	0	8	2	4	0	9	65	6	0	3	11	6	0	0	199
11:45	4	68	14	0	10	12	4	0	7	73	2	0	5	8	7	0	0	214
12:00	2	78	4	0	3	17	4	0	10	55	3	0	4	5	5	0	0	190
12:15	5	53	3	0	5	9	1	0	5	54	4	0	5	12	6	0	0	162
12:30	5	77	6	0	3	16	7	0	7	71	5	0	2	4	9	0	0	212
12:45	4	68	4	0	6	11	4	0	6	56	4	0	5	11	3	0	0	182
13:00	7	73	4	0	8	9	6	0	4	43	8	0	5	6	4	0	0	177
13:15	2	46	8	0	9	9	4	0	8	47	3	0	6	11	12	0	0	165
13:30	3	76	11	0	6	10	3	0	14	54	3	0	1	13	5	0	0	199
13:45	6	69	9	0	6	22	7	0	8	70	5	0	6	8	4	0	0	220
14:00	1	50	15	0	6	12	4	0	10	58	6	0	7	14	6	0	0	189
14:15	2	80	31	0	4	19	3	0	9	60	7	0	4	7	6	0	0	232
14:30	1	64	35	2	1	52	3	0	13	65	2	0	7	10	7	0	0	260
14:45	2	70	35	0	7	37	6	0	9	59	4	0	69	82	18	0	0	398
15:00	4	83	24	0	9	28	6	0	7	45	1	0	57	86	23	0	0	373
15:15	2	71	6	0	7	37	7	0	10	51	6	0	28	26	18	0	0	269
15:30	5	85	8	0	14	29	6	0	9	69	4	0	16	31	17	0	0	293
15:45	5	92	9	0	10	9	3	0	11	82	5	0	16	20	15	0	0	277

Location: CSAH 48 (Highland Scenic Rd) at TH 371

Count Date: 2/9/2022

Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	TH 371				CSAH 48				TH 371				CSAH 48				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	2	89	8	0	8	30	2	0	13	65	6	0	10	15	11	0	259
16:15	8	81	19	0	8	16	4	0	9	56	3	0	11	23	12	0	250
16:30	5	95	19	0	13	25	6	0	15	68	5	0	26	35	25	0	337
16:45	8	103	10	0	11	29	1	0	24	74	1	0	11	26	17	0	315
17:00	9	84	11	0	20	25	9	0	18	64	3	0	9	13	16	0	281
17:15	8	77	4	0	9	21	4	0	13	72	6	0	5	15	12	0	246
17:30	6	86	6	0	8	21	5	0	10	71	2	0	7	10	8	0	240
17:45	2	70	4	0	4	12	2	0	9	66	4	0	3	10	7	0	193
18:00	4	55	8	0	3	8	5	0	13	44	1	0	4	9	3	0	157
18:15	5	44	5	0	3	10	4	0	8	43	7	0	3	2	3	0	137
18:30	6	48	6	0	2	5	3	0	8	46	2	0	3	7	6	0	142
18:45	3	30	2	0	2	6	1	0	1	34	2	0	5	6	2	0	94
19:00	2	29	5	0	3	11	2	0	5	30	2	0	1	3	4	0	97
19:15	7	40	7	0	1	3	2	0	3	35	2	0	9	9	3	0	121
19:30	4	25	1	0	2	1	0	0	4	34	2	0	10	15	3	0	101
19:45	2	34	5	0	1	9	4	0	5	24	1	0	0	1	1	0	87
20:00	4	33	3	0	5	8	3	0	4	25	1	0	2	0	3	0	91
20:15	3	34	4	0	1	5	2	0	4	18	1	0	3	6	5	0	86
20:30	1	36	1	0	4	5	1	0	0	21	1	0	7	4	5	0	86
20:45	1	18	3	0	0	9	2	0	2	16	3	0	5	3	1	0	63
21:00	0	27	2	0	2	7	2	0	0	20	3	0	0	2	4	0	69
21:15	1	12	4	0	5	5	1	0	2	11	3	0	0	4	4	0	52
21:30	2	8	3	0	2	6	3	0	3	18	1	0	4	5	2	0	57
21:45	1	12	1	0	1	1	0	0	0	9	2	0	3	1	2	0	33
22:00	1	19	2	0	2	1	2	0	4	13	2	0	1	1	1	0	49
22:15	0	11	1	0	0	1	1	0	1	10	0	0	1	0	0	0	26
22:30	1	6	1	0	1	0	0	0	1	9	0	0	0	4	0	0	23
22:45	2	5	0	0	1	0	2	0	0	6	0	0	0	0	1	0	17
23:00	1	4	1	0	0	1	0	0	0	8	0	0	1	1	3	0	20
23:15	0	4	0	0	1	1	0	0	1	8	0	0	0	0	1	0	16
23:30	0	4	1	0	0	3	2	0	1	4	0	0	1	1	1	0	18
23:45	3	3	0	0	1	1	0	0	1	4	0	0	0	2	0	0	15
Total	208	3688	697	2	331	1099	264	0	621	3557	336	0	728	1169	611	0	11855
Cars+	207	3455	680	0	324	1034	262	0	597	3351	327	0	703	1101	589	0	12630
Trucks	1	233	17	2	7	65	2	0	24	206	9	0	25	68	22	0	679
% Trucks	0.5	6.3	2.4	100.0	2.1	5.9	0.8	0.0	3.9	5.8	2.7	0.0	3.4	5.8	3.6	0.0	
	5.5				4.4				5.3				4.6				5.7

Location: CSAH 48 (Highland Scenic Rd) at Forestview Drive
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	N/A				CSAH 48				Forestview Dr				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2
0:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
0:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:45	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
1:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	2
1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
2:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
3:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
4:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
4:30	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	4
4:45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	4
5:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	3
5:15	0	0	0	0	0	3	0	0	2	0	2	0	0	0	6	0	0	13
5:30	0	0	0	0	0	1	0	0	1	0	1	0	0	0	5	1	0	9
5:45	0	0	0	0	0	4	0	0	4	0	4	0	0	0	7	0	0	19
6:00	0	0	0	0	1	7	0	0	1	0	1	0	0	0	9	1	0	20
6:15	0	0	0	0	0	4	0	0	5	0	1	0	0	0	6	1	0	17
6:30	0	0	0	0	0	5	0	0	3	0	3	0	0	0	12	1	0	24
6:45	0	0	0	0	0	8	0	0	4	0	6	0	0	0	22	0	0	40
7:00	0	0	0	0	1	9	0	0	9	0	5	0	0	0	35	1	0	60
7:15	0	0	0	0	2	38	0	0	15	0	6	0	0	0	63	1	0	125
7:30	0	0	0	0	1	99	0	0	19	0	13	0	0	0	111	3	0	246
7:45	0	0	0	0	1	108	0	0	9	0	9	0	0	0	151	12	0	290
8:00	0	0	0	0	2	50	0	0	3	0	1	0	0	0	96	4	0	156
8:15	0	0	0	0	2	21	0	0	4	0	1	0	0	0	56	3	0	87
8:30	0	0	0	0	2	9	0	0	6	0	3	0	0	0	19	0	0	39
8:45	0	0	0	0	2	11	0	0	9	0	5	0	0	0	23	3	0	53
9:00	0	0	0	0	1	10	0	0	0	0	5	0	0	0	20	1	0	37
9:15	0	0	0	0	2	13	0	0	6	0	2	0	0	0	9	3	0	35
9:30	0	0	0	0	1	14	0	0	7	0	5	0	0	0	17	3	0	47
9:45	0	0	0	0	0	15	0	0	6	0	0	0	0	0	11	1	0	33
10:00	0	0	0	0	1	11	0	0	4	0	1	0	0	0	11	2	0	30
10:15	0	0	0	0	1	15	0	0	0	0	3	0	0	0	11	4	0	34
10:30	0	0	0	0	2	15	0	0	5	0	1	0	0	0	13	3	0	39
10:45	0	0	0	0	5	27	0	0	4	0	2	0	0	0	12	2	0	52
11:00	0	0	0	0	2	16	0	0	0	0	2	0	0	0	17	4	0	41
11:15	0	0	0	0	4	21	0	0	3	0	3	0	0	0	12	4	0	47
11:30	0	0	0	0	1	8	0	0	4	0	2	0	0	0	15	0	0	30
11:45	0	0	0	0	2	22	0	0	6	0	5	0	0	0	13	4	0	52
12:00	0	0	0	0	4	11	0	0	1	0	0	0	0	0	11	3	0	30
12:15	0	0	0	0	2	19	0	1	1	0	2	0	0	0	16	4	0	44
12:30	0	0	0	0	2	10	0	0	2	0	4	0	0	0	17	5	0	40
12:45	0	0	0	0	5	20	0	0	3	0	3	0	0	0	39	2	0	72
13:00	0	0	0	0	2	19	0	0	3	0	1	0	0	0	16	4	0	45
13:15	0	0	0	0	2	20	0	0	2	0	1	0	0	0	14	1	0	40
13:30	0	0	0	0	2	22	0	0	1	0	2	0	0	0	15	4	0	46
13:45	0	0	0	0	5	27	0	0	6	0	0	0	0	0	15	4	0	57
14:00	0	0	0	0	2	22	0	0	2	0	3	0	0	0	19	2	0	50
14:15	0	0	0	0	6	21	0	0	7	0	5	0	0	0	12	4	0	55
14:30	0	0	0	0	4	53	0	0	5	0	6	0	0	0	12	3	0	83
14:45	0	0	0	0	3	47	0	0	4	0	3	0	0	0	83	8	0	148
15:00	0	0	0	0	8	32	0	0	4	0	3	0	0	0	86	4	0	137
15:15	0	0	0	0	6	47	0	0	5	0	5	0	0	0	34	2	0	99
15:30	0	0	0	0	7	43	0	0	7	0	3	0	0	0	32	8	0	100
15:45	0	0	0	0	6	23	0	0	2	0	2	0	0	0	25	9	0	67

Location: CSAH 48 (Highland Scenic Rd) at Forestview Drive
Count Date: 2/9/2022
Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	N/A				CSAH 48				Forestview Dr				CSAH 48				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	0	0	0	0	3	34	0	0	2	0	5	0	0	21	3	0	68
16:15	0	0	0	0	5	30	0	0	4	0	4	0	0	21	11	0	75
16:30	0	0	0	0	2	36	0	0	6	0	3	0	0	36	11	0	94
16:45	0	0	0	0	2	35	0	0	2	0	4	0	0	29	7	0	79
17:00	0	0	0	0	11	51	0	0	6	0	3	0	0	16	11	0	98
17:15	0	0	0	0	7	29	0	0	3	0	5	0	0	23	5	0	72
17:30	0	0	0	0	7	28	0	0	3	0	2	0	0	16	3	0	59
17:45	0	0	0	0	8	13	0	0	5	0	2	0	0	12	5	0	45
18:00	0	0	0	0	7	12	0	0	5	0	2	0	0	8	7	0	41
18:15	0	0	0	0	7	15	0	0	1	0	2	0	0	11	5	0	41
18:30	0	0	0	0	5	10	0	0	2	0	4	0	0	10	2	0	33
18:45	0	0	0	0	3	10	0	0	1	0	2	0	0	6	4	0	26
19:00	0	0	0	0	6	12	0	0	2	0	1	0	0	3	4	0	28
19:15	0	0	0	0	3	4	0	0	2	0	2	0	0	10	6	0	27
19:30	0	0	0	0	4	4	0	0	0	0	3	0	0	15	5	0	31
19:45	0	0	0	0	2	11	0	0	1	0	2	0	0	4	2	0	22
20:00	0	0	0	0	4	14	0	0	0	0	0	0	0	5	2	0	25
20:15	0	0	0	0	3	6	0	0	2	0	2	0	0	7	2	0	22
20:30	0	0	0	0	1	14	0	0	1	0	1	0	0	8	1	0	26
20:45	0	0	0	0	5	5	0	0	2	0	5	0	0	7	2	0	26
21:00	0	0	0	0	1	8	0	0	2	0	2	0	0	5	1	0	19
21:15	0	0	0	0	1	10	0	0	0	0	0	0	0	8	0	0	19
21:30	0	0	0	0	1	9	0	0	2	0	0	0	0	4	2	0	18
21:45	0	0	0	0	0	3	0	0	0	0	0	0	0	3	2	0	8
22:00	0	0	0	0	0	2	0	0	1	0	0	0	0	2	2	0	7
22:15	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
22:30	0	0	0	0	2	1	0	0	0	0	1	0	0	5	0	0	9
22:45	0	0	0	0	0	1	0	0	1	0	1	0	0	1	1	0	5
23:00	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	4
23:15	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3
23:30	0	0	0	0	1	3	0	0	2	0	0	0	0	1	0	0	7
23:45	0	0	0	0	1	1	0	0	0	0	1	0	0	2	3	0	8
Total	0	0	0	0	206	1422	0	1	257	0	197	0	0	1541	240	0	3478
Cars+	0	0	0	0	199	1352	0	1	252	0	195	0	0	1463	238	0	3699
Trucks	0	0	0	0	7	70	0	0	5	0	2	0	0	78	2	0	164
% Trucks	0.0	0.0	0.0	0.0	3.4	4.9	0.0	0.0	1.9	0.0	1.0	0.0	0.0	5.1	0.8	0.0	4.7
	0.0				4.7				1.5				4.5				4.7

Location: CSAH 48 (Highland Scenic Rd) at Scenic River Drive
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	N/A				CSAH 48				Scenic River Dr				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
0:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
0:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
1:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
2:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
3:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
4:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
4:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	3
4:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
5:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	3
5:15	0	0	0	0	0	3	0	0	0	0	0	0	0	0	8	0	0	11
5:30	0	0	0	0	0	1	0	0	0	0	0	1	0	0	5	0	0	7
5:45	0	0	0	0	0	4	0	0	0	0	0	0	0	0	12	0	0	16
6:00	0	0	0	0	0	7	0	0	1	0	0	0	0	0	10	0	0	18
6:15	0	0	0	0	0	4	0	0	0	0	0	0	0	0	7	0	0	11
6:30	0	0	0	0	0	4	0	0	1	0	1	0	0	0	15	0	0	21
6:45	0	0	0	0	0	8	0	0	1	0	0	0	0	0	28	0	0	37
7:00	0	0	0	0	2	10	0	0	0	0	1	0	0	0	40	0	0	53
7:15	0	0	0	0	1	43	0	0	1	0	1	0	0	0	69	0	0	115
7:30	0	0	0	0	0	90	0	0	7	0	2	0	0	0	120	0	0	219
7:45	0	0	0	0	3	110	0	0	1	0	3	0	0	0	158	1	0	276
8:00	0	0	0	0	0	46	0	0	2	0	0	0	0	0	95	2	0	145
8:15	0	0	0	0	0	22	0	0	1	0	2	0	0	0	57	0	0	82
8:30	0	0	0	0	1	11	0	0	0	0	1	0	0	0	22	0	0	35
8:45	0	0	0	0	0	13	0	0	0	0	1	0	0	0	27	0	0	41
9:00	0	0	0	0	0	11	0	0	0	0	1	0	0	0	25	0	0	37
9:15	0	0	0	0	1	13	0	0	2	0	3	0	0	0	11	0	0	30
9:30	0	0	0	0	0	14	0	0	0	0	1	0	0	0	20	1	0	36
9:45	0	0	0	0	0	14	0	0	1	0	0	0	0	0	10	1	0	26
10:00	0	0	0	0	1	12	0	0	0	0	0	0	0	0	12	0	0	25
10:15	0	0	0	0	1	14	0	0	2	0	0	0	0	0	14	0	0	31
10:30	0	0	0	0	1	17	0	0	0	0	1	0	0	0	14	0	0	33
10:45	0	0	0	0	0	31	0	0	1	0	2	0	0	0	14	0	0	48
11:00	0	0	0	0	2	18	0	0	0	0	0	0	0	0	19	0	0	39
11:15	0	0	0	0	0	21	0	0	2	0	2	0	0	0	14	0	0	39
11:30	0	0	0	0	1	7	0	0	2	0	2	0	0	0	17	1	0	30
11:45	0	0	0	0	3	23	0	0	0	0	0	0	0	0	16	2	0	44
12:00	0	0	0	0	0	15	0	0	0	0	0	0	0	0	11	0	0	26
12:15	0	0	0	0	1	21	0	0	0	0	0	0	0	0	15	3	0	40
12:30	0	0	0	0	0	13	0	0	1	0	0	0	0	0	20	1	0	35
12:45	0	0	0	0	1	23	0	0	0	0	0	0	0	0	42	0	0	66
13:00	0	0	0	0	0	18	0	0	3	0	0	0	0	0	15	2	0	38
13:15	0	0	0	0	0	21	0	0	1	0	1	0	0	0	12	2	0	37
13:30	0	0	0	0	0	23	0	0	0	0	0	0	0	0	19	0	0	42
13:45	0	0	0	0	0	29	0	0	2	0	1	0	0	0	15	0	0	47
14:00	0	0	0	0	1	23	0	0	0	0	0	0	0	0	21	1	0	46
14:15	0	0	0	0	1	27	0	0	0	0	0	2	0	0	16	0	0	46
14:30	0	0	0	0	1	56	0	0	2	0	1	0	0	0	19	0	0	79
14:45	0	0	0	0	1	48	0	0	1	0	0	0	0	0	85	1	0	136
15:00	0	0	0	0	3	40	0	0	0	0	0	0	0	0	85	2	0	130
15:15	0	0	0	0	1	53	0	0	1	0	1	0	0	0	38	1	0	95
15:30	0	0	0	0	1	48	0	0	0	0	1	0	0	0	35	2	0	87
15:45	0	0	0	0	1	28	0	0	1	0	1	0	0	0	27	0	0	58

Location: CSAH 48 (Highland Scenic Rd) at Scenic River Drive
Count Date: 2/9/2022
Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	N/A				CSAH 48				Scenic River Dr				CSAH 48				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	0	0	0	0	1	38	0	0	0	0	1	0	0	24	2	0	66
16:15	0	0	0	0	1	35	0	0	0	0	2	0	0	23	0	0	61
16:30	0	0	0	0	1	37	0	0	2	0	1	0	0	37	0	0	78
16:45	0	0	0	0	1	38	0	0	0	0	1	0	0	31	4	0	75
17:00	0	0	0	0	4	60	0	0	2	0	2	0	0	18	1	0	87
17:15	0	0	0	0	3	34	0	0	1	0	1	0	0	25	3	0	67
17:30	0	0	0	0	2	33	0	0	1	0	2	0	0	18	0	0	56
17:45	0	0	0	0	3	21	0	0	0	0	1	0	0	14	0	0	39
18:00	0	0	0	0	1	18	0	0	1	0	2	0	0	8	2	0	32
18:15	0	0	0	0	1	21	0	0	1	0	0	0	0	12	1	0	36
18:30	0	0	0	0	0	15	0	0	0	0	1	0	0	14	0	0	30
18:45	0	0	0	0	2	13	0	0	0	0	0	0	0	8	0	0	23
19:00	0	0	0	0	0	18	0	0	0	0	0	0	0	4	0	0	22
19:15	0	0	0	0	5	7	0	0	0	0	1	0	0	12	0	0	25
19:30	0	0	0	0	1	8	0	0	0	0	0	0	0	17	1	0	27
19:45	0	0	0	0	0	12	0	0	1	0	0	0	0	5	1	0	19
20:00	0	0	0	0	3	19	0	0	0	0	0	0	0	4	1	0	27
20:15	0	0	0	0	1	7	0	0	1	0	0	0	0	8	1	0	18
20:30	0	0	0	0	1	15	0	0	0	0	1	0	0	9	0	0	26
20:45	0	0	0	0	2	10	0	0	0	0	0	0	0	12	0	0	24
21:00	0	0	0	0	0	9	0	0	0	0	0	0	0	7	0	0	16
21:15	0	0	0	0	0	11	0	0	0	0	1	0	0	7	1	0	20
21:30	0	0	0	0	0	9	0	0	1	0	0	0	0	4	0	0	14
21:45	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	6
22:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	4
22:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
22:30	0	0	0	0	0	3	0	0	0	0	0	0	0	5	1	0	9
22:45	0	0	0	0	2	1	0	0	0	0	0	0	0	1	0	0	4
23:00	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
23:15	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	5
23:30	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
23:45	0	0	0	0	0	2	0	0	0	0	1	0	0	2	1	0	6
Total	0	0	0	0	64	1573	0	0	48	0	52	0	0	1687	43	0	3129
Cars+	0	0	0	0	64	1496	0	0	47	0	51	0	0	1612	43	0	3313
Trucks	0	0	0	0	0	77	0	0	1	0	1	0	0	75	0	0	154
% Trucks	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.0	2.1	0.0	1.9	0.0	0.0	4.4	0.0	0.0	4.9
	0.0				4.7				2.0				4.3				

Location: CSAH 48 (Highland Scenic Rd) at Evergreen Drive
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Evergreen Dr				CSAH 48				N/A				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
0:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
1:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
2:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
3:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
4:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
4:30	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	3
4:45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	4
5:00	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	3
5:15	0	0	0	0	0	3	0	0	0	0	0	0	0	3	5	0	0	11
5:30	0	0	0	0	0	1	0	0	0	0	0	0	0	1	5	0	0	7
5:45	1	0	1	0	0	3	0	0	0	0	0	0	0	0	11	0	0	16
6:00	0	0	1	0	0	6	0	0	0	0	0	0	0	2	8	0	0	17
6:15	0	0	0	0	0	4	0	0	0	0	0	0	0	1	6	0	0	11
6:30	0	0	0	0	0	4	0	0	0	0	0	0	0	4	12	0	0	20
6:45	0	0	0	0	0	8	0	0	0	0	0	0	0	2	26	0	0	36
7:00	0	0	0	0	0	12	0	0	0	0	0	0	0	5	36	0	0	53
7:15	0	0	2	0	0	42	0	0	0	0	0	0	0	2	66	0	0	112
7:30	0	0	0	0	0	91	0	0	0	0	0	0	0	7	113	0	0	211
7:45	0	0	0	0	0	112	0	0	0	0	0	0	0	9	150	0	0	271
8:00	1	0	0	0	0	46	0	0	0	0	0	0	0	1	94	0	0	142
8:15	0	0	0	0	0	21	1	0	0	0	0	0	0	2	57	0	0	81
8:30	0	0	1	0	0	11	0	0	0	0	0	0	0	2	21	0	0	35
8:45	0	0	2	0	0	11	1	0	0	0	0	0	0	0	29	0	0	43
9:00	0	0	1	0	0	10	0	0	0	0	0	0	0	2	24	0	0	37
9:15	0	0	1	0	0	13	1	0	0	0	0	0	0	1	13	0	0	29
9:30	0	0	1	0	0	14	1	0	0	0	0	0	0	0	21	0	0	37
9:45	1	0	0	0	0	14	2	0	0	0	0	0	0	1	10	0	0	28
10:00	1	0	0	0	0	13	0	0	0	0	0	0	0	0	11	0	0	25
10:15	1	0	0	0	0	15	1	0	0	0	0	0	0	0	14	0	0	31
10:30	0	0	1	0	0	17	0	0	0	0	0	0	0	0	15	0	0	33
10:45	1	0	3	0	0	28	0	0	0	0	0	0	0	2	14	0	0	48
11:00	1	0	3	0	0	17	0	0	0	0	0	0	0	0	19	0	0	40
11:15	1	0	1	0	0	22	0	0	0	0	0	0	0	0	16	0	0	40
11:30	1	0	0	0	0	8	1	0	0	0	0	0	0	1	17	0	0	28
11:45	0	0	3	0	0	24	0	0	0	0	0	0	0	0	16	0	0	43
12:00	0	0	3	0	0	11	0	0	0	0	0	0	0	0	11	0	0	25
12:15	0	0	1	1	0	21	0	0	0	0	0	0	0	2	13	0	0	37
12:30	2	0	0	0	0	13	0	0	0	0	0	0	0	1	19	0	0	35
12:45	0	0	1	0	0	23	0	0	0	0	0	0	0	3	39	0	0	66
13:00	3	0	1	0	0	19	0	0	0	0	0	0	0	2	14	0	0	39
13:15	0	0	2	0	0	14	0	0	0	0	0	0	0	3	20	0	0	39
13:30	0	0	1	0	0	18	0	0	0	0	0	0	0	2	7	0	0	28
13:45	1	0	3	0	0	24	1	0	0	0	0	0	0	1	11	0	0	41
14:00	0	0	7	0	0	17	2	0	0	0	0	0	0	1	20	0	0	47
14:15	0	0	1	0	0	27	0	0	0	0	0	0	0	4	13	0	0	45
14:30	1	0	1	0	0	58	0	0	0	0	0	0	0	1	19	0	0	80
14:45	0	0	4	0	0	43	1	0	0	0	0	0	0	1	84	0	0	133
15:00	2	0	3	0	0	40	0	0	0	0	0	0	0	1	84	0	0	130
15:15	1	0	3	0	0	52	3	0	0	0	0	0	0	2	37	0	0	98
15:30	0	0	2	0	0	46	0	0	0	0	0	0	0	0	37	0	0	85
15:45	1	0	5	0	0	24	0	0	0	0	0	0	0	0	27	0	0	57

Location: CSAH 48 (Highland Scenic Rd) at Evergreen Drive

Count Date: 2/9/2022

Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Evergreen Dr				CSAH 48				N/A				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
16:00	1	0	1	0	0	37	0	0	0	0	0	0	0	0	26	0	0	65
16:15	1	0	2	0	0	34	1	0	0	0	0	0	0	1	24	0	0	63
16:30	1	0	1	0	0	36	0	0	0	0	0	0	0	1	35	0	0	74
16:45	2	0	4	0	0	35	0	0	0	0	0	0	0	0	32	0	0	73
17:00	1	0	7	0	0	57	0	0	0	0	0	0	0	0	20	0	0	85
17:15	0	0	4	0	0	34	1	0	0	0	0	0	0	1	25	0	0	65
17:30	3	0	3	0	0	31	0	0	0	0	0	0	0	0	20	0	0	57
17:45	0	0	2	0	0	22	0	0	0	0	0	0	0	2	13	0	0	39
18:00	0	0	2	0	0	17	0	0	0	0	0	0	0	0	10	0	0	29
18:15	2	0	2	0	0	20	0	0	0	0	0	0	0	2	10	0	0	36
18:30	0	0	1	0	0	15	0	0	0	0	0	0	0	0	15	0	0	31
18:45	0	0	0	0	0	14	0	0	0	0	0	0	0	1	8	0	0	23
19:00	0	0	2	0	0	16	0	0	0	0	0	0	0	0	4	0	0	22
19:15	0	0	2	0	0	10	0	0	0	0	0	0	0	0	14	0	0	26
19:30	0	0	1	0	0	8	0	0	0	0	0	0	0	0	17	0	0	26
19:45	0	0	0	0	0	12	0	0	0	0	0	0	0	1	4	0	0	17
20:00	0	0	4	0	0	19	0	0	0	0	0	0	0	0	4	0	0	27
20:15	1	0	0	0	0	7	0	0	0	0	0	0	0	0	8	0	0	16
20:30	1	0	0	0	0	16	0	0	0	0	0	0	0	0	10	0	0	27
20:45	0	0	0	0	0	12	0	0	0	0	0	0	0	0	12	0	0	24
21:00	0	0	0	0	0	9	0	0	0	0	0	0	0	1	6	0	0	16
21:15	0	0	0	0	0	11	1	0	0	0	0	0	0	0	8	0	0	20
21:30	0	0	0	0	0	9	0	0	0	0	0	0	0	0	3	0	0	12
21:45	0	0	0	0	0	3	5	0	0	0	0	0	0	0	4	0	0	12
22:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	4
22:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
22:30	0	0	1	0	0	2	0	0	0	0	0	0	0	0	5	0	0	8
22:45	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	4
23:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	3
23:15	0	0	0	0	0	4	0	0	0	0	0	0	0	0	1	0	0	5
23:30	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	4
23:45	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	0	0	5
Total	33	0	100	1	0	1528	23	0	0	0	0	0	0	87	1642	0	0	3076
Cars+	33	0	99	1	0	1451	23	0	0	0	0	0	0	84	1569	0	0	3259
Trucks	0	0	1	0	0	77	0	0	0	0	0	0	0	3	73	0	0	154
% Trucks	0.0	0.0	1.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	4.4	0.0	0.0	5.0
	0.8				5.0				0.0				4.4					

Location: CSAH 48 (Highland Scenic Rd) at Camwood Trail
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	N/A				CSAH 48				Camwood Trl				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
0:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
1:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
2:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:15	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	2
3:30	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
3:45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
4:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
4:30	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2
4:45	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3
5:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
5:15	0	0	0	0	0	2	0	0	0	0	0	0	0	5	0	0	0	7
5:30	0	0	0	0	0	1	0	0	0	0	0	0	0	5	0	0	0	6
5:45	0	0	0	0	0	3	0	0	0	0	0	0	0	11	0	0	0	14
6:00	0	0	0	0	0	5	0	0	2	0	2	0	0	10	1	0	0	20
6:15	0	0	0	0	1	2	0	0	1	0	0	0	0	5	0	0	0	9
6:30	0	0	0	0	0	5	0	0	0	0	1	0	0	13	0	0	0	19
6:45	0	0	0	0	0	6	0	0	1	0	1	0	0	27	0	0	0	35
7:00	0	0	0	0	0	14	0	0	0	0	1	0	0	34	0	0	0	49
7:15	0	0	0	0	0	41	0	0	1	0	3	0	0	69	0	0	0	114
7:30	0	0	0	0	0	87	0	0	5	0	2	0	0	113	0	0	0	207
7:45	0	0	0	0	1	108	0	0	2	0	3	0	0	152	0	0	0	266
8:00	0	0	0	0	1	45	0	0	2	0	4	0	0	98	2	0	0	152
8:15	0	0	0	0	2	21	0	0	0	0	0	0	0	56	1	0	0	80
8:30	0	0	0	0	1	9	0	0	1	0	1	0	0	22	0	0	0	34
8:45	0	0	0	0	0	12	0	0	1	0	0	0	0	26	0	0	0	39
9:00	0	0	0	0	1	9	0	0	0	0	2	0	0	27	0	0	0	39
9:15	0	0	0	0	2	15	0	0	0	0	1	0	0	13	0	0	0	31
9:30	0	0	0	0	0	15	0	0	2	0	1	0	0	21	0	0	0	39
9:45	0	0	0	0	1	13	0	0	1	0	0	0	0	12	1	0	0	28
10:00	0	0	0	0	1	12	0	0	1	0	0	0	0	12	1	0	0	27
10:15	0	0	0	0	0	16	0	0	1	0	3	0	0	14	0	0	0	34
10:30	0	0	0	0	0	15	0	0	1	0	2	0	0	15	0	0	0	33
10:45	0	0	0	0	0	28	0	0	0	0	2	0	0	13	0	0	0	43
11:00	0	0	0	0	1	18	0	0	1	0	0	0	0	18	0	0	0	38
11:15	0	0	0	0	2	20	0	0	2	0	2	0	0	17	2	0	0	45
11:30	0	0	0	0	0	10	0	0	1	0	0	0	0	16	0	0	0	27
11:45	0	0	0	0	0	23	0	0	0	0	1	0	0	17	0	0	0	41
12:00	0	0	0	0	0	10	0	0	2	0	0	0	0	12	2	0	0	26
12:15	0	0	0	0	1	20	0	0	0	0	0	0	0	12	1	1	0	34
12:30	0	0	0	0	1	14	0	0	0	0	0	0	0	20	2	0	0	37
12:45	0	0	0	0	2	21	0	0	2	0	2	0	0	39	0	0	0	66
13:00	0	0	0	0	0	18	0	0	0	0	3	0	0	13	1	0	0	35
13:15	0	0	0	0	0	15	0	0	1	0	0	0	0	20	1	0	0	37
13:30	0	0	0	0	0	20	0	0	0	0	3	0	0	7	0	0	0	30
13:45	0	0	0	0	4	23	0	0	0	0	2	0	0	14	1	0	0	44
14:00	0	0	0	0	0	17	0	0	1	0	0	0	0	20	0	0	0	38
14:15	0	0	0	0	0	29	0	0	0	0	1	0	0	14	0	0	0	44
14:30	0	0	0	0	1	56	0	0	0	0	1	0	0	20	0	0	0	78
14:45	0	0	0	0	1	44	0	0	0	0	4	0	0	81	0	0	0	130
15:00	0	0	0	0	1	41	0	0	0	0	0	0	0	85	3	0	0	130
15:15	0	0	0	0	1	38	0	0	1	0	1	0	0	54	1	0	0	96
15:30	0	0	0	0	1	46	0	0	1	0	1	0	0	37	0	0	0	86
15:45	0	0	0	0	0	25	0	0	0	0	1	0	0	24	2	0	0	52

Location: CSAH 48 (Highland Scenic Rd) at Camwood Trail
Count Date: 2/9/2022
Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	N/A				CSAH 48				Camwood Trl				CSAH 48				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	0	0	0	0	2	37	0	0	0	0	1	0	0	28	0	0	68
16:15	0	0	0	0	3	37	0	0	0	0	0	0	0	25	2	0	67
16:30	0	0	0	0	2	35	0	0	1	0	2	0	0	35	0	0	75
16:45	0	0	0	0	2	35	0	0	0	0	0	0	0	32	3	0	72
17:00	0	0	0	0	2	56	0	0	1	0	1	0	0	19	2	0	81
17:15	0	0	0	0	4	35	0	0	3	0	0	0	0	26	0	0	68
17:30	0	0	0	0	1	28	0	0	1	0	2	0	0	16	5	0	53
17:45	0	0	0	0	3	21	0	0	0	0	1	0	0	16	0	0	41
18:00	0	0	0	0	0	19	0	0	1	0	2	0	0	9	0	0	31
18:15	0	0	0	0	1	17	0	0	1	0	2	0	0	13	0	0	34
18:30	0	0	0	0	2	15	0	0	0	0	3	0	0	13	2	0	35
18:45	0	0	0	0	0	14	0	0	0	0	1	0	0	7	0	0	22
19:00	0	0	0	0	1	16	0	0	0	0	0	0	0	4	0	0	21
19:15	0	0	0	0	0	9	0	0	0	0	1	0	0	12	1	0	23
19:30	0	0	0	0	1	8	0	0	0	0	2	0	0	16	0	0	27
19:45	0	0	0	0	2	12	0	0	0	0	1	0	0	5	0	0	20
20:00	0	0	0	0	1	20	0	0	0	0	2	0	0	4	0	0	27
20:15	0	0	0	0	1	7	0	0	0	0	0	0	0	7	1	0	16
20:30	0	0	0	0	2	15	0	0	1	0	0	0	0	10	1	0	29
20:45	0	0	0	0	0	11	0	0	1	0	0	0	0	12	1	0	25
21:00	0	0	0	0	2	10	0	0	0	0	1	0	0	7	0	0	20
21:15	0	0	0	0	1	11	0	0	0	0	0	0	0	9	0	0	21
21:30	0	0	0	0	0	10	0	0	0	0	0	0	0	3	0	0	13
21:45	0	0	0	0	0	3	0	0	0	0	0	0	0	5	0	0	8
22:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	4
22:15	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
22:30	0	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	6
22:45	0	0	0	0	0	4	0	0	0	0	0	0	0	2	0	0	6
23:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
23:15	0	0	0	0	0	4	0	0	0	0	0	0	0	1	0	0	5
23:30	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
23:45	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	0	5
Total	0	0	0	0	62	1496	0	0	45	0	73	0	0	1672	40	1	3059
Cars+ Trucks	0	0	0	0	62	1420	0	0	45	0	73	0	0	1596	40	1	3236
	0	0	0	0	0	76	0	0	0	0	0	0	0	76	0	0	152
% Trucks	0.0	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	5.0
	0.0				4.9				0.0				4.4				

Location: CSAH 48 (Highland Scenic Rd) at Berrywood Dr
 Count Date: 11/10/2021
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Berrywood Drive				CSAH 48				Driveway				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
0:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
0:30	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	3
0:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
1:45	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2:15	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	4
3:30	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
3:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	3
4:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
5:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	3
5:15	0	0	0	1	0	1	0	0	0	0	0	0	0	1	3	0	0	5
5:30	0	0	0	0	0	4	0	0	0	0	0	0	0	0	9	0	0	13
5:45	0	0	0	0	1	6	0	0	0	0	0	0	0	0	6	0	0	13
6:00	0	0	2	0	0	10	0	0	0	0	0	0	0	1	10	0	0	23
6:15	2	1	2	0	0	6	1	0	0	0	0	0	0	1	15	2	0	30
6:30	0	0	1	0	1	11	0	1	0	0	0	1	0	0	20	0	0	34
6:45	0	0	0	0	1	5	0	0	0	0	0	0	0	1	37	1	0	45
7:00	0	0	1	0	0	19	2	0	0	0	0	0	0	0	36	0	0	58
7:15	0	0	2	0	0	48	1	0	0	0	0	0	0	1	81	0	0	133
7:30	2	0	1	0	0	90	0	0	0	0	0	0	0	3	128	2	0	226
7:45	0	0	3	0	0	105	0	0	0	0	0	1	0	4	142	0	0	255
8:00	2	0	0	0	0	33	1	0	0	0	0	0	0	1	99	0	0	136
8:15	2	0	1	0	1	12	0	0	0	1	1	0	0	2	35	0	0	55
8:30	4	0	2	0	0	15	1	0	0	0	0	0	0	4	47	0	0	73
8:45	0	0	1	0	0	7	3	0	0	0	0	0	0	2	28	0	0	41
9:00	2	0	0	0	0	11	1	0	0	0	2	0	0	2	18	0	0	36
9:15	0	0	0	0	0	9	2	0	0	0	0	0	0	1	13	0	0	25
9:30	0	0	1	0	0	13	0	0	0	0	0	0	0	0	24	0	0	38
9:45	0	0	1	0	0	14	1	0	0	0	0	0	0	1	20	0	0	37
10:00	1	0	2	0	0	14	1	0	0	0	0	0	1	0	9	0	0	27
10:15	1	0	0	1	1	18	1	1	0	0	0	0	0	1	13	0	0	35
10:30	1	0	2	0	0	14	2	0	0	1	0	0	0	0	14	0	0	34
10:45	1	0	1	0	0	17	2	0	0	0	0	0	0	3	20	0	0	44
11:00	3	0	1	0	0	22	0	0	0	0	0	0	0	1	24	0	0	51
11:15	0	0	1	0	0	20	3	0	0	0	0	1	0	2	16	1	0	44
11:30	0	0	0	0	0	12	1	0	0	0	0	0	0	0	14	0	0	27
11:45	0	0	3	0	0	30	0	0	0	0	0	0	0	0	24	0	0	57
12:00	0	0	2	0	0	22	0	0	0	0	0	0	0	3	14	0	0	41
12:15	0	0	3	0	0	17	2	0	0	0	0	0	0	1	25	0	0	48
12:30	1	0	1	0	0	22	5	0	0	0	0	0	0	1	30	0	0	60
12:45	1	0	1	0	0	26	1	0	0	0	1	0	0	3	25	0	0	58
13:00	2	0	2	0	0	22	2	0	0	0	0	0	0	0	14	0	0	42
13:15	0	0	1	0	1	14	0	0	0	0	0	1	0	0	13	0	0	30
13:30	2	0	2	0	1	19	0	0	0	0	0	0	0	0	22	0	0	46
13:45	2	0	0	0	0	30	0	0	0	0	0	0	0	1	19	0	0	52
14:00	0	0	1	0	0	28	1	0	0	0	0	0	0	0	22	0	0	52
14:15	0	0	2	0	0	20	1	0	0	0	0	0	0	3	18	0	0	44
14:30	2	0	4	0	0	57	0	0	0	0	0	0	0	3	28	0	0	94
14:45	1	0	3	0	0	54	2	0	0	0	0	0	0	0	29	0	0	89
15:00	3	0	0	0	0	43	2	0	0	1	0	0	0	2	119	0	0	170
15:15	0	0	1	0	0	87	2	0	0	1	0	1	0	2	62	0	0	156
15:30	0	0	1	0	0	34	2	0	0	2	0	0	0	1	35	0	0	75
15:45	3	0	2	0	0	34	1	0	0	0	0	0	0	1	33	0	0	74

Location: CSAH 48 (Highland Scenic Rd) at Berrywood Dr
Count Date: 11/10/2021
Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Berrywood Drive				CSAH 48				Driveway				CSAH 48				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
16:00	1	0	0	0	0	37	1	0	0	0	0	0	0	0	27	0	0	66
16:15	0	0	3	0	0	50	1	0	0	0	0	0	0	3	22	0	0	79
16:30	0	0	3	0	0	47	1	0	0	0	0	0	0	3	23	0	0	77
16:45	1	0	1	0	0	34	0	0	0	0	0	0	0	1	24	0	0	61
17:00	0	0	4	0	0	49	2	0	0	0	0	0	0	3	39	0	0	97
17:15	0	0	2	0	0	46	1	0	0	0	0	0	0	2	12	0	0	63
17:30	1	0	3	0	0	27	3	0	0	0	0	0	0	2	22	0	0	58
17:45	0	0	5	0	0	26	1	0	0	0	0	0	0	1	18	0	0	51
18:00	1	0	6	0	0	22	3	0	0	0	0	0	0	5	14	0	0	51
18:15	2	0	3	0	0	15	1	0	0	0	0	0	0	5	14	0	0	40
18:30	0	0	2	0	0	8	0	0	0	0	0	0	0	0	13	0	0	23
18:45	0	0	3	0	0	14	0	0	0	0	0	0	0	0	14	0	0	31
19:00	0	0	2	0	0	15	0	0	0	0	0	0	0	1	8	0	0	26
19:15	0	0	3	0	0	12	0	0	0	0	0	0	0	0	10	0	0	25
19:30	0	0	2	0	0	6	0	0	0	0	0	0	0	1	7	0	0	16
19:45	0	0	8	0	0	8	0	0	0	0	0	0	0	4	3	0	0	23
20:00	1	0	3	0	0	5	0	0	0	0	0	0	0	0	5	0	0	14
20:15	0	0	2	0	0	14	0	0	0	0	0	0	0	1	6	0	0	23
20:30	0	0	2	0	0	21	1	0	0	0	0	0	0	0	4	0	0	28
20:45	0	0	1	0	0	7	0	0	0	0	0	0	0	0	6	0	0	14
21:00	0	0	2	0	0	7	0	0	0	0	0	0	0	0	4	0	0	13
21:15	0	0	0	0	0	6	0	0	0	0	0	0	0	0	2	0	0	8
21:30	0	0	0	0	0	4	1	0	0	0	0	0	0	0	2	0	0	7
21:45	0	0	4	0	0	1	0	0	0	0	0	0	0	0	2	0	0	7
22:00	1	0	1	0	0	2	0	0	0	0	0	0	0	0	5	0	0	9
22:15	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	8
22:30	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
22:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
23:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	0	0	5
23:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
23:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
23:45	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	3
Total	48	2	121	2	7	1606	60	2	6	5	5	1	87	1736	6	0		3392
Cars+	46	1	120	2	7	1535	58	2	5	4	5	1	85	1653	6	0		3525
Trucks	2	1	1	0	0	71	2	0	1	1	0	0	2	83	0	0		164
% Trucks	4.2	50.0	0.8	0.0	0.0	4.4	3.3	0.0	16.7	20.0	0.0	0.0	2.3	4.8	0.0	0.0		4.8
	2.3				4.4				12.5				4.6					

Location: CSAH 48 (Highland Scenic Rd) at College Road
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	CSAH 48				College Rd				CSAH 48				College Rd				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	0	0	0	0	0	1	0	0	0	1	0	0	0	0	4	0	0	6
0:15	0	1	0	0	0	1	0	0	0	0	0	1	0	0	2	0	0	5
0:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
0:45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1:15	1	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	4
1:30	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
2:00	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	3
2:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
2:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	3
2:45	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	0	0	5
3:00	0	1	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	4
3:15	1	1	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	6
3:30	0	0	0	0	0	2	0	0	0	0	0	2	0	0	1	0	0	5
3:45	0	0	0	0	0	4	1	0	1	0	0	1	0	0	0	0	0	7
4:00	0	0	1	0	0	1	1	0	0	0	0	0	0	0	2	0	0	5
4:15	1	0	1	0	0	7	0	0	0	0	0	1	0	0	1	0	0	11
4:30	0	0	0	0	1	5	0	0	0	0	0	1	0	0	1	0	0	8
4:45	0	0	0	0	0	12	0	0	0	0	0	3	0	0	4	0	0	19
5:00	0	2	2	0	0	9	0	0	0	0	0	0	0	1	4	0	0	18
5:15	1	1	2	0	0	15	1	0	1	2	2	0	0	0	5	0	0	30
5:30	0	0	2	0	0	19	1	0	0	4	2	0	0	0	4	0	0	32
5:45	2	1	0	0	2	11	1	0	0	5	5	0	0	0	14	0	0	41
6:00	2	2	1	0	2	18	4	0	1	2	8	0	0	0	11	0	0	51
6:15	2	4	4	0	1	16	4	0	1	1	4	0	0	0	16	1	0	54
6:30	2	5	4	0	3	25	1	0	1	9	5	0	1	32	1	0	89	
6:45	2	4	3	0	12	37	5	0	1	8	12	0	3	31	1	0	119	
7:00	3	3	3	0	13	32	4	0	2	8	30	0	2	31	1	0	132	
7:15	7	10	3	0	34	50	4	0	2	18	53	0	1	60	1	0	243	
7:30	9	17	8	0	68	63	2	0	5	46	74	0	5	51	0	0	348	
7:45	8	31	11	0	72	88	4	0	0	50	88	0	9	74	3	0	438	
8:00	10	19	5	0	34	79	5	0	4	44	70	0	2	67	4	0	343	
8:15	8	10	7	0	11	46	5	0	1	25	40	0	2	60	0	0	215	
8:30	5	2	6	0	10	46	8	0	5	8	27	0	6	44	1	0	168	
8:45	9	6	8	0	10	36	3	0	1	9	23	1	12	50	1	0	168	
9:00	3	4	7	0	5	39	1	0	6	15	15	1	7	40	1	1	143	
9:15	4	8	11	0	7	34	7	0	1	9	10	0	6	33	1	0	131	
9:30	4	5	7	0	10	47	2	0	5	8	19	0	5	45	3	0	160	
9:45	2	8	11	0	6	63	1	0	0	12	9	0	11	59	0	0	182	
10:00	3	4	8	0	12	57	2	0	1	4	10	0	5	43	0	0	149	
10:15	0	12	10	0	9	32	2	0	5	5	19	0	2	29	1	0	126	
10:30	3	6	11	0	6	51	4	0	5	7	6	0	6	54	2	0	161	
10:45	3	20	10	0	9	57	3	0	3	10	11	0	12	54	2	0	194	
11:00	3	10	10	0	9	49	2	0	7	8	13	0	8	34	0	0	153	
11:15	3	9	12	0	17	62	5	0	5	11	10	0	2	45	0	0	181	
11:30	6	8	18	0	9	49	3	0	2	9	15	0	8	45	3	0	175	
11:45	3	7	15	0	22	69	5	0	5	8	13	1	12	51	0	0	210	
12:00	3	3	16	0	13	79	6	0	5	8	10	2	10	55	2	0	210	
12:15	1	9	16	0	14	45	5	0	1	12	8	0	11	46	0	0	168	
12:30	7	9	13	0	4	55	4	0	1	12	15	0	9	62	1	0	192	
12:45	5	13	11	0	14	37	4	0	2	13	33	0	6	52	1	1	191	
13:00	3	5	8	0	13	53	1	0	4	13	11	0	8	58	1	0	178	
13:15	1	6	12	0	9	56	4	0	4	7	11	1	5	43	0	0	158	
13:30	3	8	7	0	14	58	3	0	2	7	9	0	4	46	3	0	164	
13:45	4	8	12	0	18	48	7	0	1	7	12	0	7	61	1	0	186	
14:00	4	5	10	0	13	47	6	0	1	13	12	0	9	54	2	0	176	
14:15	3	10	7	0	26	63	4	0	2	10	5	0	14	55	1	0	200	
14:30	7	24	13	0	39	59	4	0	3	16	8	0	6	52	1	0	232	
14:45	4	21	14	0	33	64	5	0	7	26	40	0	10	61	2	0	287	
15:00	3	15	13	0	14	60	3	0	3	29	77	0	13	73	1	0	304	
15:15	6	20	21	0	43	93	2	0	4	21	27	0	7	50	2	0	296	
15:30	0	13	8	0	25	94	7	0	6	16	32	1	8	61	2	0	272	
15:45	5	7	15	0	11	78	9	0	5	11	20	1	10	65	3	0	239	

Location: CSAH 48 (Highland Scenic Rd) at College Road
Count Date: 2/9/2022
Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	CSAH 48				College Rd				CSAH 48				College Rd				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	3	11	13	0	29	83	6	0	2	19	19	0	8	70	0	0	263
16:15	0	14	16	0	21	76	1	0	2	7	19	0	7	79	3	0	245
16:30	3	13	6	0	20	77	5	0	5	12	30	0	4	77	3	0	255
16:45	6	16	4	0	24	72	5	0	8	11	25	1	7	68	0	0	246
17:00	12	22	13	0	26	89	4	1	2	7	15	1	11	73	2	0	276
17:15	4	16	11	0	20	65	3	0	0	11	11	0	12	65	2	0	220
17:30	4	13	10	0	17	57	1	0	5	7	11	0	2	56	2	0	185
17:45	3	11	6	0	12	53	8	0	3	6	7	0	4	38	1	0	152
18:00	2	9	7	0	13	55	4	0	0	5	6	0	4	47	3	0	155
18:15	1	7	13	0	9	32	2	0	2	5	6	0	2	44	0	0	123
18:30	1	5	5	0	7	35	2	0	0	8	11	0	4	44	2	0	124
18:45	1	7	2	0	14	32	2	0	0	5	9	0	1	40	0	0	113
19:00	0	12	5	0	4	20	0	0	0	4	3	0	2	39	0	0	89
19:15	2	3	2	0	4	21	2	0	0	3	10	0	1	28	1	0	77
19:30	2	6	3	0	4	11	2	0	0	8	7	0	3	36	0	0	82
19:45	2	3	0	0	6	16	1	0	1	2	7	0	9	22	2	0	71
20:00	1	7	1	0	2	20	1	0	0	4	7	0	6	45	1	0	95
20:15	0	6	5	0	3	14	3	0	1	3	6	0	7	24	1	0	73
20:30	0	4	3	0	15	18	0	0	0	5	7	1	8	14	2	0	76
20:45	0	4	1	0	8	14	0	0	1	5	9	1	2	12	0	0	56
21:00	0	0	1	0	6	12	1	0	0	2	7	0	1	17	0	0	47
21:15	1	7	4	0	6	10	0	0	2	2	5	0	0	16	0	0	53
21:30	1	6	4	0	4	12	0	0	0	3	1	0	0	10	1	0	42
21:45	0	1	1	0	3	17	1	0	0	3	3	0	1	13	0	0	43
22:00	0	2	2	0	1	10	1	0	0	4	1	1	0	21	0	0	42
22:15	0	1	0	0	1	3	1	0	0	1	0	0	0	13	0	0	20
22:30	1	1	1	0	2	8	0	0	1	1	0	0	0	9	0	0	24
22:45	0	1	0	0	2	7	0	0	0	1	3	0	0	3	0	0	17
23:00	0	0	0	0	2	1	0	0	0	0	1	0	0	10	0	0	14
23:15	0	2	0	0	3	2	2	0	0	0	0	0	0	7	0	0	16
23:30	1	0	0	0	2	3	1	0	0	0	1	0	0	1	0	0	9
23:45	0	1	0	0	1	1	1	0	0	1	0	0	0	3	0	0	8
Total	220	609	536	0	989	3175	227	1	157	725	1181	13	371	3053	76	2	10143
Cars+	202	573	531	0	949	3146	208	1	155	692	1134	12	371	3012	71	2	11044
Trucks	18	36	5	0	40	29	19	0	2	33	47	1	0	41	5	0	275
% Trucks	8.2	5.9	0.9	0.0	4.0	0.9	8.4	0.0	1.3	4.6	4.0	7.7	0.0	1.3	6.6	0.0	2.7
	4.3				2.0				4.0				1.3				

Location: College Road at TH 371
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	TH 371				College Rd				TH 371				Glory Rd				Int. Total	
	Southbound				Westbound				Northbound				Eastbound					
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds		
0:00	2	5	0	0	0	0	3	0	0	3	1	0	0	0	1	0	0	15
0:15	0	1	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	4
0:30	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	5
0:45	0	2	0	0	1	0	0	0	0	2	1	0	0	1	0	0	0	7
1:00	1	1	0	0	2	0	1	0	0	1	0	0	0	0	0	0	0	6
1:15	0	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
1:30	1	0	0	0	0	0	0	0	0	3	1	0	0	0	1	1	0	7
1:45	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
2:00	0	1	0	0	0	0	1	0	0	3	1	0	0	1	0	0	0	7
2:15	1	1	0	0	0	0	1	0	1	0	1	0	0	0	1	0	0	6
2:30	2	1	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	7
2:45	2	1	0	0	0	1	2	0	0	2	0	0	0	0	1	0	0	9
3:00	0	2	0	0	0	0	1	0	0	4	0	0	0	1	1	0	0	9
3:15	4	4	1	0	1	1	0	0	0	4	0	0	0	0	1	0	0	16
3:30	1	6	2	0	0	3	0	0	1	3	0	0	0	1	1	0	0	18
3:45	0	0	1	0	0	2	1	0	0	1	2	0	0	1	0	0	0	8
4:00	3	2	0	0	1	2	1	0	0	2	0	0	0	0	0	0	0	11
4:15	0	5	1	0	2	3	1	0	0	6	1	0	0	0	0	0	0	19
4:30	2	4	2	0	1	3	1	0	0	5	1	0	0	0	1	0	0	20
4:45	3	1	4	0	0	6	2	0	2	10	0	0	0	0	0	0	0	28
5:00	7	9	1	0	0	1	3	0	1	5	6	0	0	0	1	1	0	35
5:15	11	10	1	0	0	2	6	0	0	13	2	0	0	1	0	0	0	46
5:30	18	15	6	0	0	6	3	0	0	18	1	0	0	0	0	1	0	68
5:45	24	23	1	0	3	5	4	0	0	16	2	0	0	1	1	0	0	80
6:00	17	24	7	0	3	3	14	0	0	25	3	0	0	1	1	0	0	98
6:15	24	33	8	0	1	6	12	0	0	30	4	0	0	2	4	1	0	125
6:30	35	43	9	0	3	4	14	0	4	39	6	0	0	4	8	1	0	170
6:45	39	47	10	0	2	15	14	0	4	49	10	0	0	5	6	4	0	205
7:00	41	39	11	0	4	10	16	0	4	66	13	0	0	7	8	2	0	221
7:15	57	90	20	0	7	25	29	0	12	79	10	0	0	9	13	2	0	353
7:30	64	96	27	0	10	25	34	0	14	102	20	0	0	12	12	1	0	417
7:45	70	96	45	0	12	35	29	0	9	143	19	0	0	20	18	4	0	500
8:00	63	65	31	0	3	37	46	0	8	114	23	0	0	16	15	5	0	426
8:15	32	45	29	0	7	28	19	0	12	71	10	0	0	19	14	3	0	289
8:30	28	44	23	0	2	19	31	0	9	63	11	0	0	25	27	2	0	284
8:45	37	42	28	0	5	32	24	0	21	60	6	0	0	32	27	5	0	319
9:00	28	56	35	0	7	24	22	0	9	57	1	0	0	22	25	8	0	294
9:15	30	38	37	0	9	33	19	0	10	60	4	0	0	52	18	7	0	317
9:30	25	49	50	0	1	35	25	0	14	49	6	0	0	38	28	5	0	325
9:45	38	55	41	0	6	44	32	0	5	56	8	0	0	35	29	9	0	358
10:00	25	61	33	0	1	49	29	0	9	52	7	0	0	28	28	9	0	331
10:15	18	50	35	0	2	36	18	0	9	69	2	0	0	29	12	10	0	290
10:30	24	53	44	0	5	37	21	0	9	70	5	0	0	39	36	15	0	358
10:45	23	56	39	0	6	30	20	0	11	64	4	0	0	57	41	18	0	369
11:00	24	61	40	0	4	45	33	0	11	50	1	0	0	49	32	11	0	361
11:15	17	66	35	0	0	34	41	0	16	54	6	0	0	43	34	10	0	356
11:30	22	68	56	0	12	38	34	0	11	63	0	0	0	47	40	3	0	394
11:45	16	63	43	0	7	49	39	0	15	62	1	1	0	58	37	10	0	400
12:00	31	79	45	0	4	39	54	0	10	46	5	1	0	50	36	8	2	407
12:15	32	61	57	0	3	38	27	0	9	62	2	0	0	52	33	13	0	389
12:30	31	67	45	0	0	38	26	0	14	54	1	0	0	61	34	8	0	379
12:45	47	69	56	0	1	29	19	0	18	52	10	0	0	45	39	13	0	398
13:00	37	74	40	0	5	48	26	0	11	39	1	0	0	45	32	10	0	368
13:15	30	66	43	0	2	42	27	0	14	51	2	0	0	53	34	11	0	375
13:30	33	57	36	0	3	39	29	0	12	46	3	0	0	52	34	18	0	362
13:45	31	71	38	0	2	26	25	0	13	52	5	0	0	60	49	10	0	382
14:00	31	92	34	0	6	39	39	0	14	65	4	0	0	62	27	12	0	425
14:15	21	79	34	0	5	40	34	0	11	50	0	0	0	60	38	9	0	381
14:30	25	95	36	0	17	37	33	0	10	85	3	0	0	39	36	11	0	427
14:45	30	73	23	0	12	34	30	0	14	77	7	0	0	47	47	8	0	402
15:00	27	66	23	0	19	41	38	0	11	94	12	0	0	55	39	11	0	436
15:15	35	75	31	0	6	55	43	0	10	67	7	0	0	45	31	12	0	417
15:30	40	60	43	0	12	43	68	0	13	72	7	0	0	40	52	15	0	465
15:45	30	79	36	0	7	47	39	0	16	79	8	0	0	49	38	22	0	450

Location: College Road at TH 371
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	TH 371				College Rd				TH 371				Glory Rd				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	33	66	33	0	11	39	53	0	14	60	4	0	64	48	11	0	436
16:15	36	72	37	0	10	41	54	0	7	61	3	0	54	41	13	0	429
16:30	21	94	40	0	11	38	66	0	5	86	9	0	53	42	21	0	486
16:45	33	84	30	0	9	28	58	0	13	75	5	0	45	50	18	0	448
17:00	18	73	26	0	13	35	59	0	13	66	3	0	55	45	11	0	417
17:15	32	63	24	0	2	45	41	0	14	68	8	0	55	32	18	0	402
17:30	30	81	24	0	5	25	35	0	6	67	1	0	44	28	12	0	358
17:45	21	49	33	0	3	21	43	0	7	76	4	0	31	27	11	0	326
18:00	22	54	20	0	5	26	18	0	10	43	4	0	22	32	15	0	271
18:15	31	43	19	0	1	18	16	0	9	44	0	0	29	20	9	0	239
18:30	21	33	17	0	2	19	24	0	4	43	3	0	43	29	11	0	249
18:45	15	33	20	0	3	14	15	0	3	35	3	0	25	18	3	0	187
19:00	19	27	13	0	2	15	9	0	3	31	0	0	16	15	4	0	154
19:15	10	43	17	0	2	11	11	0	3	45	2	0	17	17	10	0	188
19:30	14	26	10	0	0	4	4	0	4	37	4	0	13	21	2	0	139
19:45	11	33	9	0	2	10	18	0	3	23	1	0	24	7	3	0	144
20:00	18	32	10	0	2	7	27	0	2	25	3	0	27	12	7	0	172
20:15	6	31	10	0	1	9	18	0	2	21	2	0	12	9	8	0	129
20:30	11	27	8	0	3	9	9	0	0	25	2	0	14	4	6	0	118
20:45	7	25	6	0	0	0	12	0	2	18	1	0	11	4	1	0	87
21:00	8	23	9	0	1	4	17	0	2	25	0	0	6	9	3	0	107
21:15	6	16	7	0	0	3	3	0	1	10	0	0	6	12	1	0	65
21:30	5	15	4	0	0	13	5	0	1	19	1	0	9	9	0	0	81
21:45	9	11	7	0	1	11	10	0	2	14	0	0	5	6	1	0	77
22:00	3	17	6	0	1	4	11	0	2	16	0	0	5	7	4	0	76
22:15	3	9	1	0	1	3	2	0	1	10	0	0	8	9	1	0	48
22:30	4	5	1	0	0	6	5	0	1	8	1	0	6	4	3	0	44
22:45	3	4	2	0	1	2	3	0	1	6	1	0	4	0	3	0	30
23:00	7	6	0	0	1	0	2	0	0	9	1	0	6	6	0	0	38
23:15	2	4	0	0	0	0	1	0	1	7	0	0	4	5	0	0	24
23:30	2	1	0	0	0	0	4	0	0	4	1	0	3	0	3	0	18
23:45	2	5	1	0	1	0	0	0	0	4	1	0	2	2	0	0	18
Total	1856	3713	1820	0	329	1824	1859	0	567	3723	346	2	2189	1693	552	2	18271
Cars+	1819	3531	1812	0	285	1800	1821	0	543	3549	296	2	2167	1675	534	2	19832
Trucks	37	182	8	0	44	24	38	0	24	174	50	0	22	18	18	0	639
% Trucks	2.0	4.9	0.4	0.0	13.4	1.3	2.0	0.0	4.2	4.7	14.5	0.0	1.0	1.1	3.3	0.0	3.5
	3.1				2.6				5.3				1.3				

Location: College Road at Douglas Fir Drive
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Industrial Park Rd				College Rd				Douglas Fir Dr				College Rd				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
0:00	1	0	0	0	0	0	0	0	2	0	0	0	0	4	0	0	7
0:15	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	3
0:30	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	3
0:45	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	3
1:00	0	0	2	0	0	1	0	0	0	0	0	0	0	1	0	0	4
1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	5
1:45	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
2:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:15	1	0	0	0	0	1	0	0	0	0	0	0	1	2	0	0	5
2:30	0	0	1	0	0	1	0	0	0	0	0	0	0	3	0	0	5
2:45	0	0	0	0	0	3	0	0	0	0	0	0	0	2	1	0	6
3:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
3:15	0	0	0	0	0	2	0	0	0	0	0	0	1	3	1	0	7
3:30	0	0	0	0	0	3	0	0	0	0	0	0	1	1	0	0	5
3:45	0	0	0	0	0	3	0	0	0	0	0	0	1	1	0	0	5
4:00	1	0	1	0	0	3	0	0	0	0	0	0	0	3	0	0	8
4:15	0	0	1	0	0	5	0	0	0	0	0	0	0	0	1	0	7
4:30	0	0	0	0	0	5	0	0	0	0	0	0	0	4	0	0	9
4:45	0	0	1	0	0	8	0	0	0	0	0	1	1	2	1	0	14
5:00	0	0	0	0	0	4	0	0	0	0	0	0	2	5	6	0	17
5:15	0	0	0	0	0	8	0	0	0	0	0	0	3	5	8	0	24
5:30	0	0	1	0	0	9	0	0	0	0	0	0	6	12	1	0	29
5:45	0	0	0	0	0	12	2	0	2	2	0	0	8	16	2	0	42
6:00	0	0	1	0	0	15	0	0	6	0	0	0	3	15	4	0	44
6:15	0	0	1	0	0	15	1	0	4	0	0	0	4	26	3	0	54
6:30	1	0	3	0	1	21	1	0	0	0	0	0	11	38	3	0	79
6:45	0	0	2	0	1	28	1	0	0	0	1	0	13	38	1	0	85
7:00	2	0	2	0	0	30	1	0	0	0	0	0	9	56	2	1	102
7:15	0	0	4	0	0	55	0	0	0	0	0	0	11	63	3	0	136
7:30	0	0	5	0	2	68	2	0	1	0	0	0	15	75	7	0	175
7:45	0	0	5	0	3	68	6	0	0	0	2	0	15	88	4	0	191
8:00	1	0	10	0	1	74	1	0	1	0	0	0	13	83	4	0	188
8:15	1	0	5	0	1	46	0	0	1	0	1	0	2	57	1	0	115
8:30	4	0	2	0	1	54	0	0	1	0	0	0	6	61	0	0	129
8:45	0	1	8	0	1	53	4	0	1	0	0	0	1	54	6	0	129
9:00	2	0	3	0	1	45	1	0	1	0	0	0	3	53	0	1	109
9:15	1	0	6	0	0	51	1	0	1	0	0	1	9	40	0	3	109
9:30	0	0	2	0	3	59	1	0	0	0	1	0	2	57	0	0	125
9:45	1	0	4	0	1	75	0	0	3	0	1	0	5	70	0	3	160
10:00	0	0	6	0	0	74	1	0	0	0	1	0	2	52	1	1	137
10:15	0	0	3	0	0	55	1	0	2	0	0	0	3	27	0	0	91
10:30	1	0	6	0	3	54	0	0	2	1	0	0	2	59	1	1	129
10:45	0	1	6	0	0	50	1	0	2	0	0	0	7	65	0	1	132
11:00	0	0	5	0	0	69	0	0	3	0	0	0	3	52	1	0	133
11:15	0	0	2	0	1	72	1	0	3	0	2	0	2	52	3	0	138
11:30	1	0	6	0	1	75	0	0	1	0	0	1	3	56	1	0	144
11:45	3	0	7	0	1	88	0	0	1	0	1	0	1	53	1	1	156
12:00	0	0	11	0	1	86	1	0	1	0	2	2	4	66	1	0	173
12:15	1	0	7	0	4	62	1	0	3	1	0	0	7	62	0	2	148
12:30	0	0	3	0	2	60	1	1	1	1	1	0	2	61	3	1	135
12:45	0	0	5	0	1	48	0	0	2	0	0	0	16	75	1	1	148
13:00	1	0	9	0	2	66	0	0	1	0	0	0	7	61	4	0	151
13:15	0	1	6	0	1	70	1	0	0	0	1	0	4	55	7	0	146
13:30	0	0	4	0	0	63	1	0	0	0	1	0	7	54	3	0	133
13:45	0	0	6	0	1	53	0	0	3	0	0	0	5	72	3	1	143
14:00	1	0	8	0	0	68	0	0	10	0	0	0	5	62	1	0	155
14:15	1	1	6	0	1	68	2	0	2	0	1	0	0	58	1	1	141
14:30	1	1	3	0	1	84	0	0	3	0	1	0	5	56	1	0	156
14:45	0	0	5	0	0	73	2	0	0	0	0	0	5	76	2	0	163
15:00	0	0	6	0	0	66	1	0	5	0	2	0	12	82	0	0	174
15:15	1	0	5	0	2	99	1	0	4	0	2	0	2	69	0	0	185
15:30	3	0	17	0	1	106	1	0	3	0	1	0	6	84	0	0	222
15:45	0	0	7	0	1	87	0	0	1	0	0	0	3	73	0	0	172

Location: College Road at Douglas Fir Drive
Count Date: 2/9/2022
Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

	Industrial Park Rd				College Rd				Douglas Fir Dr				College Rd				
	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
16:00	1	0	10	0	0	94	0	0	1	0	1	0	2	82	0	0	191
16:15	1	1	6	0	1	97	1	0	1	1	0	1	3	76	1	0	189
16:30	6	0	11	0	0	102	0	0	6	0	0	0	3	67	1	0	196
16:45	0	0	8	0	0	84	0	0	9	0	0	0	3	79	0	2	183
17:00	1	0	15	0	1	92	0	0	2	0	0	0	3	64	1	2	179
17:15	0	0	11	0	1	74	0	0	3	0	0	0	3	67	0	0	159
17:30	1	1	4	0	0	57	0	0	0	0	1	0	3	58	0	1	125
17:45	0	0	2	0	0	57	0	0	5	0	0	0	4	50	0	1	118
18:00	0	0	3	0	1	48	0	0	1	0	0	0	2	60	0	1	115
18:15	0	0	1	0	0	34	0	0	0	0	0	0	0	53	1	0	89
18:30	0	0	1	0	0	45	0	0	1	0	0	0	0	55	1	0	103
18:45	0	0	0	0	0	30	0	0	1	0	0	0	1	39	0	0	71
19:00	0	0	2	0	1	25	0	0	1	0	0	0	1	32	0	1	62
19:15	0	0	0	0	0	22	0	0	1	0	0	0	0	26	0	1	49
19:30	0	0	2	0	0	6	0	0	0	0	0	0	2	40	0	0	50
19:45	0	0	5	0	0	24	2	0	0	0	0	0	1	17	0	0	49
20:00	1	1	1	0	0	34	0	0	0	0	0	0	0	31	0	0	68
20:15	1	0	0	0	0	27	0	0	1	0	0	0	0	15	1	0	45
20:30	0	0	2	0	0	18	1	0	0	0	0	0	0	15	1	0	37
20:45	2	0	0	0	0	14	0	0	0	0	0	0	0	12	0	0	28
21:00	0	0	3	0	0	18	0	0	1	0	0	0	0	16	1	0	39
21:15	0	0	2	0	0	4	0	0	0	0	0	0	0	18	0	0	24
21:30	0	0	1	0	0	17	0	0	1	0	0	0	1	13	1	0	34
21:45	0	0	0	0	0	22	0	0	0	0	0	0	0	15	0	0	37
22:00	0	0	0	0	0	11	0	0	4	0	1	0	0	10	0	0	26
22:15	0	0	0	0	0	5	0	0	2	0	0	0	0	12	0	0	19
22:30	0	0	0	0	0	8	0	0	2	0	0	0	1	8	0	0	19
22:45	0	0	0	0	0	6	1	0	0	0	0	0	1	3	0	0	11
23:00	0	0	1	0	0	2	0	0	0	0	0	0	0	14	0	0	17
23:15	1	0	0	0	0	1	0	0	0	0	0	0	0	7	0	0	9
23:30	0	0	0	0	0	3	0	0	1	0	0	0	0	3	0	0	7
23:45	1	0	1	0	0	0	2	0	1	0	0	0	0	4	0	0	9
Total	46	8	312	0	45	3605	46	1	124	4	27	5	298	3487	103	27	7253
Cars+	45	6	276	0	40	3554	46	1	107	3	22	5	269	3410	92	27	7870
Trucks	1	2	36	0	5	51	0	0	17	1	5	0	29	77	11	0	235
% Trucks	2.2	25.0	11.5	0.0	11.1	1.4	0.0	0.0	13.7	25.0	18.5	0.0	9.7	2.2	10.7	0.0	
	10.7				1.5				14.8				3.0				3.2

Location: College Road at Cypress Drive
 Count Date: 2/9/2022
 Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Cypress Dr				College Rd				Cypress Dr				College Rd				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
0:00	0	0	0	0	0	0	1	0	0	0	0	0	1	4	0	0	6
0:15	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2
0:30	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
0:45	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
1:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1:15	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2
1:30	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2
1:45	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	3
2:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2:15	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
2:30	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	3
2:45	0	0	1	0	0	2	0	0	1	0	0	0	0	3	0	0	7
3:00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
3:15	0	0	0	0	0	2	0	0	0	0	0	0	2	2	0	0	6
3:30	0	0	1	0	0	2	0	0	0	1	0	0	0	1	0	0	5
3:45	1	0	0	0	0	4	1	0	0	0	0	0	0	1	0	0	7
4:00	0	0	0	0	0	2	0	0	0	1	0	0	0	3	0	0	6
4:15	0	1	1	0	1	5	0	0	1	0	0	0	0	0	1	0	10
4:30	0	0	1	0	0	5	1	0	0	1	0	0	1	1	1	0	11
4:45	1	1	0	0	1	10	2	0	1	1	1	0	0	2	0	0	20
5:00	0	0	5	0	2	4	2	0	0	0	0	0	0	4	0	0	17
5:15	1	5	3	0	3	10	0	0	0	1	0	0	0	4	0	0	27
5:30	0	5	0	0	1	14	3	0	0	1	1	0	0	3	3	0	31
5:45	2	3	5	0	2	8	3	0	1	10	1	0	0	11	0	0	46
6:00	2	3	5	0	2	11	3	0	1	1	1	0	0	12	3	0	44
6:15	3	4	0	0	1	18	1	0	2	2	1	0	2	11	1	0	46
6:30	5	0	6	0	3	19	6	0	0	3	2	0	5	35	0	0	84
6:45	6	2	10	0	1	35	5	0	1	2	1	0	4	24	1	0	92
7:00	3	4	9	0	2	28	4	0	1	7	1	0	10	34	1	0	104
7:15	10	4	10	0	1	48	3	0	2	5	3	0	10	49	1	0	146
7:30	7	4	14	0	3	61	8	0	1	5	10	0	21	42	1	0	177
7:45	13	4	9	0	6	81	15	1	4	4	4	0	11	72	0	0	223
8:00	10	10	10	0	2	75	14	0	1	2	2	0	10	57	3	0	196
8:15	15	2	7	0	2	44	6	0	2	2	0	0	3	48	0	0	131
8:30	6	1	9	0	0	41	10	0	3	2	2	0	7	52	0	0	133
8:45	5	4	5	0	0	50	10	0	3	6	2	0	4	52	3	0	144
9:00	7	0	5	0	3	42	6	0	2	3	3	1	5	47	3	0	126
9:15	8	2	2	0	1	38	7	0	2	2	0	0	5	31	1	0	99
9:30	11	1	7	0	0	50	5	0	5	2	4	0	10	49	3	0	147
9:45	9	2	3	0	1	68	7	0	2	3	4	0	10	52	2	0	163
10:00	8	1	2	0	1	60	7	0	6	3	0	0	5	46	0	0	139
10:15	8	2	7	0	1	44	6	0	3	3	3	0	4	26	0	0	107
10:30	15	2	6	0	3	51	12	0	5	2	0	0	7	51	1	0	155
10:45	20	6	7	0	3	43	17	0	1	6	2	0	9	52	2	0	168
11:00	9	4	4	0	2	57	11	0	1	2	2	0	7	36	3	0	138
11:15	10	3	10	0	3	64	8	0	2	5	3	0	11	42	3	0	164
11:30	13	4	7	0	0	62	7	0	2	7	0	0	9	48	2	0	161
11:45	9	7	6	0	6	75	4	0	1	1	4	0	8	56	2	0	179
12:00	11	4	7	0	5	75	15	0	1	7	2	0	11	56	5	0	199
12:15	10	8	4	0	2	55	9	0	2	6	3	0	7	50	1	0	157
12:30	9	7	9	0	1	62	8	0	0	5	4	0	14	55	3	0	177
12:45	10	6	9	0	4	38	5	0	4	7	5	0	8	56	2	0	154
13:00	12	9	13	0	5	56	5	0	3	5	2	0	4	53	5	0	172
13:15	10	11	9	0	9	52	14	0	5	2	2	0	9	37	4	0	164
13:30	10	6	10	0	1	56	9	0	2	8	2	0	12	49	0	0	165
13:45	11	7	4	0	3	46	8	0	3	3	1	0	11	58	2	0	157
14:00	8	3	9	0	1	62	11	0	1	18	9	0	7	68	5	0	202
14:15	10	2	5	0	3	59	11	0	2	4	5	0	9	46	3	0	159
14:30	10	2	11	0	3	61	5	0	3	5	4	0	7	55	3	0	169
14:45	12	3	5	0	0	63	12	0	2	5	5	0	12	59	1	0	179
15:00	14	8	10	0	1	69	14	0	4	4	4	0	12	74	3	0	217
15:15	8	4	7	0	3	96	17	0	1	4	3	0	11	51	1	0	206
15:30	8	9	10	0	2	86	18	1	4	7	5	0	13	65	5	0	232
15:45	8	5	3	0	2	79	11	0	4	2	3	0	10	71	3	0	201

Location: College Road at Cypress Drive
Count Date: 2/9/2022
Counted By: CountCloud



TURNING MOVEMENT COUNT DATA

All Vehicles

Start Time	Cypress Dr				College Rd				Cypress Dr				College Rd				Int. Total
	Southbound				Westbound				Northbound				Eastbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	6	5	4	0	0	74	16	0	1	3	1	0	8	67	3	0	188
16:15	21	6	8	0	1	80	9	0	3	5	2	0	6	68	6	0	215
16:30	15	4	11	0	1	65	17	0	2	9	6	0	14	68	2	0	214
16:45	13	7	5	0	3	64	10	0	1	6	2	0	13	67	6	0	197
17:00	17	7	8	0	2	73	22	0	4	6	4	0	14	68	1	0	226
17:15	13	7	9	0	2	58	13	0	1	3	7	0	8	65	3	0	189
17:30	28	7	7	0	2	47	14	0	0	5	1	0	6	48	3	0	168
17:45	11	7	3	0	2	43	12	0	4	7	0	0	8	42	3	0	142
18:00	12	1	4	0	3	39	5	0	0	11	1	0	8	55	3	0	142
18:15	23	2	1	0	3	27	1	0	1	1	0	0	5	46	2	0	112
18:30	7	4	4	0	1	36	7	0	1	0	1	0	2	51	5	0	119
18:45	8	0	2	0	0	28	5	0	3	0	3	0	6	34	2	0	91
19:00	6	3	3	0	1	18	7	0	0	1	0	0	0	34	2	0	75
19:15	6	2	2	0	1	18	2	0	0	0	0	0	2	24	1	0	58
19:30	3	3	1	0	1	8	3	0	0	2	0	0	6	24	2	0	53
19:45	3	0	0	0	0	23	6	0	0	3	0	0	1	16	0	0	52
20:00	9	3	1	0	1	36	5	0	0	0	0	0	3	26	1	0	85
20:15	3	1	0	0	1	36	5	0	0	1	0	0	3	11	4	0	65
20:30	4	3	2	0	0	15	2	0	1	1	1	0	2	13	1	0	45
20:45	1	2	0	0	1	14	3	0	0	1	0	0	1	11	0	0	34
21:00	4	3	1	0	0	14	1	1	1	1	1	0	0	14	4	0	44
21:15	1	4	0	0	8	4	1	1	2	1	0	0	2	14	1	0	38
21:30	2	1	2	0	0	15	1	0	1	0	2	0	4	10	0	0	38
21:45	1	2	2	0	0	18	1	0	0	1	0	0	1	12	1	0	39
22:00	1	0	1	0	1	10	1	0	0	5	10	0	2	12	0	0	43
22:15	0	0	2	0	0	3	0	0	0	0	0	0	0	13	0	0	18
22:30	2	2	0	0	1	7	3	0	0	2	1	0	1	6	1	0	26
22:45	2	2	0	0	0	6	0	0	1	0	0	0	0	2	1	0	14
23:00	0	2	0	0	1	2	0	0	0	0	0	0	0	12	2	0	19
23:15	0	0	0	0	0	1	0	0	0	0	1	0	1	6	1	0	10
23:30	1	0	0	0	0	3	1	0	0	0	0	0	1	1	1	0	8
23:45	0	1	1	0	0	1	0	0	0	0	0	0	0	3	1	0	7
Total	601	277	387	0	139	3137	542	4	127	264	160	1	466	2919	150	0	8179
Cars+	580	268	363	0	136	3118	529	4	125	255	157	1	434	2885	149	0	8999
Trucks	21	9	24	0	3	19	13	0	2	9	3	0	32	34	1	0	170
% Trucks	3.5	3.2	6.2	0.0	2.2	0.6	2.4	0.0	1.6	3.4	1.9	0.0	6.9	1.2	0.7	0.0	2.1
	4.3				0.9				2.5				1.9				

Appendix B

Warrant Analysis Results

CSAH 48 at Forestview Dr - 2022 Existing ALL WAY STOP WARRANT ANALYSIS

LOCATION: CSAH 48 at Forestview Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach Total
55	Major App1: CSAH 48 EB	2	2129
55	Major App3: CSAH 48 WB	2	2031
30	Minor App2: Forestview Dr NB	1	505
30	Minor App4: N/A	1	0

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement

210

140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
Hour	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	1	5	3	0	6	3	NO / NO
1:00 - 2:00	4	2	0	0	6	0	NO / NO
2:00 - 3:00	1	2	1	0	3	1	NO / NO
3:00 - 4:00	3	1	0	0	4	0	NO / NO
4:00 - 5:00	2	4	3	0	6	3	NO / NO
5:00 - 6:00	20	15	16	0	35	16	NO / NO
6:00 - 7:00	98	50	27	0	148	27	NO / NO
7:00 - 8:00	408	294	88	0	702	88	YES / NO
8:00 - 9:00	228	79	32	0	307	32	YES / NO
9:00 - 10:00	82	56	36	0	138	36	NO / NO
10:00 - 11:00	63	84	23	0	147	23	NO / NO
11:00 - 12:00	92	107	28	0	199	28	NO / NO
12:00 - 13:00	134	111	17	0	245	17	YES / NO
13:00 - 14:00	92	111	17	0	203	17	NO / NO
14:00 - 15:00	116	204	40	0	320	40	YES / NO
15:00 - 16:00	308	241	35	0	549	35	YES / NO
16:00 - 17:00	152	216	39	0	368	39	YES / NO
17:00 - 18:00	140	206	38	0	346	38	YES / NO
18:00 - 19:00	80	84	21	0	164	21	NO / NO
19:00 - 20:00	50	58	13	0	108	13	NO / NO
20:00 - 21:00	24	59	14	0	83	14	NO / NO
21:00 - 22:00	14	19	6	0	33	6	NO / NO
22:00 - 23:00	10	17	5	0	27	5	NO / NO
23:00 - 24:00	7	6	3	0	13	3	NO / NO
Daily	2129	2031	505	0			

Hours met for warrant: Met (Hr) 0 Required (Hr) 8

All-way Stop Warrant:

Not satisfied

REMARKS:

CSAH 48 at Forestview Dr - 2022 Existing SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: CSAH 48 at Forestview Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	2129
55	Major App3: CSAH 48 WB	2	2031
30	Minor App2: Forestview Dr NB	1	288
30	Minor App4: N/A	1	0

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	105	53	84

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
Hour	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP. 1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	1	5	3	0	6	3	NO / NO	NO / NO	NO / NO
1:00 - 2:00	4	2	0	0	6	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	1	2	0	0	3	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	3	1	0	0	4	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	2	4	1	0	6	1	NO / NO	NO / NO	NO / NO
5:00 - 6:00	20	15	8	0	35	8	NO / NO	NO / NO	NO / NO
6:00 - 7:00	98	50	15	0	148	15	NO / NO	NO / NO	NO / NO
7:00 - 8:00	408	294	54	0	702	54	YES / NO	YES / YES	YES / NO
8:00 - 9:00	228	79	22	0	307	22	NO / NO	NO / NO	NO / NO
9:00 - 10:00	82	56	22	0	138	22	NO / NO	NO / NO	NO / NO
10:00 - 11:00	63	84	16	0	147	16	NO / NO	NO / NO	NO / NO
11:00 - 12:00	92	107	15	0	199	15	NO / NO	NO / NO	NO / NO
12:00 - 13:00	134	111	7	0	245	7	NO / NO	NO / NO	NO / NO
13:00 - 14:00	92	111	13	0	203	13	NO / NO	NO / NO	NO / NO
14:00 - 15:00	116	204	21	0	320	21	NO / NO	NO / NO	NO / NO
15:00 - 16:00	308	241	21	0	549	21	YES / NO	NO / NO	YES / NO
16:00 - 17:00	152	216	19	0	368	19	NO / NO	NO / NO	NO / NO
17:00 - 18:00	140	206	22	0	346	22	NO / NO	NO / NO	NO / NO
18:00 - 19:00	80	84	10	0	164	10	NO / NO	NO / NO	NO / NO
19:00 - 20:00	50	58	5	0	108	5	NO / NO	NO / NO	NO / NO
20:00 - 21:00	24	59	5	0	83	5	NO / NO	NO / NO	NO / NO
21:00 - 22:00	14	19	4	0	33	4	NO / NO	NO / NO	NO / NO
22:00 - 23:00	10	17	3	0	27	3	NO / NO	NO / NO	NO / NO
23:00 - 24:00	7	6	2	0	13	2	NO / NO	NO / NO	NO / NO
Daily	2129	2031	288	0					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	1	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	1	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS:

CSAH 48 at Forestview Dr - 2022 Existing SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: CSAH 48 at Forestview Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	2129
55	Major App3: CSAH 48 WB	2	2031
30	Minor App2: Forestview Dr NB	1	288
30	Minor App4: N/A	1	0

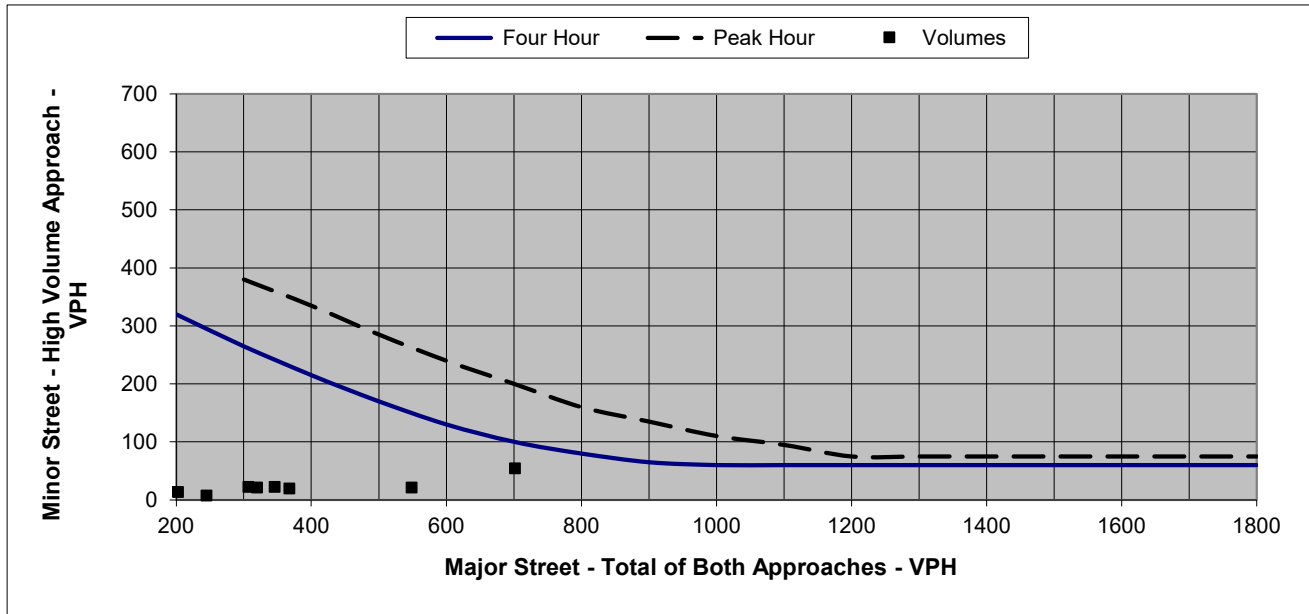


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200	320	
300	265	380
400	215	335
500	170	285
600	130	240
700	100	200
800	80	160
900	65	135
1000	60	110
1100	60	95
1200	60	75
1300	60	75
1400	60	75
1500	60	75
1600	60	75
1700	60	75
1800	60	75

Actual Hourly Count			Warrants Met:	
HOURLY	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	6	3	NO	NO
1:00 - 2:00	6	0	NO	NO
2:00 - 3:00	3	0	NO	NO
3:00 - 4:00	4	0	NO	NO
4:00 - 5:00	6	1	NO	NO
5:00 - 6:00	35	8	NO	NO
6:00 - 7:00	148	15	NO	NO
7:00 - 8:00	702	54	NO	NO
8:00 - 9:00	307	22	NO	NO
9:00 - 10:00	138	22	NO	NO
10:00 - 11:00	147	16	NO	NO
11:00 - 12:00	199	15	NO	NO
12:00 - 13:00	245	7	NO	NO
13:00 - 14:00	203	13	NO	NO
14:00 - 15:00	320	21	NO	NO
15:00 - 16:00	549	21	NO	NO
16:00 - 17:00	368	19	NO	NO
17:00 - 18:00	346	22	NO	NO
18:00 - 19:00	164	10	NO	NO
19:00 - 20:00	108	5	NO	NO
20:00 - 21:00	83	5	NO	NO
21:00 - 22:00	33	4	NO	NO
22:00 - 23:00	27	3	NO	NO
23:00 - 24:00	13	2	NO	NO

CSAH 48 at Evergreen Dr - 2022 Existing ALL WAY STOP WARRANT ANALYSIS

LOCATION: CSAH 48 at Evergreen Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach Total
55	Major App1: CSAH 48 EB	2	2079
55	Major App3: CSAH 48 WB	2	1961
30	Minor App2: Evergreen Dr SB	1	146
30	Minor App4: N/A	1	0

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement
210 140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
HOURLY	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	1	4	1	0	5	1	NO / NO
1:00 - 2:00	3	1	1	0	4	1	NO / NO
2:00 - 3:00	2	2	0	0	4	0	NO / NO
3:00 - 4:00	3	1	0	0	4	0	NO / NO
4:00 - 5:00	4	4	0	0	8	0	NO / NO
5:00 - 6:00	28	14	2	0	42	2	NO / NO
6:00 - 7:00	108	46	1	0	154	1	NO / NO
7:00 - 8:00	430	289	2	0	719	2	YES / NO
8:00 - 9:00	230	76	4	0	306	4	YES / NO
9:00 - 10:00	91	55	4	0	146	4	NO / NO
10:00 - 11:00	61	81	7	0	142	7	NO / NO
11:00 - 12:00	91	103	10	0	194	10	NO / NO
12:00 - 13:00	124	107	7	0	231	7	YES / NO
13:00 - 14:00	78	99	11	0	177	11	NO / NO
14:00 - 15:00	117	193	16	0	310	16	YES / NO
15:00 - 16:00	294	234	18	0	528	18	YES / NO
16:00 - 17:00	129	208	16	0	337	16	YES / NO
17:00 - 18:00	129	197	26	0	326	26	YES / NO
18:00 - 19:00	70	81	7	0	151	7	NO / NO
19:00 - 20:00	37	59	5	0	96	5	NO / NO
20:00 - 21:00	25	60	7	0	85	7	NO / NO
21:00 - 22:00	11	25	0	0	36	0	NO / NO
22:00 - 23:00	8	16	1	0	24	1	NO / NO
23:00 - 24:00	5	6	0	0	11	0	NO / NO
Daily	2079	1961	146	0			

Hours met for warrant: Met (Hr) 0 Required (Hr) 8

All-way Stop Warrant:

Not satisfied

REMARKS:

CSAH 48 at Evergreen Dr - 2022 Existing SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: CSAH 48 at Evergreen Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	2079
55	Major App3: CSAH 48 WB	2	1961
30	Minor App2: Evergreen Dr SB	1	35
30	Minor App4: N/A	1	0

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	105	53	84

HOUR	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	1	4	0	0	5	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	3	1	0	0	4	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	2	2	0	0	4	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	3	1	0	0	4	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	4	4	0	0	8	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	28	14	1	0	42	1	NO / NO	NO / NO	NO / NO
6:00 - 7:00	108	46	0	0	154	0	NO / NO	NO / NO	NO / NO
7:00 - 8:00	430	289	0	0	719	0	YES / NO	YES / NO	YES / NO
8:00 - 9:00	230	76	1	0	306	1	NO / NO	NO / NO	NO / NO
9:00 - 10:00	91	55	1	0	146	1	NO / NO	NO / NO	NO / NO
10:00 - 11:00	61	81	3	0	142	3	NO / NO	NO / NO	NO / NO
11:00 - 12:00	91	103	3	0	194	3	NO / NO	NO / NO	NO / NO
12:00 - 13:00	124	107	2	0	231	2	NO / NO	NO / NO	NO / NO
13:00 - 14:00	78	99	4	0	177	4	NO / NO	NO / NO	NO / NO
14:00 - 15:00	117	193	1	0	310	1	NO / NO	NO / NO	NO / NO
15:00 - 16:00	294	234	4	0	528	4	YES / NO	NO / NO	YES / NO
16:00 - 17:00	129	208	6	0	337	6	NO / NO	NO / NO	NO / NO
17:00 - 18:00	129	197	5	0	326	5	NO / NO	NO / NO	NO / NO
18:00 - 19:00	70	81	2	0	151	2	NO / NO	NO / NO	NO / NO
19:00 - 20:00	37	59	0	0	96	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	25	60	2	0	85	2	NO / NO	NO / NO	NO / NO
21:00 - 22:00	11	25	0	0	36	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	8	16	0	0	24	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	5	6	0	0	11	0	NO / NO	NO / NO	NO / NO
Daily	2079	1961	35	0					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	0	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS: _____

CSAH 48 at Evergreen Dr - 2022 Existing SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: CSAH 48 at Evergreen Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	2079
55	Major App3: CSAH 48 WB	2	1961
30	Minor App2: Evergreen Dr SB	1	35
30	Minor App4: N/A	1	0

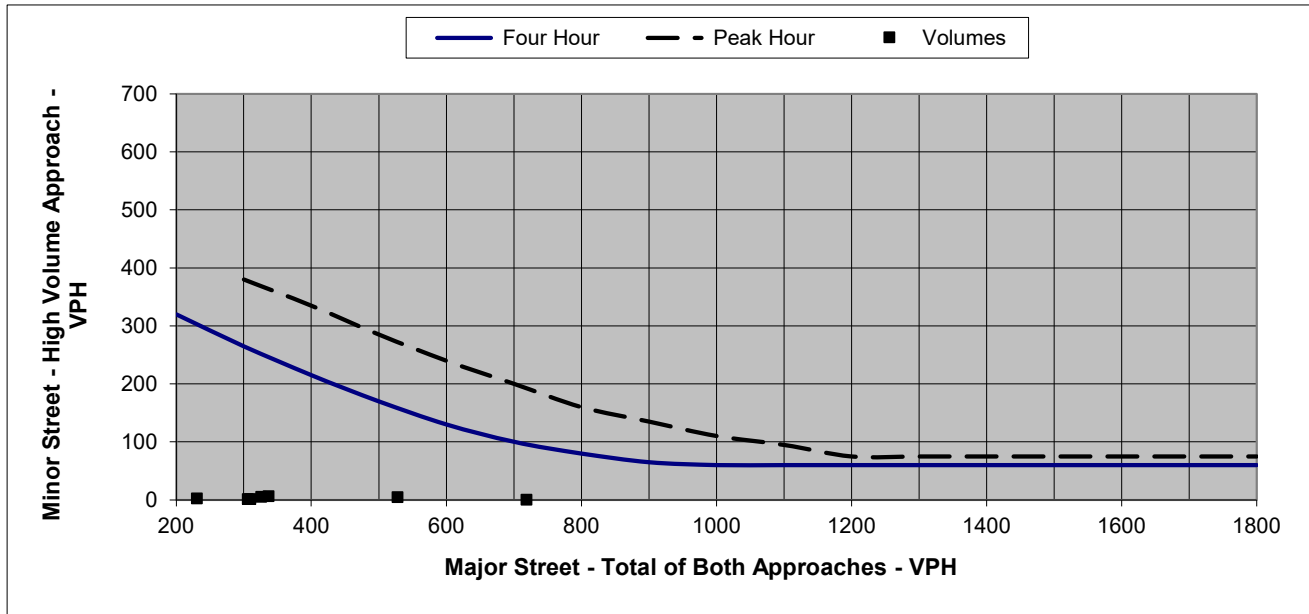


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200	320	
300	265	380
400	215	335
500	170	285
600	130	240
700	100	200
800	80	160
900	65	135
1000	60	110
1100	60	95
1200	60	75
1300	60	75
1400	60	75
1500	60	75
1600	60	75
1700	60	75
1800	60	75

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	5	0	NO	NO
1:00 - 2:00	4	0	NO	NO
2:00 - 3:00	4	0	NO	NO
3:00 - 4:00	4	0	NO	NO
4:00 - 5:00	8	0	NO	NO
5:00 - 6:00	42	1	NO	NO
6:00 - 7:00	154	0	NO	NO
7:00 - 8:00	719	0	NO	NO
8:00 - 9:00	306	1	NO	NO
9:00 - 10:00	146	1	NO	NO
10:00 - 11:00	142	3	NO	NO
11:00 - 12:00	194	3	NO	NO
12:00 - 13:00	231	2	NO	NO
13:00 - 14:00	177	4	NO	NO
14:00 - 15:00	310	1	NO	NO
15:00 - 16:00	528	4	NO	NO
16:00 - 17:00	337	6	NO	NO
17:00 - 18:00	326	5	NO	NO
18:00 - 19:00	151	2	NO	NO
19:00 - 20:00	96	0	NO	NO
20:00 - 21:00	85	2	NO	NO
21:00 - 22:00	36	0	NO	NO
22:00 - 23:00	24	0	NO	NO
23:00 - 24:00	11	0	NO	NO

CSAH 48 at Camwood Trl - 2022 Existing ALL WAY STOP WARRANT ANALYSIS

LOCATION: CSAH 48 at Camwood Trl

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach Total
55	Major App1: CSAH 48 EB	2	2024
55	Major App3: CSAH 48 WB	2	1984
30	Minor App2: Camwood Trl NB	1	122
30	Minor App4: n/a	1	0

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement

210

140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
HOURLY	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	1	4	0	0	5	0	NO / NO
1:00 - 2:00	2	1	0	0	3	0	NO / NO
2:00 - 3:00	2	2	0	0	4	0	NO / NO
3:00 - 4:00	3	0	1	0	3	1	NO / NO
4:00 - 5:00	2	4	0	0	6	0	NO / NO
5:00 - 6:00	23	14	0	0	37	0	NO / NO
6:00 - 7:00	98	43	8	0	141	8	NO / NO
7:00 - 8:00	407	282	17	0	689	17	YES / NO
8:00 - 9:00	226	76	9	0	302	9	YES / NO
9:00 - 10:00	88	56	7	0	144	7	NO / NO
10:00 - 11:00	62	79	10	0	141	10	NO / NO
11:00 - 12:00	93	102	7	0	195	7	NO / NO
12:00 - 13:00	120	107	6	0	227	6	YES / NO
13:00 - 14:00	74	103	9	0	177	9	NO / NO
14:00 - 15:00	110	194	8	0	304	8	YES / NO
15:00 - 16:00	295	235	5	0	530	5	YES / NO
16:00 - 17:00	133	220	5	0	353	5	YES / NO
17:00 - 18:00	130	204	11	0	334	11	YES / NO
18:00 - 19:00	69	82	10	0	151	10	NO / NO
19:00 - 20:00	36	63	4	0	99	4	NO / NO
20:00 - 21:00	27	62	4	0	89	4	NO / NO
21:00 - 22:00	10	28	1	0	38	1	NO / NO
22:00 - 23:00	8	17	0	0	25	0	NO / NO
23:00 - 24:00	5	6	0	0	11	0	NO / NO
Daily	2024	1984	122	0			

Hours met for warrant: Met (Hr) 0 Required (Hr) 8

All-way Stop Warrant:

Not satisfied

REMARKS:

CSAH 48 at Camwood Trl - 2022 Existing SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: CSAH 48 at Camwood Trl

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	2024
55	Major App3: CSAH 48 WB	2	1984
30	Minor App2: Camwood Trl NB	1	46
30	Minor App4: n/a	1	0

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	105	53	84

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
HOUR	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP. 1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	1	4	0	0	5	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	2	1	0	0	3	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	2	2	0	0	4	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	3	0	1	0	3	1	NO / NO	NO / NO	NO / NO
4:00 - 5:00	2	4	0	0	6	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	23	14	0	0	37	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	98	43	4	0	141	4	NO / NO	NO / NO	NO / NO
7:00 - 8:00	407	282	8	0	689	8	YES / NO	YES / NO	YES / NO
8:00 - 9:00	226	76	4	0	302	4	NO / NO	NO / NO	NO / NO
9:00 - 10:00	88	56	3	0	144	3	NO / NO	NO / NO	NO / NO
10:00 - 11:00	62	79	3	0	141	3	NO / NO	NO / NO	NO / NO
11:00 - 12:00	93	102	4	0	195	4	NO / NO	NO / NO	NO / NO
12:00 - 13:00	120	107	4	0	227	4	NO / NO	NO / NO	NO / NO
13:00 - 14:00	74	103	1	0	177	1	NO / NO	NO / NO	NO / NO
14:00 - 15:00	110	194	1	0	304	1	NO / NO	NO / NO	NO / NO
15:00 - 16:00	295	235	2	0	530	2	YES / NO	NO / NO	YES / NO
16:00 - 17:00	133	220	1	0	353	1	NO / NO	NO / NO	NO / NO
17:00 - 18:00	130	204	6	0	334	6	NO / NO	NO / NO	NO / NO
18:00 - 19:00	69	82	2	0	151	2	NO / NO	NO / NO	NO / NO
19:00 - 20:00	36	63	0	0	99	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	27	62	2	0	89	2	NO / NO	NO / NO	NO / NO
21:00 - 22:00	10	28	0	0	38	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	8	17	0	0	25	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	5	6	0	0	11	0	NO / NO	NO / NO	NO / NO
Daily	2024	1984	46	0					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	0	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS: _____

CSAH 48 at Camwood Trl - 2022 Existing SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: CSAH 48 at Camwood Trl

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	2024
55	Major App3: CSAH 48 WB	2	1984
30	Minor App2: Camwood Trl NB	1	46
30	Minor App4: n/a	1	0

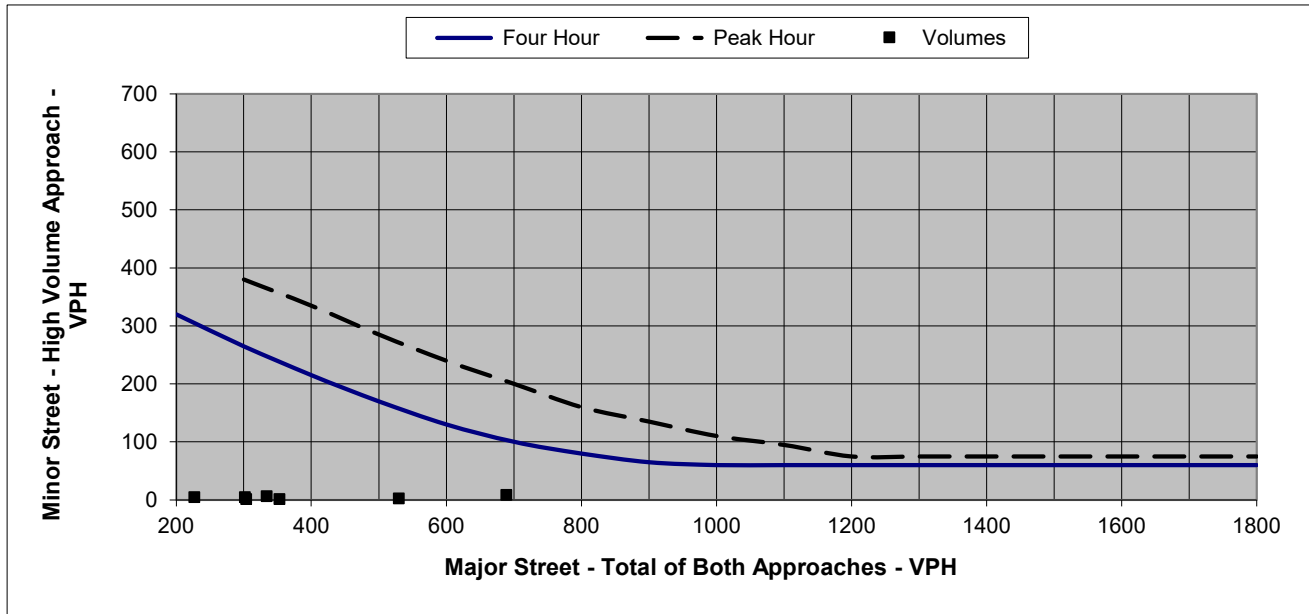


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200	320	
300	265	380
400	215	335
500	170	285
600	130	240
700	100	200
800	80	160
900	65	135
1000	60	110
1100	60	95
1200	60	75
1300	60	75
1400	60	75
1500	60	75
1600	60	75
1700	60	75
1800	60	75

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	5	0	NO	NO
1:00 - 2:00	3	0	NO	NO
2:00 - 3:00	4	0	NO	NO
3:00 - 4:00	3	1	NO	NO
4:00 - 5:00	6	0	NO	NO
5:00 - 6:00	37	0	NO	NO
6:00 - 7:00	141	4	NO	NO
7:00 - 8:00	689	8	NO	NO
8:00 - 9:00	302	4	NO	NO
9:00 - 10:00	144	3	NO	NO
10:00 - 11:00	141	3	NO	NO
11:00 - 12:00	195	4	NO	NO
12:00 - 13:00	227	4	NO	NO
13:00 - 14:00	177	1	NO	NO
14:00 - 15:00	304	1	NO	NO
15:00 - 16:00	530	2	NO	NO
16:00 - 17:00	353	1	NO	NO
17:00 - 18:00	334	6	NO	NO
18:00 - 19:00	151	2	NO	NO
19:00 - 20:00	99	0	NO	NO
20:00 - 21:00	89	2	NO	NO
21:00 - 22:00	38	0	NO	NO
22:00 - 23:00	25	0	NO	NO
23:00 - 24:00	11	0	NO	NO

College Rd at Douglas Fir Dr - 2022 Existing ALL WAY STOP WARRANT ANALYSIS

LOCATION: College Rd at Douglas Fir Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach Total
41	Major App1: College Rd EB	3	4454
41	Major App3: College Rd WB	3	4258
30	Minor App2: Douglas Fir Dr NB	3	169
30	Minor App4: Douglas Fir Dr SB	3	414

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement
210 140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
HOURLY	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	8	3	5	1	11	6	NO / NO
1:00 - 2:00	9	1	0	2	10	2	NO / NO
2:00 - 3:00	9	5	0	3	14	3	NO / NO
3:00 - 4:00	10	9	0	0	19	0	NO / NO
4:00 - 5:00	13	24	1	4	37	5	NO / NO
5:00 - 6:00	84	40	2	1	124	3	NO / NO
6:00 - 7:00	183	95	13	8	278	21	YES / NO
7:00 - 8:00	365	246	3	18	611	21	YES / NO
8:00 - 9:00	302	248	5	33	550	38	YES / NO
9:00 - 10:00	275	273	7	21	548	28	YES / NO
10:00 - 11:00	251	274	8	26	525	34	YES / NO
11:00 - 12:00	260	353	11	27	613	38	YES / NO
12:00 - 13:00	341	306	12	31	647	43	YES / NO
13:00 - 14:00	324	296	6	31	620	37	YES / NO
14:00 - 15:00	312	343	19	30	655	49	YES / NO
15:00 - 16:00	380	419	20	45	799	65	YES / NO
16:00 - 17:00	398	474	23	56	872	79	YES / NO
17:00 - 18:00	318	352	14	44	670	58	YES / NO
18:00 - 19:00	243	182	3	5	425	8	YES / NO
19:00 - 20:00	137	92	2	10	229	12	YES / NO
20:00 - 21:00	86	108	1	8	194	9	NO / NO
21:00 - 22:00	74	71	2	6	145	8	NO / NO
22:00 - 23:00	40	36	10	0	76	10	NO / NO
23:00 - 24:00	32	8	2	4	40	6	NO / NO
Daily	4454	4258	169	414			

Hours met for warrant: Met (Hr) 0 Required (Hr) 8

All-way Stop Warrant:

Not satisfied

REMARKS:

College Rd at Douglas Fir Dr - 2022 Existing SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: College Rd at Douglas Fir Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description		Lanes	Approach
41	Major App1:	College Rd EB	3	4454
41	Major App3:	College Rd WB	3	4258
30	Minor App2:	Douglas Fir Dr NB	2	142
30	Minor App4:	Douglas Fir Dr SB	2	56

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	140	70	112

HOUR	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	8	3	4	1	11	4	NO / NO	NO / NO	NO / NO
1:00 - 2:00	9	1	0	0	10	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	9	5	0	1	14	1	NO / NO	NO / NO	NO / NO
3:00 - 4:00	10	9	0	0	19	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	13	24	0	1	37	1	NO / NO	NO / NO	NO / NO
5:00 - 6:00	84	40	2	0	124	2	NO / NO	NO / NO	NO / NO
6:00 - 7:00	183	95	12	1	278	12	NO / NO	NO / NO	NO / NO
7:00 - 8:00	365	246	1	2	611	2	YES / NO	NO / NO	YES / NO
8:00 - 9:00	302	248	4	7	550	7	YES / NO	NO / NO	YES / NO
9:00 - 10:00	275	273	5	4	548	5	YES / NO	NO / NO	YES / NO
10:00 - 11:00	251	274	7	2	525	7	YES / NO	NO / NO	YES / NO
11:00 - 12:00	260	353	8	4	613	8	YES / NO	NO / NO	YES / NO
12:00 - 13:00	341	306	9	1	647	9	YES / NO	YES / NO	YES / NO
13:00 - 14:00	324	296	4	2	620	4	YES / NO	NO / NO	YES / NO
14:00 - 15:00	312	343	17	5	655	17	YES / NO	YES / NO	YES / NO
15:00 - 16:00	380	419	15	4	799	15	YES / NO	YES / NO	YES / NO
16:00 - 17:00	398	474	22	11	872	22	YES / NO	YES / NO	YES / NO
17:00 - 18:00	318	352	13	3	670	13	YES / NO	YES / NO	YES / NO
18:00 - 19:00	243	182	3	0	425	3	YES / NO	NO / NO	NO / NO
19:00 - 20:00	137	92	2	0	229	2	NO / NO	NO / NO	NO / NO
20:00 - 21:00	86	108	1	5	194	5	NO / NO	NO / NO	NO / NO
21:00 - 22:00	74	71	2	0	145	2	NO / NO	NO / NO	NO / NO
22:00 - 23:00	40	36	9	0	76	9	NO / NO	NO / NO	NO / NO
23:00 - 24:00	32	8	2	2	40	2	NO / NO	NO / NO	NO / NO
Daily	4454	4258	142	56					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	0	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS: _____

College Rd at Douglas Fir Dr - 2022 Existing SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: College Rd at Douglas Fir Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
41	Major App1: College Rd EB	3	4454
41	Major App3: College Rd WB	3	4258
30	Minor App2: Douglas Fir Dr NB	2	142
30	Minor App4: Douglas Fir Dr SB	2	56

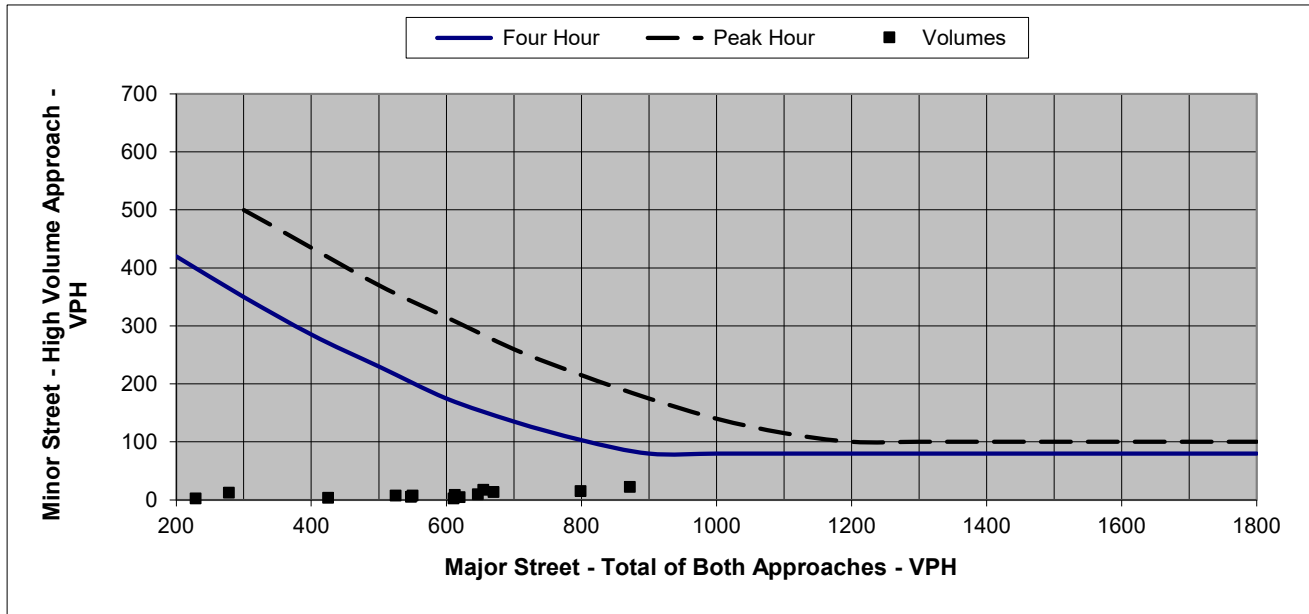


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major	Minor App.	Minor App.
Approach	Four Hour	Peak Hour
200	420	
300	350	500
400	285	435
500	230	370
600	175	315
700	135	260
800	103	215
900	80	175
1000	80	140
1100	80	115
1200	80	100
1300	80	100
1400	80	100
1500	80	100
1600	80	100
1700	80	100
1800	80	100

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	11	4	NO	NO
1:00 - 2:00	10	0	NO	NO
2:00 - 3:00	14	1	NO	NO
3:00 - 4:00	19	0	NO	NO
4:00 - 5:00	37	1	NO	NO
5:00 - 6:00	124	2	NO	NO
6:00 - 7:00	278	12	NO	NO
7:00 - 8:00	611	2	NO	NO
8:00 - 9:00	550	7	NO	NO
9:00 - 10:00	548	5	NO	NO
10:00 - 11:00	525	7	NO	NO
11:00 - 12:00	613	8	NO	NO
12:00 - 13:00	647	9	NO	NO
13:00 - 14:00	620	4	NO	NO
14:00 - 15:00	655	17	NO	NO
15:00 - 16:00	799	15	NO	NO
16:00 - 17:00	872	22	NO	NO
17:00 - 18:00	670	13	NO	NO
18:00 - 19:00	425	3	NO	NO
19:00 - 20:00	229	2	NO	NO
20:00 - 21:00	194	5	NO	NO
21:00 - 22:00	145	2	NO	NO
22:00 - 23:00	76	9	NO	NO
23:00 - 24:00	40	2	NO	NO

CSAH 48 at Forestview Dr - 2045 Future ALL WAY STOP WARRANT ANALYSIS

LOCATION: CSAH 48 at Forestview Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach Total
55	Major App1: CSAH 48 EB	2	6499
55	Major App3: CSAH 48 WB	2	5880
30	Minor App2: Forestview Dr NB	1	2923
30	Minor App4: Forestview Dr SB	2	2197

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement
210 140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
HOURL	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	31	24	12	11	55	23	NO / NO
1:00 - 2:00	18	12	6	6	30	12	NO / NO
2:00 - 3:00	9	7	2	5	16	7	NO / NO
3:00 - 4:00	12	7	3	5	19	8	NO / NO
4:00 - 5:00	13	15	14	11	28	25	NO / NO
5:00 - 6:00	57	54	64	27	111	91	NO / NO
6:00 - 7:00	196	155	204	64	351	268	YES / YES
7:00 - 8:00	625	538	319	122	1163	441	YES / YES
8:00 - 9:00	438	290	287	120	728	407	YES / YES
9:00 - 10:00	254	220	205	115	474	320	YES / YES
10:00 - 11:00	250	266	140	119	516	259	YES / YES
11:00 - 12:00	299	308	134	119	607	253	YES / YES
12:00 - 13:00	379	335	142	128	714	270	YES / YES
13:00 - 14:00	327	336	133	125	663	258	YES / YES
14:00 - 15:00	369	428	150	128	797	278	YES / YES
15:00 - 16:00	649	519	173	153	1168	326	YES / YES
16:00 - 17:00	582	575	196	208	1157	404	YES / YES
17:00 - 18:00	563	563	189	171	1126	360	YES / YES
18:00 - 19:00	442	374	175	149	816	324	YES / YES
19:00 - 20:00	346	291	152	137	637	289	YES / YES
20:00 - 21:00	267	256	103	121	523	224	YES / YES
21:00 - 22:00	209	174	52	96	383	148	YES / YES
22:00 - 23:00	108	88	45	35	196	80	NO / NO
23:00 - 24:00	56	45	23	22	101	45	NO / NO
Daily	6499	5880	2923	2197			

Hours met for warrant: Met (Hr) 16 Required (Hr) 8

All-way Stop Warrant:

Satisfied

REMARKS:

CSAH 48 at Forestview Dr - 2045 Future SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: CSAH 48 at Forestview Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	6499
55	Major App3: CSAH 48 WB	2	5880
30	Minor App2: Forestview Dr NB	1	2087
30	Minor App4: Forestview Dr SB	1	1463

40 MPH OR FASTER? YES
 POPULATION < 10,000? YES
 VOLUME REQ. AT 70%? **YES**

CORRECTABLE CRASHES: 0
 (12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	105	53	84

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
HOUR	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	31	24	10	7	55	10	NO / NO	NO / NO	NO / NO
1:00 - 2:00	18	12	4	4	30	4	NO / NO	NO / NO	NO / NO
2:00 - 3:00	9	7	1	4	16	4	NO / NO	NO / NO	NO / NO
3:00 - 4:00	12	7	3	3	19	3	NO / NO	NO / NO	NO / NO
4:00 - 5:00	13	15	9	6	28	9	NO / NO	NO / NO	NO / NO
5:00 - 6:00	57	54	42	18	111	42	NO / NO	NO / NO	NO / NO
6:00 - 7:00	196	155	142	44	351	142	NO / YES	NO / YES	NO / YES
7:00 - 8:00	625	538	223	89	1163	223	YES / YES	YES / YES	YES / YES
8:00 - 9:00	438	290	208	83	728	208	YES / YES	YES / YES	YES / YES
9:00 - 10:00	254	220	145	76	474	145	YES / YES	NO / YES	NO / YES
10:00 - 11:00	250	266	104	78	516	104	YES / NO	NO / YES	YES / YES
11:00 - 12:00	299	308	95	79	607	95	YES / NO	NO / YES	YES / YES
12:00 - 13:00	379	335	101	86	714	101	YES / NO	YES / YES	YES / YES
13:00 - 14:00	327	336	101	84	663	101	YES / NO	YES / YES	YES / YES
14:00 - 15:00	369	428	104	85	797	104	YES / NO	YES / YES	YES / YES
15:00 - 16:00	649	519	124	100	1168	124	YES / YES	YES / YES	YES / YES
16:00 - 17:00	582	575	134	131	1157	134	YES / YES	YES / YES	YES / YES
17:00 - 18:00	563	563	136	112	1126	136	YES / YES	YES / YES	YES / YES
18:00 - 19:00	442	374	126	100	816	126	YES / YES	YES / YES	YES / YES
19:00 - 20:00	346	291	110	92	637	110	YES / YES	YES / YES	YES / YES
20:00 - 21:00	267	256	73	80	523	80	YES / NO	NO / YES	YES / NO
21:00 - 22:00	209	174	41	63	383	63	NO / NO	NO / YES	NO / NO
22:00 - 23:00	108	88	34	24	196	34	NO / NO	NO / NO	NO / NO
23:00 - 24:00	56	45	17	15	101	17	NO / NO	NO / NO	NO / NO
Daily	6499	5880	2087	1463					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	12	8	Satisfied
Warrant 1A Minimum Vehicular Volume	8	8	Satisfied
Warrant 1B Interruption of Continuous Flow	10	8	Satisfied
1A & 1B Combination of Warrants	12	8	Satisfied
Warrant 2 Four Hour Volumes	8	4	Satisfied
Warrant 3 Peak Hour Volumes	5	1	Satisfied
Warrant 7 Crash Experience	7	8	Not satisfied

COMMENTS: _____

CSAH 48 at Forestview Dr - 2045 Future SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: CSAH 48 at Forestview Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	6499
55	Major App3: CSAH 48 WB	2	5880
30	Minor App2: Forestview Dr NB	1	2087
30	Minor App4: Forestview Dr SB	1	1463

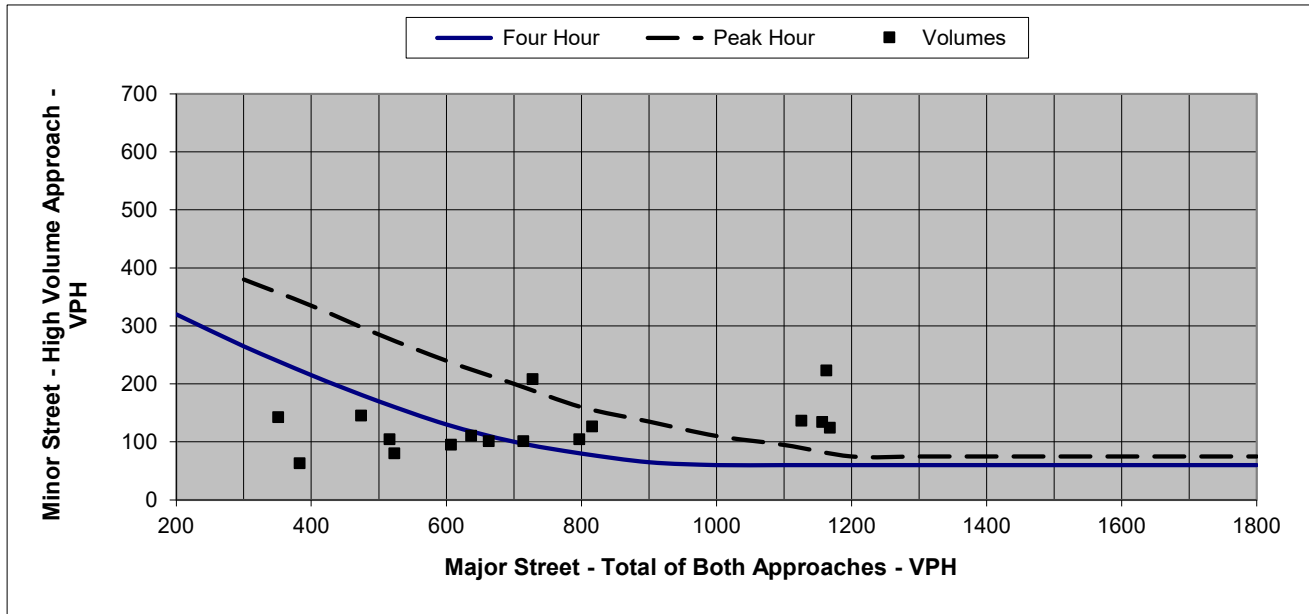


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200	320	
300	265	380
400	215	335
500	170	285
600	130	240
700	100	200
800	80	160
900	65	135
1000	60	110
1100	60	95
1200	60	75
1300	60	75
1400	60	75
1500	60	75
1600	60	75
1700	60	75
1800	60	75

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	55	10	NO	NO
1:00 - 2:00	30	4	NO	NO
2:00 - 3:00	16	4	NO	NO
3:00 - 4:00	19	3	NO	NO
4:00 - 5:00	28	9	NO	NO
5:00 - 6:00	111	42	NO	NO
6:00 - 7:00	351	142	NO	NO
7:00 - 8:00	1163	223	YES	YES
8:00 - 9:00	728	208	YES	YES
9:00 - 10:00	474	145	NO	NO
10:00 - 11:00	516	104	NO	NO
11:00 - 12:00	607	95	NO	NO
12:00 - 13:00	714	101	YES	NO
13:00 - 14:00	663	101	NO	NO
14:00 - 15:00	797	104	YES	NO
15:00 - 16:00	1168	124	YES	YES
16:00 - 17:00	1157	134	YES	YES
17:00 - 18:00	1126	136	YES	YES
18:00 - 19:00	816	126	YES	NO
19:00 - 20:00	637	110	NO	NO
20:00 - 21:00	523	80	NO	NO
21:00 - 22:00	383	63	NO	NO
22:00 - 23:00	196	34	NO	NO
23:00 - 24:00	101	17	NO	NO

CSAH 48 at Evergreen Dr - 2045 Future ALL WAY STOP WARRANT ANALYSIS

LOCATION: CSAH 48 at Evergreen Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach Total
55	Major App1: CSAH 48 EB	2	5806
55	Major App3: CSAH 48 WB	2	5594
30	Minor App2: Evergreen Dr SB	2	277
30	Minor App4: N/A	2	0

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement
210 140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
HOURLY	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	16	18	1	0	34	1	NO / NO
1:00 - 2:00	11	9	1	0	20	1	NO / NO
2:00 - 3:00	6	6	0	0	12	0	NO / NO
3:00 - 4:00	10	7	0	0	17	0	NO / NO
4:00 - 5:00	14	14	0	0	28	0	NO / NO
5:00 - 6:00	63	53	2	0	116	2	NO / NO
6:00 - 7:00	225	159	1	0	384	1	YES / NO
7:00 - 8:00	701	527	5	0	1228	5	YES / NO
8:00 - 9:00	477	299	8	0	776	8	YES / NO
9:00 - 10:00	278	228	8	0	506	8	YES / NO
10:00 - 11:00	249	265	14	0	514	14	YES / NO
11:00 - 12:00	292	302	20	0	594	20	YES / NO
12:00 - 13:00	360	332	15	0	692	15	YES / NO
13:00 - 14:00	294	319	19	0	613	19	YES / NO
14:00 - 15:00	342	409	27	0	751	27	YES / NO
15:00 - 16:00	577	497	32	0	1074	32	YES / NO
16:00 - 17:00	464	548	39	0	1012	39	YES / NO
17:00 - 18:00	442	518	47	0	960	47	YES / NO
18:00 - 19:00	311	326	11	0	637	11	YES / NO
19:00 - 20:00	241	261	9	0	502	9	YES / NO
20:00 - 21:00	196	231	12	0	427	12	YES / NO
21:00 - 22:00	141	159	4	0	300	4	YES / NO
22:00 - 23:00	63	71	2	0	134	2	NO / NO
23:00 - 24:00	33	36	0	0	69	0	NO / NO
Daily	5806	5594	277	0			

Hours met for warrant: Met (Hr) 0 Required (Hr) 8

All-way Stop Warrant:

Not satisfied

REMARKS:

CSAH 48 at Evergreen Dr - 2045 Future SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: CSAH 48 at Evergreen Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	5806
55	Major App3: CSAH 48 WB	2	5594
30	Minor App2: Evergreen Dr SB	1	48
30	Minor App4: N/A	1	0

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	105	53	84

HOUR	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8	WARRANT 1B - 8	WARRANT 1A &
	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	(APP. 2 or 4)	hr MAJOR/MINOR	hr MAJOR/MINOR	B MAJOR/MINOR
0:00 - 1:00	16	18	0	0	34	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	11	9	0	0	20	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	6	6	0	0	12	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	10	7	0	0	17	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	14	14	0	0	28	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	63	53	1	0	116	1	NO / NO	NO / NO	NO / NO
6:00 - 7:00	225	159	0	0	384	0	NO / NO	NO / NO	NO / NO
7:00 - 8:00	701	527	0	0	1228	0	YES / NO	YES / NO	YES / NO
8:00 - 9:00	477	299	1	0	776	1	YES / NO	YES / NO	YES / NO
9:00 - 10:00	278	228	1	0	506	1	YES / NO	NO / NO	YES / NO
10:00 - 11:00	249	265	3	0	514	3	YES / NO	NO / NO	YES / NO
11:00 - 12:00	292	302	5	0	594	5	YES / NO	NO / NO	YES / NO
12:00 - 13:00	360	332	2	0	692	2	YES / NO	YES / NO	YES / NO
13:00 - 14:00	294	319	4	0	613	4	YES / NO	NO / NO	YES / NO
14:00 - 15:00	342	409	1	0	751	1	YES / NO	YES / NO	YES / NO
15:00 - 16:00	577	497	6	0	1074	6	YES / NO	YES / NO	YES / NO
16:00 - 17:00	464	548	10	0	1012	10	YES / NO	YES / NO	YES / NO
17:00 - 18:00	442	518	10	0	960	10	YES / NO	YES / NO	YES / NO
18:00 - 19:00	311	326	2	0	637	2	YES / NO	YES / NO	YES / NO
19:00 - 20:00	241	261	0	0	502	0	YES / NO	NO / NO	NO / NO
20:00 - 21:00	196	231	2	0	427	2	YES / NO	NO / NO	NO / NO
21:00 - 22:00	141	159	0	0	300	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	63	71	0	0	134	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	33	36	0	0	69	0	NO / NO	NO / NO	NO / NO
Daily	5806	5594	48	0					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	0	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS: _____

CSAH 48 at Evergreen Dr - 2045 Future SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: CSAH 48 at Evergreen Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	5806
55	Major App3: CSAH 48 WB	2	5594
30	Minor App2: Evergreen Dr SB	1	48
30	Minor App4: N/A	1	0

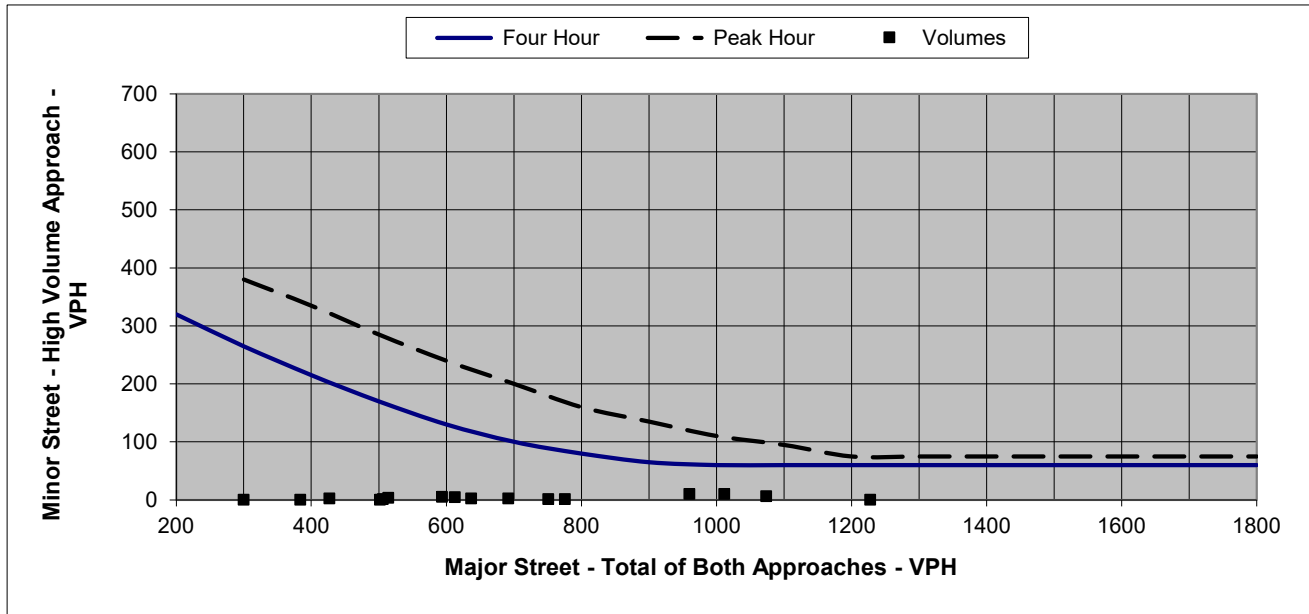


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200	320	
300	265	380
400	215	335
500	170	285
600	130	240
700	100	200
800	80	160
900	65	135
1000	60	110
1100	60	95
1200	60	75
1300	60	75
1400	60	75
1500	60	75
1600	60	75
1700	60	75
1800	60	75

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	34	0	NO	NO
1:00 - 2:00	20	0	NO	NO
2:00 - 3:00	12	0	NO	NO
3:00 - 4:00	17	0	NO	NO
4:00 - 5:00	28	0	NO	NO
5:00 - 6:00	116	1	NO	NO
6:00 - 7:00	384	0	NO	NO
7:00 - 8:00	1228	0	NO	NO
8:00 - 9:00	776	1	NO	NO
9:00 - 10:00	506	1	NO	NO
10:00 - 11:00	514	3	NO	NO
11:00 - 12:00	594	5	NO	NO
12:00 - 13:00	692	2	NO	NO
13:00 - 14:00	613	4	NO	NO
14:00 - 15:00	751	1	NO	NO
15:00 - 16:00	1074	6	NO	NO
16:00 - 17:00	1012	10	NO	NO
17:00 - 18:00	960	10	NO	NO
18:00 - 19:00	637	2	NO	NO
19:00 - 20:00	502	0	NO	NO
20:00 - 21:00	427	2	NO	NO
21:00 - 22:00	300	0	NO	NO
22:00 - 23:00	134	0	NO	NO
23:00 - 24:00	69	0	NO	NO

CSAH 48 at Camwood Trl - 2045 Future ALL WAY STOP WARRANT ANALYSIS

LOCATION: CSAH 48 at Camwood Trl

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach Total
55	Major App1: CSAH 48 EB	2	5652
55	Major App3: CSAH 48 WB	2	5225
30	Minor App2: Camwood Trl NB	2	239
30	Minor App4: Douglas Fir Dr SB	2	500

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement
210 140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
HOURL	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	17	16	0	0	33	0	NO / NO
1:00 - 2:00	8	7	0	0	15	0	NO / NO
2:00 - 3:00	6	6	0	0	12	0	NO / NO
3:00 - 4:00	10	6	1	0	16	1	NO / NO
4:00 - 5:00	12	14	0	1	26	1	NO / NO
5:00 - 6:00	55	49	2	5	104	7	NO / NO
6:00 - 7:00	203	143	17	22	346	39	YES / NO
7:00 - 8:00	660	487	33	38	1147	71	YES / NO
8:00 - 9:00	460	270	23	40	730	63	YES / NO
9:00 - 10:00	261	208	18	30	469	48	YES / NO
10:00 - 11:00	240	241	14	26	481	40	YES / NO
11:00 - 12:00	285	279	11	32	564	43	YES / NO
12:00 - 13:00	347	306	10	36	653	46	YES / NO
13:00 - 14:00	285	301	13	28	586	41	YES / NO
14:00 - 15:00	329	387	14	26	716	40	YES / NO
15:00 - 16:00	573	477	13	31	1050	44	YES / NO
16:00 - 17:00	464	528	15	51	992	66	YES / NO
17:00 - 18:00	445	495	18	45	940	63	YES / NO
18:00 - 19:00	316	303	18	26	619	44	YES / NO
19:00 - 20:00	240	243	10	25	483	35	YES / NO
20:00 - 21:00	196	214	7	18	410	25	YES / NO
21:00 - 22:00	140	148	1	12	288	13	YES / NO
22:00 - 23:00	66	66	1	6	132	7	NO / NO
23:00 - 24:00	34	31	0	2	65	2	NO / NO
Daily	5652	5225	239	500			

Hours met for warrant: Met (Hr) 0 Required (Hr) 8

All-way Stop Warrant:

Not satisfied

REMARKS:

CSAH 48 at Camwood Trl - 2045 Future SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: CSAH 48 at Camwood Trl

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	5652
55	Major App3: CSAH 48 WB	2	5225
30	Minor App2: Camwood Trl NB	1	133
30	Minor App4: Douglas Fir Dr SB	1	93

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	105	53	84

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
Hour	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP. 1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	17	16	0	0	33	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	8	7	0	0	15	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	6	6	0	0	12	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	10	6	1	0	16	1	NO / NO	NO / NO	NO / NO
4:00 - 5:00	12	14	0	0	26	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	55	49	2	0	104	2	NO / NO	NO / NO	NO / NO
6:00 - 7:00	203	143	10	4	346	10	NO / NO	NO / NO	NO / NO
7:00 - 8:00	660	487	20	8	1147	20	YES / NO	YES / NO	YES / NO
8:00 - 9:00	460	270	14	8	730	14	YES / NO	YES / NO	YES / NO
9:00 - 10:00	261	208	10	5	469	10	YES / NO	NO / NO	NO / NO
10:00 - 11:00	240	241	7	4	481	7	YES / NO	NO / NO	NO / NO
11:00 - 12:00	285	279	8	6	564	8	YES / NO	NO / NO	YES / NO
12:00 - 13:00	347	306	8	8	653	8	YES / NO	YES / NO	YES / NO
13:00 - 14:00	285	301	5	4	586	5	YES / NO	NO / NO	YES / NO
14:00 - 15:00	329	387	5	5	716	5	YES / NO	YES / NO	YES / NO
15:00 - 16:00	573	477	8	6	1050	8	YES / NO	YES / NO	YES / NO
16:00 - 17:00	464	528	8	11	992	11	YES / NO	YES / NO	YES / NO
17:00 - 18:00	445	495	10	8	940	10	YES / NO	YES / NO	YES / NO
18:00 - 19:00	316	303	7	4	619	7	YES / NO	NO / NO	YES / NO
19:00 - 20:00	240	243	4	4	483	4	YES / NO	NO / NO	NO / NO
20:00 - 21:00	196	214	5	4	410	5	NO / NO	NO / NO	NO / NO
21:00 - 22:00	140	148	0	3	288	3	NO / NO	NO / NO	NO / NO
22:00 - 23:00	66	66	1	1	132	1	NO / NO	NO / NO	NO / NO
23:00 - 24:00	34	31	0	0	65	0	NO / NO	NO / NO	NO / NO
Daily	5652	5225	133	93					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	0	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS:

CSAH 48 at Camwood Trl - 2045 Future SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: CSAH 48 at Camwood Trl

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	5652
55	Major App3: CSAH 48 WB	2	5225
30	Minor App2: Camwood Trl NB	1	133
30	Minor App4: Douglas Fir Dr SB	1	93

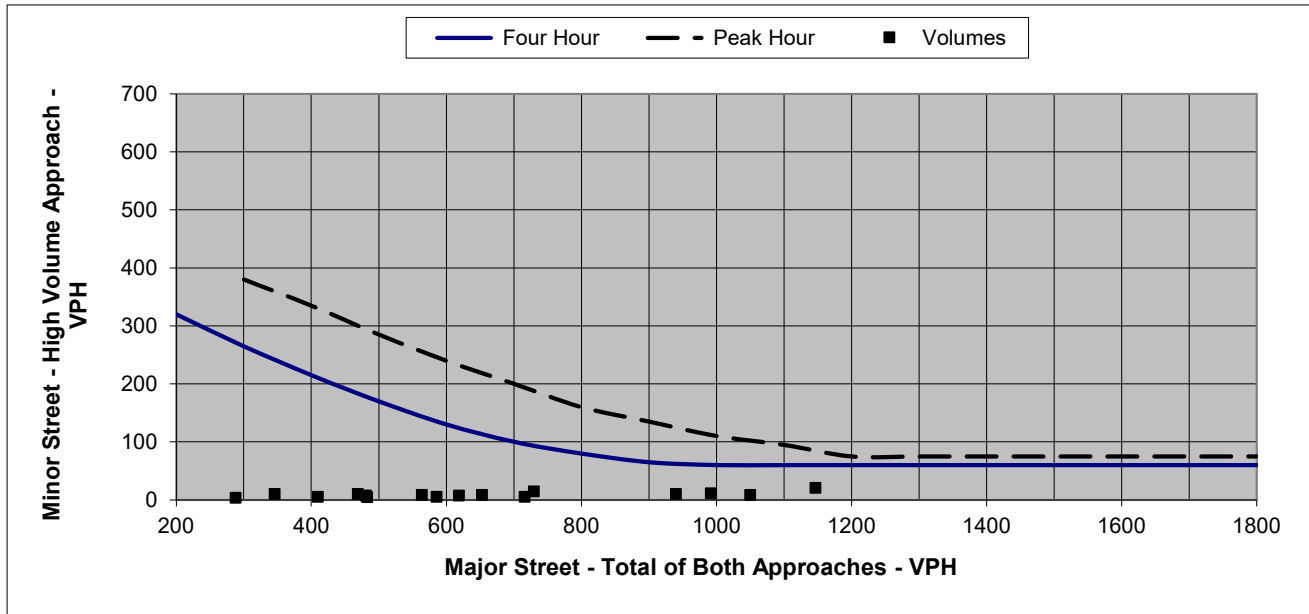


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200	320	
300	265	380
400	215	335
500	170	285
600	130	240
700	100	200
800	80	160
900	65	135
1000	60	110
1100	60	95
1200	60	75
1300	60	75
1400	60	75
1500	60	75
1600	60	75
1700	60	75
1800	60	75

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	33	0	NO	NO
1:00 - 2:00	15	0	NO	NO
2:00 - 3:00	12	0	NO	NO
3:00 - 4:00	16	1	NO	NO
4:00 - 5:00	26	0	NO	NO
5:00 - 6:00	104	2	NO	NO
6:00 - 7:00	346	10	NO	NO
7:00 - 8:00	1147	20	NO	NO
8:00 - 9:00	730	14	NO	NO
9:00 - 10:00	469	10	NO	NO
10:00 - 11:00	481	7	NO	NO
11:00 - 12:00	564	8	NO	NO
12:00 - 13:00	653	8	NO	NO
13:00 - 14:00	586	5	NO	NO
14:00 - 15:00	716	5	NO	NO
15:00 - 16:00	1050	8	NO	NO
16:00 - 17:00	992	11	NO	NO
17:00 - 18:00	940	10	NO	NO
18:00 - 19:00	619	7	NO	NO
19:00 - 20:00	483	4	NO	NO
20:00 - 21:00	410	5	NO	NO
21:00 - 22:00	288	3	NO	NO
22:00 - 23:00	132	1	NO	NO
23:00 - 24:00	65	0	NO	NO

CSAH 48 at Camwood Trl (Evergreen Closed) - 2045 Future ALL WAY STOP WARRANT ANALYSIS

LOCATION: CSAH 48 at Camwood Trl (Evergreen Closed)

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach Total
55	Major App1: CSAH 48 EB	2	5802
55	Major App3: CSAH 48 WB	2	5230
30	Minor App2: Camwood Trl NB	2	239
30	Minor App4: Douglas Fir Dr SB	2	799

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement

210	140
-----	-----

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
Hour	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	19	16	0	2	35	2	NO / NO
1:00 - 2:00	9	7	0	1	16	1	NO / NO
2:00 - 3:00	6	6	0	0	12	0	NO / NO
3:00 - 4:00	10	6	1	0	16	1	NO / NO
4:00 - 5:00	14	14	0	1	28	1	NO / NO
5:00 - 6:00	62	49	2	8	111	10	NO / NO
6:00 - 7:00	216	143	17	29	359	46	YES / NO
7:00 - 8:00	700	487	33	45	1187	78	YES / NO
8:00 - 9:00	472	269	23	49	741	72	YES / NO
9:00 - 10:00	267	207	18	43	474	61	YES / NO
10:00 - 11:00	242	242	14	42	484	56	YES / NO
11:00 - 12:00	285	276	11	52	561	63	YES / NO
12:00 - 13:00	359	309	10	50	668	60	YES / NO
13:00 - 14:00	293	304	13	47	597	60	YES / NO
14:00 - 15:00	341	388	14	53	729	67	YES / NO
15:00 - 16:00	576	475	13	64	1051	77	YES / NO
16:00 - 17:00	464	528	15	87	992	102	YES / NO
17:00 - 18:00	451	496	18	91	947	109	YES / NO
18:00 - 19:00	321	302	18	41	623	59	YES / NO
19:00 - 20:00	248	245	10	36	493	46	YES / NO
20:00 - 21:00	199	214	7	30	413	37	YES / NO
21:00 - 22:00	145	147	1	16	292	17	YES / NO
22:00 - 23:00	68	68	1	10	136	11	NO / NO
23:00 - 24:00	35	32	0	2	67	2	NO / NO
Daily	5802	5230	239	799			

Hours met for warrant: Met (Hr) Required (Hr)
0 8

All-way Stop Warrant:

Not satisfied

REMARKS:

CSAH 48 at Camwood Trl (Evergreen Closed) - 2045 Future SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: CSAH 48 at Camwood Trl (Evergreen Closed)

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	5802
55	Major App3: CSAH 48 WB	2	5230
30	Minor App2: Camwood Trl NB	1	133
30	Minor App4: Douglas Fir Dr SB	1	158

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	105	53	84

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
HOUR	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP. 1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	19	16	0	0	35	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	9	7	0	0	16	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	6	6	0	0	12	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	10	6	1	0	16	1	NO / NO	NO / NO	NO / NO
4:00 - 5:00	14	14	0	0	28	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	62	49	2	1	111	2	NO / NO	NO / NO	NO / NO
6:00 - 7:00	216	143	10	5	359	10	NO / NO	NO / NO	NO / NO
7:00 - 8:00	700	487	20	8	1187	20	YES / NO	YES / NO	YES / NO
8:00 - 9:00	472	269	14	9	741	14	YES / NO	YES / NO	YES / NO
9:00 - 10:00	267	207	10	9	474	10	YES / NO	NO / NO	NO / NO
10:00 - 11:00	242	242	7	10	484	10	YES / NO	NO / NO	NO / NO
11:00 - 12:00	285	276	8	11	561	11	YES / NO	NO / NO	YES / NO
12:00 - 13:00	359	309	8	10	668	10	YES / NO	YES / NO	YES / NO
13:00 - 14:00	293	304	5	12	597	12	YES / NO	NO / NO	YES / NO
14:00 - 15:00	341	388	5	8	729	8	YES / NO	YES / NO	YES / NO
15:00 - 16:00	576	475	8	13	1051	13	YES / NO	YES / NO	YES / NO
16:00 - 17:00	464	528	8	20	992	20	YES / NO	YES / NO	YES / NO
17:00 - 18:00	451	496	10	17	947	17	YES / NO	YES / NO	YES / NO
18:00 - 19:00	321	302	7	9	623	9	YES / NO	NO / NO	YES / NO
19:00 - 20:00	248	245	4	5	493	5	YES / NO	NO / NO	NO / NO
20:00 - 21:00	199	214	5	6	413	6	NO / NO	NO / NO	NO / NO
21:00 - 22:00	145	147	0	4	292	4	NO / NO	NO / NO	NO / NO
22:00 - 23:00	68	68	1	1	136	1	NO / NO	NO / NO	NO / NO
23:00 - 24:00	35	32	0	0	67	0	NO / NO	NO / NO	NO / NO
Daily	5802	5230	133	158					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	0	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS: _____

CSAH 48 at Camwood Trl (Evergreen Closed) - 2045 Future SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: CSAH 48 at Camwood Trl (Evergreen Closed)

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	5802
55	Major App3: CSAH 48 WB	2	5230
30	Minor App2: Camwood Trl NB	1	133
30	Minor App4: Douglas Fir Dr SB	1	158

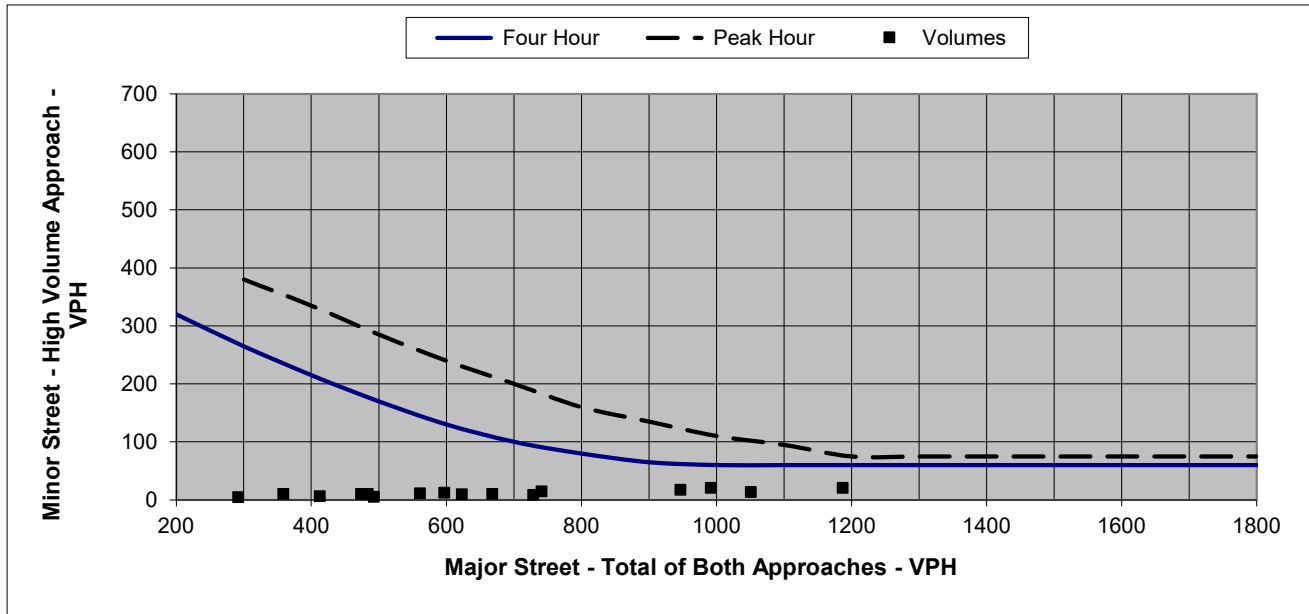


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major	Minor App.	Minor App.
Approach	Four Hour	Peak Hour
200	320	
300	265	380
400	215	335
500	170	285
600	130	240
700	100	200
800	80	160
900	65	135
1000	60	110
1100	60	95
1200	60	75
1300	60	75
1400	60	75
1500	60	75
1600	60	75
1700	60	75
1800	60	75

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	35	0	NO	NO
1:00 - 2:00	16	0	NO	NO
2:00 - 3:00	12	0	NO	NO
3:00 - 4:00	16	1	NO	NO
4:00 - 5:00	28	0	NO	NO
5:00 - 6:00	111	2	NO	NO
6:00 - 7:00	359	10	NO	NO
7:00 - 8:00	1187	20	NO	NO
8:00 - 9:00	741	14	NO	NO
9:00 - 10:00	474	10	NO	NO
10:00 - 11:00	484	10	NO	NO
11:00 - 12:00	561	11	NO	NO
12:00 - 13:00	668	10	NO	NO
13:00 - 14:00	597	12	NO	NO
14:00 - 15:00	729	8	NO	NO
15:00 - 16:00	1051	13	NO	NO
16:00 - 17:00	992	20	NO	NO
17:00 - 18:00	947	17	NO	NO
18:00 - 19:00	623	9	NO	NO
19:00 - 20:00	493	5	NO	NO
20:00 - 21:00	413	6	NO	NO
21:00 - 22:00	292	4	NO	NO
22:00 - 23:00	136	1	NO	NO
23:00 - 24:00	67	0	NO	NO

CSAH 48 at Cypress Dr - 2045 Future ALL WAY STOP WARRANT ANALYSIS

LOCATION: CSAH 48 at Cypress Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach Total
55	Major App1: CSAH 48 EB	2	5334
55	Major App3: CSAH 48 WB	2	3803
30	Minor App2: Cypress Dr SB	2	1588
30	Minor App4: N/A	2	0

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement
210 140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
HOURL	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	15	12	5	0	27	5	NO / NO
1:00 - 2:00	10	5	4	0	15	4	NO / NO
2:00 - 3:00	7	6	1	0	13	1	NO / NO
3:00 - 4:00	9	3	2	0	12	2	NO / NO
4:00 - 5:00	12	9	5	0	21	5	NO / NO
5:00 - 6:00	55	30	20	0	85	20	NO / NO
6:00 - 7:00	203	98	52	0	301	52	YES / NO
7:00 - 8:00	653	395	103	0	1048	103	YES / NO
8:00 - 9:00	440	178	100	0	618	100	YES / NO
9:00 - 10:00	255	142	78	0	397	78	YES / NO
10:00 - 11:00	232	165	87	0	397	87	YES / NO
11:00 - 12:00	270	198	93	0	468	93	YES / NO
12:00 - 13:00	322	214	103	0	536	103	YES / NO
13:00 - 14:00	269	205	107	0	474	107	YES / NO
14:00 - 15:00	316	307	92	0	623	92	YES / NO
15:00 - 16:00	545	377	110	0	922	110	YES / NO
16:00 - 17:00	427	402	138	0	829	138	YES / NO
17:00 - 18:00	407	364	144	0	771	144	YES / YES
18:00 - 19:00	286	204	105	0	490	105	YES / NO
19:00 - 20:00	217	170	81	0	387	81	YES / NO
20:00 - 21:00	174	153	68	0	327	68	YES / NO
21:00 - 22:00	121	98	55	0	219	55	YES / NO
22:00 - 23:00	58	46	23	0	104	23	NO / NO
23:00 - 24:00	31	22	12	0	53	12	NO / NO
Daily	5334	3803	1588	0			

Hours met for warrant: Met (Hr) 1 Required (Hr) 8

All-way Stop Warrant:

Not satisfied

REMARKS:

CSAH 48 at Cypress Dr - 2045 Future SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: CSAH 48 at Cypress Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	5334
55	Major App3: CSAH 48 WB	2	3803
30	Minor App2: Cypress Dr SB	1	73
30	Minor App4: N/A	1	0

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	105	53	84

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
HOUR	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP. 1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	15	12	0	0	27	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	10	5	0	0	15	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	7	6	0	0	13	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	9	3	0	0	12	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	12	9	0	0	21	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	55	30	0	0	85	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	203	98	2	0	301	2	NO / NO	NO / NO	NO / NO
7:00 - 8:00	653	395	7	0	1048	7	YES / NO	YES / NO	YES / NO
8:00 - 9:00	440	178	5	0	618	5	YES / NO	NO / NO	YES / NO
9:00 - 10:00	255	142	4	0	397	4	NO / NO	NO / NO	NO / NO
10:00 - 11:00	232	165	4	0	397	4	NO / NO	NO / NO	NO / NO
11:00 - 12:00	270	198	4	0	468	4	YES / NO	NO / NO	NO / NO
12:00 - 13:00	322	214	4	0	536	4	YES / NO	NO / NO	YES / NO
13:00 - 14:00	269	205	4	0	474	4	YES / NO	NO / NO	NO / NO
14:00 - 15:00	316	307	4	0	623	4	YES / NO	NO / NO	YES / NO
15:00 - 16:00	545	377	5	0	922	5	YES / NO	YES / NO	YES / NO
16:00 - 17:00	427	402	6	0	829	6	YES / NO	YES / NO	YES / NO
17:00 - 18:00	407	364	6	0	771	6	YES / NO	YES / NO	YES / NO
18:00 - 19:00	286	204	5	0	490	5	YES / NO	NO / NO	NO / NO
19:00 - 20:00	217	170	4	0	387	4	NO / NO	NO / NO	NO / NO
20:00 - 21:00	174	153	4	0	327	4	NO / NO	NO / NO	NO / NO
21:00 - 22:00	121	98	4	0	219	4	NO / NO	NO / NO	NO / NO
22:00 - 23:00	58	46	1	0	104	1	NO / NO	NO / NO	NO / NO
23:00 - 24:00	31	22	0	0	53	0	NO / NO	NO / NO	NO / NO
Daily	5334	3803	73	0					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	0	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS: _____

CSAH 48 at Cypress Dr - 2045 Future SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: CSAH 48 at Cypress Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
55	Major App1: CSAH 48 EB	2	5334
55	Major App3: CSAH 48 WB	2	3803
30	Minor App2: Cypress Dr SB	1	73
30	Minor App4: N/A	1	0

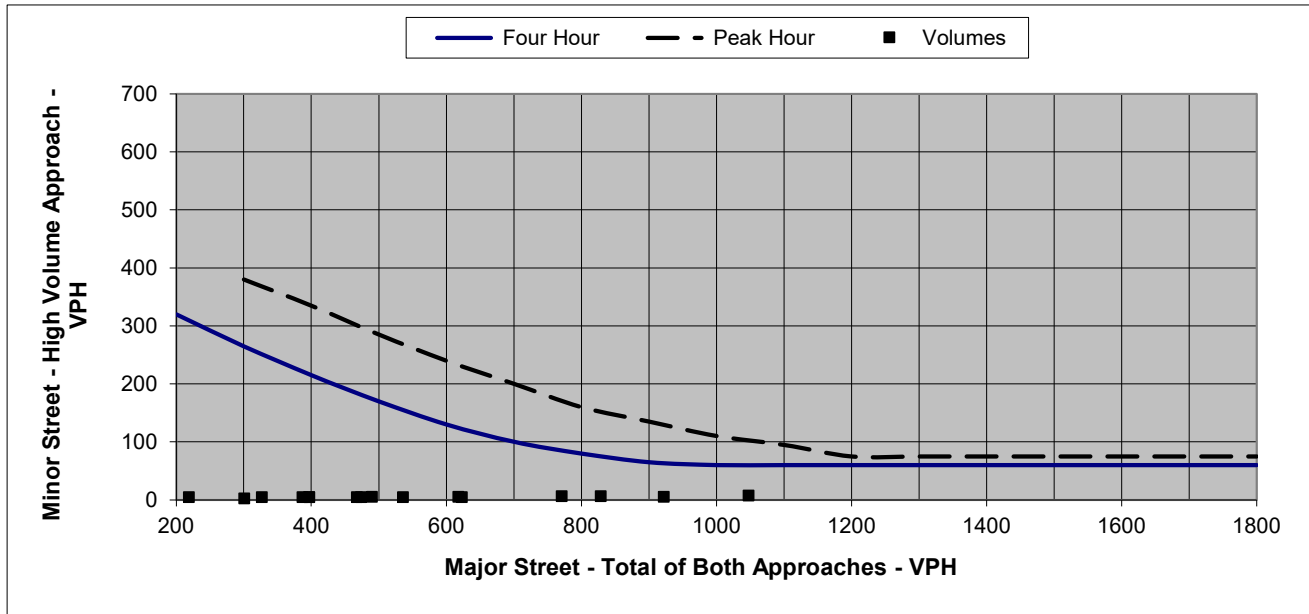


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200	320	
300	265	380
400	215	335
500	170	285
600	130	240
700	100	200
800	80	160
900	65	135
1000	60	110
1100	60	95
1200	60	75
1300	60	75
1400	60	75
1500	60	75
1600	60	75
1700	60	75
1800	60	75

Actual Hourly Count			Warrants Met:	
HOURLY	Sum Major App.	Max Minor App.	Four Hour	Peak Hour
0:00 - 1:00	27	0	NO	NO
1:00 - 2:00	15	0	NO	NO
2:00 - 3:00	13	0	NO	NO
3:00 - 4:00	12	0	NO	NO
4:00 - 5:00	21	0	NO	NO
5:00 - 6:00	85	0	NO	NO
6:00 - 7:00	301	2	NO	NO
7:00 - 8:00	1048	7	NO	NO
8:00 - 9:00	618	5	NO	NO
9:00 - 10:00	397	4	NO	NO
10:00 - 11:00	397	4	NO	NO
11:00 - 12:00	468	4	NO	NO
12:00 - 13:00	536	4	NO	NO
13:00 - 14:00	474	4	NO	NO
14:00 - 15:00	623	4	NO	NO
15:00 - 16:00	922	5	NO	NO
16:00 - 17:00	829	6	NO	NO
17:00 - 18:00	771	6	NO	NO
18:00 - 19:00	490	5	NO	NO
19:00 - 20:00	387	4	NO	NO
20:00 - 21:00	327	4	NO	NO
21:00 - 22:00	219	4	NO	NO
22:00 - 23:00	104	1	NO	NO
23:00 - 24:00	53	0	NO	NO

College Rd at Douglas Fir Dr - 2045 Future ALL WAY STOP WARRANT ANALYSIS

LOCATION: College Rd at Douglas Fir Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description	Lanes	Approach Total
41	Major App1: College Rd EB	3	5817
41	Major App3: College Rd WB	3	5424
30	Minor App2: Douglas Fir Dr NB	3	967
30	Minor App4: Douglas Fir Dr SB	3	454

0.70 SPEED FACTOR USED?

Yes

Minimum Volume Requirement
210 140

	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
HOURLY	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	12	5	7	1	17	8	NO / NO
1:00 - 2:00	10	1	0	2	11	2	NO / NO
2:00 - 3:00	9	5	0	3	14	3	NO / NO
3:00 - 4:00	10	9	0	0	19	0	NO / NO
4:00 - 5:00	15	27	5	4	42	9	NO / NO
5:00 - 6:00	102	51	12	1	153	13	NO / NO
6:00 - 7:00	226	125	43	8	351	51	YES / NO
7:00 - 8:00	473	330	36	20	803	56	YES / NO
8:00 - 9:00	392	321	51	36	713	87	YES / NO
9:00 - 10:00	346	336	51	23	682	74	YES / NO
10:00 - 11:00	323	338	53	29	661	82	YES / NO
11:00 - 12:00	332	428	58	30	760	88	YES / NO
12:00 - 13:00	430	381	62	34	811	96	YES / NO
13:00 - 14:00	411	369	53	35	780	88	YES / NO
14:00 - 15:00	398	423	67	33	821	100	YES / NO
15:00 - 16:00	489	523	80	50	1012	130	YES / NO
16:00 - 17:00	514	579	99	62	1093	161	YES / YES
17:00 - 18:00	420	444	79	49	864	128	YES / NO
18:00 - 19:00	332	251	54	5	583	59	YES / NO
19:00 - 20:00	206	146	50	11	352	61	YES / NO
20:00 - 21:00	143	156	41	8	299	49	YES / NO
21:00 - 22:00	122	110	33	6	232	39	YES / NO
22:00 - 23:00	57	50	24	0	107	24	NO / NO
23:00 - 24:00	45	16	9	4	61	13	NO / NO
Daily	5817	5424	967	454			

Hours met for warrant: Met (Hr) 1 Required (Hr) 8

All-way Stop Warrant:

Not satisfied

REMARKS:

College Rd at Douglas Fir Dr - 2045 Future SIGNAL WARRANT ANALYSIS Warrant 1 and Summary

LOCATION: College Rd at Douglas Fir Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

85 th Speed	Approach Description		Lanes	Approach
41	Major App1:	College Rd EB	3	5817
41	Major App3:	College Rd WB	3	5424
30	Minor App2:	Douglas Fir Dr NB	2	632
30	Minor App4:	Douglas Fir Dr SB	2	57

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

CORRECTABLE CRASHES: 0
(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	420	630	504
Minor Approach	140	70	112

HOUR	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MAX MINOR APPROACH	WARRANT 1A - 8 hr	WARRANT 1B - 8 hr	WARRANT 1A & B
	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	(APP. 2 or 4)	MAJOR/MINOR	MAJOR/MINOR	MAJOR/MINOR
0:00 - 1:00	12	5	5	1	17	5	NO / NO	NO / NO	NO / NO
1:00 - 2:00	10	1	0	0	11	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	9	5	0	1	14	1	NO / NO	NO / NO	NO / NO
3:00 - 4:00	10	9	0	0	19	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	15	27	3	1	42	3	NO / NO	NO / NO	NO / NO
5:00 - 6:00	102	51	8	0	153	8	NO / NO	NO / NO	NO / NO
6:00 - 7:00	226	125	31	1	351	31	NO / NO	NO / NO	NO / NO
7:00 - 8:00	473	330	20	2	803	20	YES / NO	YES / NO	YES / NO
8:00 - 9:00	392	321	32	7	713	32	YES / NO	YES / NO	YES / NO
9:00 - 10:00	346	336	32	4	682	32	YES / NO	YES / NO	YES / NO
10:00 - 11:00	323	338	34	2	661	34	YES / NO	YES / NO	YES / NO
11:00 - 12:00	332	428	37	4	760	37	YES / NO	YES / NO	YES / NO
12:00 - 13:00	430	381	39	1	811	39	YES / NO	YES / NO	YES / NO
13:00 - 14:00	411	369	32	2	780	32	YES / NO	YES / NO	YES / NO
14:00 - 15:00	398	423	46	5	821	46	YES / NO	YES / NO	YES / NO
15:00 - 16:00	489	523	52	4	1012	52	YES / NO	YES / NO	YES / NO
16:00 - 17:00	514	579	72	12	1093	72	YES / NO	YES / YES	YES / NO
17:00 - 18:00	420	444	53	3	864	53	YES / NO	YES / NO	YES / NO
18:00 - 19:00	332	251	34	0	583	34	YES / NO	NO / NO	YES / NO
19:00 - 20:00	206	146	31	0	352	31	NO / NO	NO / NO	NO / NO
20:00 - 21:00	143	156	25	5	299	25	NO / NO	NO / NO	NO / NO
21:00 - 22:00	122	110	21	0	232	21	NO / NO	NO / NO	NO / NO
22:00 - 23:00	57	50	18	0	107	18	NO / NO	NO / NO	NO / NO
23:00 - 24:00	45	16	7	2	61	7	NO / NO	NO / NO	NO / NO
Daily	5817	5424	632	57					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	1	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	0	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	1	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	0	8	Not satisfied

COMMENTS: _____

College Rd at Douglas Fir Dr - 2045 Future SIGNAL WARRANT ANALYSIS Warrants 2 and 3

LOCATION: College Rd at Douglas Fir Dr

COUNTY: Crow Wing

REF. POINT: 0

DATE: 9/20/2022

OPERATOR: JDA

40 MPH OR FASTER? YES

POPULATION < 10,000? YES

VOLUME REQ. AT 70%? YES

85 th Speed	Approach Description	Lanes	Approach
41	Major App1: College Rd EB	3	5817
41	Major App3: College Rd WB	3	5424
30	Minor App2: Douglas Fir Dr NB	2	632
30	Minor App4: Douglas Fir Dr SB	2	57

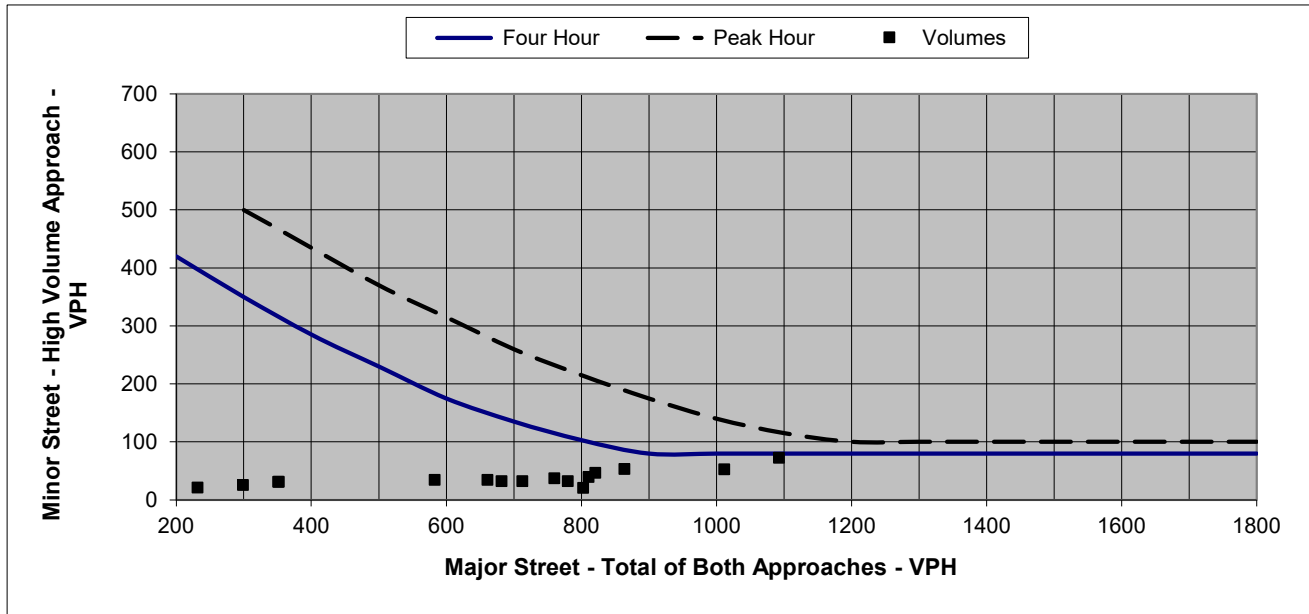


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major	Minor App.	Minor App.
Approach	Four Hour	Peak Hour
200	420	
300	350	500
400	285	435
500	230	370
600	175	315
700	135	260
800	103	215
900	80	175
1000	80	140
1100	80	115
1200	80	100
1300	80	100
1400	80	100
1500	80	100
1600	80	100
1700	80	100
1800	80	100

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	17	5	NO	NO
1:00 - 2:00	11	0	NO	NO
2:00 - 3:00	14	1	NO	NO
3:00 - 4:00	19	0	NO	NO
4:00 - 5:00	42	3	NO	NO
5:00 - 6:00	153	8	NO	NO
6:00 - 7:00	351	31	NO	NO
7:00 - 8:00	803	20	NO	NO
8:00 - 9:00	713	32	NO	NO
9:00 - 10:00	682	32	NO	NO
10:00 - 11:00	661	34	NO	NO
11:00 - 12:00	760	37	NO	NO
12:00 - 13:00	811	39	NO	NO
13:00 - 14:00	780	32	NO	NO
14:00 - 15:00	821	46	NO	NO
15:00 - 16:00	1012	52	NO	NO
16:00 - 17:00	1093	72	NO	NO
17:00 - 18:00	864	53	NO	NO
18:00 - 19:00	583	34	NO	NO
19:00 - 20:00	352	31	NO	NO
20:00 - 21:00	299	25	NO	NO
21:00 - 22:00	232	21	NO	NO
22:00 - 23:00	107	18	NO	NO
23:00 - 24:00	61	7	NO	NO

Appendix C

Traffic Operations Analysis Results

Table C1a
CSAH 48 Corridor Study
Existing Conditions (2022)
AM Peak Hour (7:15 to 8:15 AM)

AM Peak Hour (7:15 to 8:15 AM)															Vehicle Queuing Information (feet)																
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)						Right Turn Lane				
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ ----->	% Block Left ⁽²⁾ <-----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ ----->	% Block Thru ⁽²⁾ <-----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹		
AM Peak Hour	CSAH 48 at TH 371 (Signal)	EB	235	394	78	707	42.1	D	28.9	C	4.5	A	30.5	C	31.6	C	530	149	380			1693	181	413					500	20	46
		WB	14	313	28	355	29.3	C	54.4	D	9.5	A	50.3	D			260	20	82		13 %	1875	238	591	13 %				260	32	367
		NB	138	318	74	530	35.3	D	26.1	C	8.7	A	25.9	C			270	67	178			1950	77	179				270	20	63	
		SB	11	169	231	411	44.5	D	33.6	C	17.1	B	24.7	C			270	20	46			2760	42	116				270	67	231	
	CSAH 48 at Forestview Dr (Minor Stop)	EB		458	21	479			7.4	A	7.0	A	7.4	A	5.5	A															
		WB	6	307		313	3.4	A	1.0	A			1.0	A			200	20	30												
		NB	48		30	78	12.8	B			8.0	A	11.0	B								965	28	93							
		SB											0.0	A																	
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		485	3	488			1.0	A	0.1	A	1.0	A	1.2	A															
		WB	4	302		306	5.9	A	0.8	A			0.9	A									531	20	61						
		NB	11		6	17	14.5	B			5.5	A	11.5	B									622	20	53						
		SB											0.0	A																	
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	19	472		491	2.0	A	0.7	A			0.7	A	1.1	A	130	20	32												
		WB		304		304			1.6	A			1.6	A																	
		NB											0.0	A																	
		SB	1		2	3	10.5	B			2.9	A	6.7	A									763	20	34						
	CSAH 48 at Camwood Trail (Minor Stop)	EB		471	2	473			2.4	A	1.3	A	2.4	A	2.2	A															
		WB	2	294		296	0.0	A	1.4	A			1.4	A																	
		NB	10		12	22	9.4	A			6.2	A	7.7	A									683	20	44						
		SB											0.0	A																	
	CSAH 48 at Berrywood Dr (Minor Stop)	EB	9	472	2	483	3.5	A	3.3	A	1.5	A	3.3	A	2.5	A						2128	20	54							
		WB		290	2	292			1.1	A	0.4	A	1.1	A																	
		NB			1	1					4.0	A	4.0	A									382	20	24						
		SB	4		6	10	11.1	B			4.3	A	6.9	A									664	20	34						
	CSAH 48 at College Rd (Signal)	EB	17	265	8	290	32.9	C	17.4	B	2.7	A	17.9	B	15.4	B	325	20	54			1118	59	123					325	20	44
		WB	219	294	15	528	25.1	C	11.1	B	6.2	A	16.8	B			200	78	163			1050	49	124							
		NB	11	166	300	477	18.3	B	18.8	B	8.5	A	12.6	B			280	20	43			1462	70	184					560	63	172
		SB	35	82	28	145	16.8	B	17.3	B	3.3	A	14.4	B			330	20	62			1026	34	102					220	20	30
College Rd at TH 371 (Signal)	EB	60	62	12	134	44.0	D	46.0	D	4.7	A	41.3	D	20.5	C	360	46	117			946	39	95					320	20	34	
	WB	34	128	144	306	43.8	D	45.3	D	8.0	A	27.5	C			300	26	94			653	54	103					320	48	121	
	NB	45	460	76	581	52.0	D	19.6	B	5.3	A	20.3	C			240	36	116			2869	86	202					240	20	64	
	SB	267	365	129	761	25.2	C	10.4	B	3.0	A	14.3	B			240	66	139			1862	40	119					250	20	36	
College Rd at Douglas Fir Dr (Minor Stop)	EB	58	324	18	400	4.7	A	1.6	A	1.3	A	2.0	A	1.4	A	270	20	54													
	WB	6	278	9	293	3.8	A	0.4	A	0.2	A	0.4	A			220	20	22			897		20								
	NB	2		2	4	13.2	B			2.6	A	6.1	A			190	20	32										335	20	34	
	SB	1		25	26	10.5	B			3.4	A	3.7	A			120	20	20			577	20	47								

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Table C1b
CSAH 48 Corridor Study
Existing Conditions (2022)
School Dismissal Peak Hour (2:45 to 3:45 PM)

School Dismissal Peak Hour (2:45 to 3:45 PM)																Vehicle Queuing Information (feet)															
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)						Right Turn Lane				
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ ----->	% Block Left ⁽²⁾ <-----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ ----->	% Block Thru ⁽²⁾ <-----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹		
School Dismissal Peak Hour	CSAH 48 at TH 371 (Signal)	EB	195	265	88	548	23.1	C	23.3	C	4.4	A	20.3	C	21.7	C	530	82	257			1693	123	392				500	22	52	
		WB	42	188	29	259	22.0	C	32.0	C	4.3	A	27.3	C			260	23	67			1875	97	230				260	20	42	
		NB	40	227	18	285	28.3	C	21.2	C	4.8	A	21.2	C			270	21	62			1950	55	128				270	20	27	
		SB	15	326	84	425	34.6	C	23.5	C	5.4	A	20.4	C			270	20	43			2760	64	153				270	20	73	
	CSAH 48 at Forestview Dr (Minor Stop)	EB		273	25	298			7.9	A	5.4	A	7.7	A	4.6	A															
		WB	27	235		262	2.0	A	0.7	A			0.8	A			200	20	34												
		NB	24		15	39	8.1	A			3.9	A	6.5	A								965	20	51							
		SB											0.0	A																	
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		282	6	288			0.9	A	0.1	A	0.9	A	0.8	A															
		WB	6	260		266	3.7	A	0.6	A			0.7	A								531	20	44							
		NB	2		2	4	8.3	A			1.8	A	4.0	A								622	20	25							
		SB											0.0	A																	
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	4	280		284	1.8	A	0.6	A			0.6	A	1.1	A	130	20	20												
		WB		253	4	257			1.4	A	1.1	A	1.4	A																	
		NB											0.0	A																	
		SB	3		13	16	11.3	B			2.9	A	4.3	A								763	20	24							
	CSAH 48 at Camwood Trail (Minor Stop)	EB		279	4	283			2.2	A	1.7	A	2.2	A	1.7	A															
		WB	4	255		259	1.4	A	1.0	A			1.0	A			130	20	20												
		NB	2		7	9	6.3	A			3.3	A	3.9	A								683	20	29							
		SB											0.0	A																	
	CSAH 48 at Berrywood Dr (Minor Stop)	EB	5	281		286	3.2	A	2.4	A			2.4	A	1.7	A						2128	20	33							
		WB		250	8	258			0.8	A	0.4	A	0.8	A																	
		NB	4		1	5	6.8	A			3.4	A	6.0	A								382	20	33							
		SB	4		5	9	5.7	A			3.4	A	4.3	A								664	20	39							
	CSAH 48 at College Rd (Signal)	EB	44	282	7	333	25.6	C	13.4	B	2.5	A	14.8	B	12.9	B	325	29	79			1118	55	115				325	20	27	
		WB	132	358	19	509	22.3	C	10.7	B	5.8	A	13.5	B			200	49	99			1050	59	120							
		NB	23	105	203	331	17.2	B	15.0	B	6.8	A	10.4	B			280	20	48			1462	41	125				560	55	160	
		SB	15	79	64	158	19.2	B	19.0	B	3.8	A	12.8	B			330	20	41			1026	34	92				220	20	46	
College Rd at TH 371 (Signal)	EB	215	195	53	463	50.6	D	54.6	D	5.1	A	46.9	D	32.6	C	360	150	277			946	94	167				320	25	56		
	WB	57	198	206	461	49.1	D	61.2	E	8.4	A	37.6	D			300	52	134			653	91	168				320	54	111		
	NB	56	357	38	451	69.7	E	27.2	C	3.9	A	30.4	C			240	47	119			2869	89	193				240	20	51		
	SB	152	315	137	604	47.9	D	14.0	B	3.1	A	19.8	B			240	62	143			1862	44	111				250	20	37		
College Rd at Douglas Fir Dr (Minor Stop)	EB	29	357	2	388	5.3	A	2.0	A	1.8	A	2.2	A	1.6	A	270	20	66													
	WB	3	396	5	404	2.6	A	0.5	A	0.2	A	0.5	A			220	20	20			897		20								
	NB	14		5	19	9.4	A			4.2	A	8.2	A			190	20	34									335	20	25		
	SB	4		39	43	7.6	A			4.5	A	4.7	A			120	20	25			577	21	66								

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Table C1c
CSAH 48 Corridor Study
Existing Conditions (2022)
PM Peak Hour (4:15 to 5:15 PM)

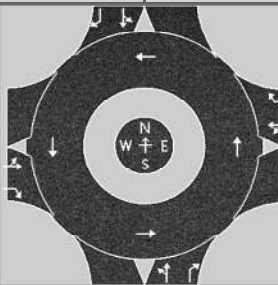
PM Peak Hour (4:15 to 5:15 PM)															Vehicle Queuing Information (feet)																
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)					Right Turn Lane					
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ <---->	% Block Left ⁽²⁾ <----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ <---->	% Block Thru ⁽²⁾ <----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹		
PM Peak Hour	CSAH 48 at TH 371 (Signal)	EB	72	130	87	289	26.1	C	27.3	C	4.6	A	20.4	C	21.1	C	530	41	125			1693	66	162				500	26	63	
		WB	65	152	25	242	26.6	C	30.9	C	4.0	A	27.1	C			260	39	115			1875	81	167				260	20	41	
		NB	83	336	15	434	23.4	C	17.8	B	3.3	A	18.4	B			270	37	98			1950	63	152				270	20	21	
		SB	37	425	75	537	28.6	C	23.2	C	4.5	A	21.0	C			270	20	68			2760	79	196				270	20	42	
	CSAH 48 at Forestview Dr (Minor Stop)	EB		131	51	182			4.9	A	4.4	A	4.8	A	2.6	A															
		WB	26	218		244	1.1	A	0.6	A			0.7	A			200	20	27												
		NB	24		18	42	6.3	A			2.5	A	4.7	A								965	20	40							
		SB											0.0	A																	
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		143	6	149			0.4	A	0.2	A	0.4	A	0.6	A															
		WB	8	238		246	1.4	A	0.6	A			0.6	A								531	20	24							
		NB	6		8	14	5.8	A			3.1	A	4.3	A								622	20	26							
		SB											0.0	A																	
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	2	149		151	0.6	A	0.3	A			0.3	A	1.1	A	130		20												
		WB		228	1	229			1.3	A	0.1	A	1.3	A																	
		NB											0.0	A																	
		SB	6		18	24	5.4	A			2.6	A	3.2	A								763	20	35							
	CSAH 48 at Camwood Trail (Minor Stop)	EB		145	10	155			0.9	A	0.7	A	0.9	A	1.0	A															
		WB	13	227		240	1.2	A	1.0	A			1.0	A			130	20	20												
		NB	2		4	6	4.8	A			3.0	A	3.7	A								683	20	24							
		SB											0.0	A																	
	CSAH 48 at Berrywood Dr (Minor Stop)	EB	13	136		149	1.8	A	1.2	A			1.3	A	1.1	A						2128	20	28							
		WB		226	5	231			0.8	A	0.5	A	0.8	A																	
		NB											0.0	A																	
		SB	1		14	15	0.0	A			3.1	A	3.1	A								664	20	38							
CSAH 48 at College Rd (Signal)	EB	37	371	11	419	26.0	C	11.2	B	1.8	A	12.1	B	11.8	B	325	23	81			1118	63	134				325	20	24		
	WB	114	392	18	524	22.1	C	8.6	A	4.7	A	11.4	B			200	44	97			1050	52	128								
	NB	22	47	112	181	19.6	B	15.1	B	4.4	A	9.6	A			280	20	49			1462	21	65				560	23	64		
	SB	27	82	49	158	18.3	B	20.4	C	4.2	A	15.1	B			330	20	58			1026	35	94				220	20	39		
College Rd at TH 371 (Signal)	EB	259	223	79	561	52.7	D	49.1	D	5.5	A	44.5	D	30.8	C	360	189	336			946	97	174				320	31	67		
	WB	54	178	298	530	48.4	D	61.6	E	11.0	B	32.9	C			300	40	119			653	83	160				320	76	182		
	NB	47	361	25	433	71.5	E	27.3	C	4.5	A	30.6	C			240	43	141			2869	86	196				240	20	44		
	SB	135	404	167	706	49.9	D	15.3	B	3.5	A	18.7	B			240	59	138			1862	65	151				250	20	48		
College Rd at Douglas Fir Dr (Minor Stop)	EB	16	358	3	377	5.8	A	2.2	A	1.9	A	2.3	A	1.9	A	270	20	40													
	WB	2	469	1	472	1.1	A	0.5	A	0.3	A	0.5	A			220		20													
	NB	23	1		24	11.5	B	8.1	A			11.4	B			190	20	47			667	20	20								
	SB	10	1	51	62	10.3	B	13.0	B	4.4	A	5.4	A			120	20	35			577	23	48								

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2022
Time Analyzed	Existing AM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	CSAH 48 at Isle Dr/Ironwood...
E/W Street Name	CSAH 48
N/S Street Name	Isle Dr/Ironwood Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.75
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Lane Assignment	LT		R		LT		R		LT		R		LT		R	
Volume (V), veh/h	0	56	451	112	0	264	395	23	0	52	38	252	0	4	22	18
Percent Heavy Vehicles, %	3	0	0	2	3	13	1	0	3	0	0	13	3	0	0	0
Flow Rate (v _{PCE}), pc/h	0	75	601	152	0	398	532	31	0	69	51	380	0	5	29	24
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.5352	2.5352		2.5352	2.5352	

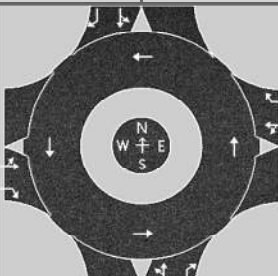
Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	676	152		930	31		120	380		34	24	
Entry Volume, veh/h	674	151		881	29		110	347		34	24	
Circulating Flow (v_c), pc/h	432			195			681			999		
Exiting Flow (v_{ex}), pc/h	986			625			157			579		
Capacity (C_{pce}), pc/h	958	958		1189	1189		764	764		572	572	
Capacity (c), veh/h	955	955		1126	1126		697	697		572	572	
v/c Ratio (x)	0.71	0.16		0.78	0.03		0.16	0.50		0.06	0.04	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	15.8	5.3		17.5	3.4		6.9	12.6		7.0	6.8	
Lane LOS	C	A		C	A		A	B		A	A	
95% Queue, veh	6.1	0.6		8.4	0.1		0.6	2.8		0.2	0.1	
Approach Delay, s/veh	13.8			17.0			11.3			6.9		
Approach LOS	B			C			B			A		
Intersection Delay, s/veh LOS	14.4						B					

HCS Roundabouts Report

General Information		Site Information		
Analyst	JDA		Intersection	CSAH 48 at Isle Dr/Ironwood...
Agency or Co.	SEH		E/W Street Name	CSAH 48
Date Performed	8/17/2022		N/S Street Name	Isle Dr/Ironwood Dr
Analysis Year	2022		Analysis Time Period, hrs	0.25
Time Analyzed	Existing School Dismissal		Peak Hour Factor	0.70
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Lane Assignment	LT		R		LT		R		LT		R		LT		R	
Volume (V), veh/h	0	25	301	24	0	93	202	17	0	55	37	227	0	20	16	30
Percent Heavy Vehicles, %	3	4	1	13	3	0	1	0	3	0	3	19	3	0	0	0
Flow Rate (v_{PCE}), pc/h	0	37	434	39	0	133	291	24	0	79	54	386	0	29	23	43
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	471	39		424	24		133	386		52	43	
Entry Volume, veh/h	462	38		421	24		117	339		52	43	
Circulating Flow (v_c), pc/h	185			170			500			503		
Exiting Flow (v_{ex}), pc/h	849			413			115			195		
Capacity (C_{pce}), pc/h	1200	1200		1216	1216		901	901		898	898	
Capacity (c), veh/h	1176	1176		1209	1209		791	791		898	898	
v/c Ratio (x)	0.39	0.03		0.35	0.02		0.15	0.43		0.06	0.05	

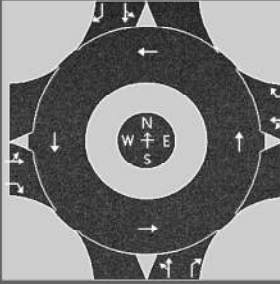
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	7.0	3.3		6.3	3.1		6.1	10.1		4.5	4.4	
Lane LOS	A	A		A	A		A	B		A	A	
95% Queue, veh	1.9	0.1		1.6	0.1		0.5	2.2		0.2	0.2	
Approach Delay, s/veh	6.7			6.1			9.0			4.5		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	7.1						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2022
Time Analyzed	Existing PM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	CSAH 48 at Isle Dr/Ironwood...
E/W Street Name	CSAH 48
N/S Street Name	Isle Dr/Ironwood Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.83
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Lane Assignment	LT		R		LT		R		LT		R		LT		R	
Volume (V), veh/h	0	27	188	6	0	78	211	21	0	13	16	68	0	33	22	33
Percent Heavy Vehicles, %	3	0	2	0	3	0	1	0	3	0	0	4	3	0	0	0
Flow Rate (v _{PCE}), pc/h	0	33	231	7	0	94	257	25	0	16	19	85	0	40	27	40
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	264	7		351	25		35	85		67	40	
Entry Volume, veh/h	260	7		349	25		34	83		67	40	
Circulating Flow (v_c), pc/h	161			68			304			367		
Exiting Flow (v_{ex}), pc/h	356			313			77			128		
Capacity (C_{pce}), pc/h	1226	1226		1335	1335		1077	1077		1017	1017	
Capacity (c), veh/h	1206	1206		1326	1326		1047	1047		1017	1017	
v/c Ratio (x)	0.22	0.01		0.26	0.02		0.03	0.08		0.07	0.04	

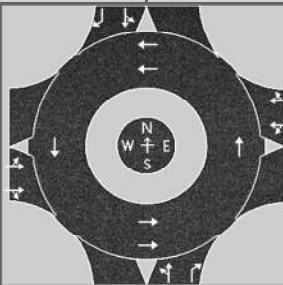
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	4.9	3.0		5.0	2.9		3.7	4.1		4.1	3.9	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.8	0.0		1.1	0.1		0.1	0.3		0.2	0.1	
Approach Delay, s/veh	4.8			4.9			4.0			4.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	4.6						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2022
Time Analyzed	Existing AM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	College Rd at Cypress Dr
E/W Street Name	College Rd
N/S Street Name	Cypress Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.83
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	56	231	5	0	12	278	42	0	8	16	20	0	43	23	46
Percent Heavy Vehicles, %	3	20	1	0	3	0	0	0	3	0	6	0	3	7	9	4
Flow Rate (v _{PCE}), pc/h	0	81	281	6	0	14	335	51	0	10	20	24	0	55	30	58
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	173	195		188	212		30	24		85	58	
Entry Volume, veh/h	165	186		188	212		29	23		80	55	
Circulating Flow (v_c), pc/h	99			111			417			359		
Exiting Flow (v_{ex}), pc/h	360			403			152			50		
Capacity (C_{pce}), pc/h	1298	1298		1284	1284		920	996		970	1047	
Capacity (c), veh/h	1240	1240		1284	1284		901	975		914	986	
v/c Ratio (x)	0.13	0.15		0.15	0.17		0.03	0.02		0.09	0.06	

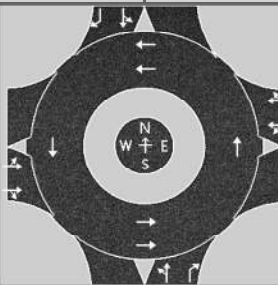
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	4.0	4.2		4.0	4.2		4.3	3.9		4.8	4.1	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.5	0.5		0.5	0.6		0.1	0.1		0.3	0.2	
Approach Delay, s/veh	4.1			4.1			4.1			4.5		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	4.2						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2022
Time Analyzed	Existing School Dismissal
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	College Rd at Cypress Dr
E/W Street Name	College Rd
N/S Street Name	Cypress Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	56	287	11	0	6	360	71	0	13	24	20	0	48	27	38
Percent Heavy Vehicles, %	3	4	1	0	3	0	0	1	3	0	0	0	3	8	0	0
Flow Rate (v _{PCE}), pc/h	0	65	322	12	0	7	400	80	0	14	27	22	0	58	30	42
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	188	211		229	258		41	22		88	42	
Entry Volume, veh/h	185	208		229	258		41	22		85	41	
Circulating Flow (v_c), pc/h	95			106			445			421		
Exiting Flow (v_{ex}), pc/h	402			456			172			49		
Capacity (C_{pce}), pc/h	1302	1302		1289	1289		896	973		916	993	
Capacity (c), veh/h	1284	1284		1287	1287		896	973		886	960	
v/c Ratio (x)	0.14	0.16		0.18	0.20		0.05	0.02		0.10	0.04	

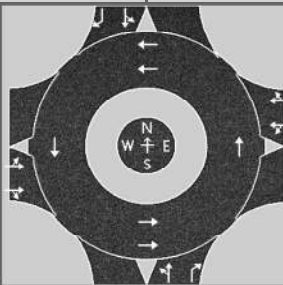
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	4.0	4.2		4.3	4.5		4.4	3.9		5.0	4.1	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.5	0.6		0.6	0.7		0.1	0.1		0.3	0.1	
Approach Delay, s/veh	4.1			4.4			4.2			4.7		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	4.3						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2022
Time Analyzed	Existing PM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	College Rd at Cypress Dr
E/W Street Name	College Rd
N/S Street Name	Cypress Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.94
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	60	339	20	0	9	352	73	0	13	33	19	0	82	31	40
Percent Heavy Vehicles, %	3	8	1	0	3	0	0	3	3	0	0	0	3	0	0	5
Flow Rate (v _{PCE}), pc/h	0	69	364	21	0	10	374	80	0	14	35	20	0	87	33	45
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	213	241		218	246		49	20		120	45	
Entry Volume, veh/h	209	236		217	245		49	20		118	44	
Circulating Flow (v_c), pc/h	130			118			520			398		
Exiting Flow (v_{ex}), pc/h	471			433			184			64		
Capacity (C_{pce}), pc/h	1262	1262		1275	1275		837	913		936	1012	
Capacity (c), veh/h	1237	1237		1269	1269		837	913		924	999	
v/c Ratio (x)	0.17	0.19		0.17	0.19		0.06	0.02		0.13	0.04	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	4.3	4.5		4.3	4.5		4.9	4.1		5.1	4.0	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.6	0.7		0.6	0.7		0.2	0.1		0.4	0.1	
Approach Delay, s/veh	4.5			4.4			4.7			4.8		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	4.5						A					

Table C2a
CSAH 48 Corridor Study
2045 No Build Conditions
AM Peak Hour (7:15 to 8:15 AM)

AM Peak Hour (7:15 to 8:15 AM)																Vehicle Queuing Information (feet)														
Intersection		Approach	Demand Volumes				Delay (s/veh)					LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)					Right Turn Lane					
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ ----->	% Block Left ⁽²⁾ <-----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ ----->	% Block Thru ⁽²⁾ <-----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	
AM Peak Hour	CSAH 48 at TH 371 (Signal)	EB	314	566	111	991	132.7	F	99.7	F	8.7	A	99.0	F	83.6	F	530	364	650		16 %	1700	718	1426	16 %		850	315	1212	
		WB	141	519	187	847	117.6	F	161.4	F	77.9	E	136.2	F			260	190	410		52 %	1223	867	1237	52 %		260	185	450	
		NB	188	410	206	804	67.3	E	57.5	E	26.4	C	51.9	D			270	139	340		1 %	1950	180	363	1 %		270	81	213	
		SB	104	215	316	635	46.6	D	56.0	E	30.5	C	41.9	D			270	67	158			2759	87	206		2 %	270	135	321	
	CSAH 48 at 3/4 Access (Minor Stop)	EB	154	722		876	18.3	C	4.5	A			7.0	A	31.0	D	300	62	164											
		WB		717	57	774			37.9	E	8.3	A	35.7	E							25 %	589	251	602	25 %		300	60	420	
		NB											0.0	A																
		SB				130	130					182.4	F	182.4			F										415	185	594	
	CSAH 48 at Forestview Dr (Minor Stop)	EB	39	613	70	722	8.2	A	1.9	A	0.8	A	2.1	A	88.8	F	300	20	53								300		20	
		WB	26	550	16	592	12.3	B	20.9	C	5.5	A	20.2	C			200	23	174		11 %	676	109	490	11 %		300	20	214	
		NB	187	36	92	315	821.8	F	834.0	F	810.4	F	820.2	F								959	955	1001						
		SB	89	13	37	139	102.2	F	120.7	F	66.0	F	94.2	F								1100	108	274	4 %		300	34	124	
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		784	10	794			1.4	A	0.5	A	1.4	A	3.5	A														
		WB	8	565		573	11.6	B	4.8	A			4.9	A									531	33	292					
		NB	27		12	39	28.2	D			11.7	B	23.6	C								619	22	71						
		SB											0.0	A																
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	39	757		796	4.2	A	0.7	A			0.9	A	1.6	A	130	20	45											
		WB		567	5	572			2.5	A	1.7	A	2.5	A									2175	20	20					
		NB											0.0	A																
		SB	1		6	7	0.0	A			6.6	A	6.6	A									763	20	35					
	CSAH 48 at Camwood Trail (Minor Stop)	EB	30	724	4	758	4.4	A	2.5	A	1.2	A	2.6	A	3.0	A	300	20	39											
		WB	4	515	7	526	3.0	A	2.1	A	1.2	A	2.1	A			300	20	20											
		NB	23		16	39	24.5	C			8.6	A	17.9	C									678	22	67					
		SB	9		34	43	16.4	C			5.2	A	7.3	A									1158	20	31			300	20	43
	CSAH 48 at Cypress Dr (Minor Stop)	EB	102	647		749	4.6	A	2.1	A			2.4	A	2.4	A	300	22	65											
		WB		418		418			1.4	A			1.4	A																
		NB											0.0	A																
		SB	8		108	116	14.6	B			5.0	A	5.7	A			300	20	24								465	23	60	
CSAH 48 at Berrywood Dr (Minor Stop)	EB	9	644	2	655	2.5	A	1.0	A	0.4	A	1.0	A	1.4	A						554	20	62							
	WB		412	2	414			1.7	A	1.3	A	1.7	A																	
	NB			1	1					3.9	A	3.9	A									382	20	27						
	SB	4		6	10	11.3	B			4.7	A	7.7	A									664	20	35						
CSAH 48 at College Rd (Signal)	EB	22	311	8	341	35.5	D	19.3	B	3.8	A	19.9	B	16.8	B	325	20	71			1118	69	134			325	20	49		
	WB	311	364	16	691	27.4	C	13.0	B	9.3	A	19.3	B			200	103	195			1050	61	140							
	NB	12	213	417	642	18.1	B	19.2	B	8.9	A	12.7	B			280	20	29			1462	77	219			560	75	170		
	SB	39	116	40	195	18.2	B	17.6	B	3.7	A	14.8	B			330	20	58			1026	47	141			220	20	28		
College Rd at TH 371 (Signal)	EB	72	91	15	178	42.6	D	44.6	D	5.4	A	40.8	D	22.8	C	360	59	131			946	51	114			320	20	33		
	WB	41	173	182	396	43.4	D	44.0	D	12.9	B	30.1	C			300	36	109			653	69	127			320	65	166		
	NB	58	757	96	911	51.5	D	20.8	C	7.4	A	21.3	C			240	43	121		1 %	2869	126	283	1 %		240	20	86		
	SB	344	579	169	1,092	34.7	C	12.8	B	4.2	A	18.4	B			240	93	168			1862	71	164			250	20	58		
College Rd at Douglas Fir Dr (Minor Stop)	EB	65	388	72	525	4.8	A	2.2	A	1.9	A	2.5	A	2.1	A	270	20	57												
	WB	38	346	10	394	3.5	A	0.5	A	0.4	A	0.7	A			220	20	42			897		20							
	NB	23		17	40	14.1	B			3.1	A	9.7	A			190	20	52								335	20	40		
	SB	1		28	29	11.6	B			4.3	A	4.6	A			120	20	20			577	20	54							

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Table C2b
CSAH 48 Corridor Study
2045 No Build Conditions
School Dismissal Peak Hour (2:45 to 3:45 PM)

School Dismissal Peak Hour (2:45 to 3:45 PM)																Vehicle Queuing Information (feet)														
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)						Right Turn Lane			
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ ----->	% Block Left ⁽²⁾ <-----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ ----->	% Block Thru ⁽²⁾ <-----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	
School Dismissal Peak Hour	CSAH 48 at TH 371 (Signal)	EB	265	460	126	851	90.8	F	125.8	F	14.2	B	99.1	F	60.6	E	530	333	660		25 %	1700	690	1582	25 %		850	310	1222	
		WB	164	359	149	672	93.2	F	57.4	E	10.3	B	55.6	E			260	167	403		12 %	1223	273	607	12 %		260	70	387	
		NB	74	303	154	531	56.2	E	45.3	D	18.8	B	39.2	D			270	59	143			1950	109	253			270	50	157	
		SB	152	433	146	731	40.4	D	40.7	D	12.8	B	35.0	D			270	90	209		1 %	2759	125	283	1 %		270	35	159	
	CSAH 48 at 3/4 Access (Minor Stop)	EB	119	647		766	11.4	B	7.7	A			8.3	A	5.6	A	300	33	83								300		20	
		WB		562	49	611			2.2	A	0.7	A	2.1	A														300		
		NB											0.0	A																
		SB				110	110					6.7	A	6.7			A											415	33	82
	CSAH 48 at Forestview Dr (Minor Stop)	EB	54	458	135	647	3.4	A	1.8	A	0.5	A	1.7	A	21.0	C	300	20	59								300	20	20	
		WB	76	447	22	545	5.3	A	2.3	A	0.4	A	2.6	A			200	21	54								300		20	
		NB	111	21	52	184	130.4	F	138.9	F	129.7	F	131.3	F								959	206	529						
		SB	73	28	53	154	61.2	F	60.0	F	8.4	A	42.2	E								1100	75	207	1 %		300	23	66	
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		563	20	583			1.4	A	0.4	A	1.4	A	1.5	A														
		WB	12	534		546	3.8	A	1.2	A			1.3	A									531	20	72					
		NB	11		5	16	13.3	B			4.1	A	10.2	B								619	20	34						
		SB											0.0	A																
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	10	558		568	2.6	A	0.6	A			0.6	A	1.5	A	130	20	27											
		WB		520	5	525			2.2	A	1.5	A	2.2	A																
		NB											0.0	A																
		SB	5		26	31	17.7	C			4.8	A	7.1	A								763	20	38						
	CSAH 48 at Camwood Trail (Minor Stop)	EB	27	524	12	563	4.8	A	4.4	A	1.5	A	4.3	A	3.4	A	300	20	48											
		WB	6	492	6	504	4.7	A	1.7	A	1.0	A	1.7	A			300	20	23								300		20	
		NB	8		11	19	23.5	C			6.7	A	14.2	B								678	20	35						
		SB	7		25	32	22.6	C			4.0	A	7.6	A								1158	20	25			300	20	35	
	CSAH 48 at Cypress Dr (Minor Stop)	EB	119	423		542	6.3	A	1.9	A			2.9	A	2.3	A	300	33	84								300		20	
		WB		398	7	405			0.7	A	0.2	A	0.7	A														300		
		NB											0.0	A																
		SB	5		106	111	10.9	B			4.7	A	5.0	A			300	20	23								465	23	65	
CSAH 48 at Berrywood Dr (Minor Stop)	EB	5	423		428	5.7	A	1.3	A			1.4	A	2.5	A						554	20	104							
	WB		396	8	404			3.5	A	1.1	A	3.4	A																	
	NB	4		1	5	12.4	B			3.2	A	10.6	B								382	20	30							
	SB	4		5	9	12.3	B			5.6	A	8.0	A								664	20	48							
CSAH 48 at College Rd (Signal)	EB	56	341	7	404	31.3	C	16.5	B	2.8	A	18.1	B	15.5	B	325	36	93			1118	73	139			325	20	30		
	WB	232	422	21	675	24.9	C	13.0	B	8.2	A	16.9	B			200	76	144			1050	71	151							
	NB	26	144	301	471	18.9	B	16.8	B	8.3	A	11.9	B			280	20	49			1462	58	134			560	71	186		
	SB	17	119	79	215	20.8	C	19.8	B	4.4	A	14.2	B			330	20	53			1026	48	129			220	20	48		
College Rd at TH 371 (Signal)	EB	257	247	65	569	52.5	D	48.1	D	7.1	A	45.5	D	33.8	C	360	183	356			946	106	234			320	29	64		
	WB	73	251	262	586	46.9	D	58.3	E	15.9	B	38.6	D			300	56	154			653	109	195			320	83	201		
	NB	68	598	51	717	67.5	E	25.6	C	5.6	A	28.3	C			240	61	168		1 %	2869	134	271	1 %		240	20	50		
	SB	198	593	170	961	64.9	E	23.1	C	5.1	A	28.4	C			240	99	172			1862	123	242			250	20	67		
College Rd at Douglas Fir Dr (Minor Stop)	EB	33	430	36	499	6.2	A	2.6	A	2.3	A	2.8	A	2.5	A	270	20	80												
	WB	25	478	5	508	3.8	A	0.6	A	0.3	A	0.8	A			220	20	33			897		20							
	NB	51		28	79	14.1	B			3.7	A	10.4	B			190	28	68								335	20	34		
	SB	4		44	48	16.1	C			5.7	A	6.4	A			120	20	29			577	25	78							

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Table C2c
CSAH 48 Corridor Study
2045 No Build Conditions
PM Peak Hour (4:15 to 5:15 PM)

PM Peak Hour (4:15 to 5:15 PM)															Vehicle Queuing Information (feet)																
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)						Right Turn Lane				
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ <---->	% Block Left ⁽²⁾ <---->	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ <---->	% Block Thru ⁽²⁾ <---->	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹		
PM Peak Hour	CSAH 48 at TH 371 (Signal)	EB	159	375	142	676	47.8	D	61.7	E	9.5	A	47.5	D	46.6	D	530	116	323		2 %	1700	287	557	2 %		850	45	131		
		WB	231	375	181	787	58.0	E	54.1	D	10.7	B	45.7	D			260	174	409		12 %	1223	273	586	12 %		260	71	413		
		NB	129	444	181	754	44.3	D	56.8	E	18.1	B	45.4	D			270	82	238		2 %	1950	180	333	1 %		270	55	149		
		SB	228	568	156	952	48.7	D	55.3	E	17.9	B	47.7	D			270	144	327		6 %	2759	206	395	7 %		270	47	209		
	CSAH 48 at 3/4 Access (Minor Stop)	EB	146	638		784	10.2	B	3.8	A			5.0	A	3.8	A	300	45	104												
		WB		619	80	699			1.2	A	0.8	A	1.2	A									589		20				300	20	30
		NB											0.0	A																	
		SB				168	168					8.4	A	8.4			A											415	45	99	
	CSAH 48 at Forestview Dr (Minor Stop)	EB	83	357	198	638	6.2	A	1.8	A	1.1	A	2.1	A	47.6	E	300	24	67									300	20	21	
		WB	89	495	39	623	5.2	A	3.7	A	0.5	A	3.7	A			200	25	63									300		20	
		NB	119	23	60	202	307.7	F	285.4	F	296.7	F	301.5	F								959	437	799							
		SB	99	38	85	222	155.0	F	155.6	F	21.2	C	102.3	F								1100	186	417	15 %		300	62	247		
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		489	27	516			1.3	A	0.6	A	1.3	A	1.5	A															
		WB	18	608		626	3.1	A	1.4	A			1.4	A									531	20	78						
		NB	15		12	27	13.1	B			4.5	A	8.9	A									619	20	44						
		SB											0.0	A																	
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	9	492		501	3.7	A	0.5	A			0.6	A	1.9	A	130	20	26												
		WB		587	2	589			2.4	A	2.4	A	2.4	A																	
		NB											0.0	A																	
		SB	11		39	50	15.5	C			6.0	A	8.4	A									763	20	55						
	CSAH 48 at Camwood Trail (Minor Stop)	EB	37	445	21	503	4.6	A	3.7	A	1.1	A	3.6	A	3.1	A	300	20	43									300		20	
		WB	18	539	10	567	4.3	A	2.0	A	1.1	A	2.1	A			300	20	28									300		20	
		NB	9		8	17	18.1	C			5.9	A	12.4	B									678	20	36						
		SB	11		41	52	13.9	B			5.0	A	6.8	A									1158	20	27			300	20	48	
	CSAH 48 at Cypress Dr (Minor Stop)	EB	156	308		464	6.0	A	1.5	A			3.0	A	2.5	A	300	38	90												
		WB		426	8	434			0.8	A	0.4	A	0.8	A									554		20				300		20
		NB											0.0	A																	
		SB	6		141	147	13.7	B			5.8	A	6.1	A			300	20	26									465	27	77	
CSAH 48 at Berrywood Dr (Minor Stop)	EB	13	301		314	4.3	A	1.0	A			1.1	A	2.6	A						554	20	75								
	WB		419	5	424			3.6	A	0.8	A	3.6	A														300		20		
	NB											0.0	A																		
	SB	1		15	16	14.2	B			5.3	A	5.8	A									664	20	43							
CSAH 48 at College Rd (Signal)	EB	52	447	11	510	31.1	C	16.1	B	3.2	A	17.3	B	15.8	B	325	35	95			1118	89	170				325	20	33		
	WB	245	455	21	721	25.2	C	12.1	B	7.9	A	16.4	B			200	77	142			1050	71	151								
	NB	24	92	238	354	20.3	C	18.5	B	7.1	A	11.2	B			280	20	49			1462	37	87				560	46	115		
	SB	30	133	60	223	22.3	C	22.1	C	4.7	A	17.6	B			330	20	66			1026	52	130				220	20	48		
College Rd at TH 371 (Signal)	EB	319	285	98	702	50.9	D	43.1	D	9.8	A	41.7	D	34.2	C	360	229	385			946	118	283				320	40	99		
	WB	75	228	374	677	40.8	D	55.1	E	22.4	C	35.9	D			300	50	121			653	94	173				320	130	278		
	NB	58	692	34	784	70.7	E	33.6	C	8.3	A	35.3	D			240	54	194		5 %	2869	187	383	6 %		240	20	48			
	SB	179	779	198	1,156	63.8	E	25.1	C	5.3	A	27.9	C			240	92	188		1 %	1862	162	290	1 %		250	20	64			
College Rd at Douglas Fir Dr (Minor Stop)	EB	16	443	31	490	6.4	A	2.7	A	2.4	A	2.8	A	3.1	A	270	20	37													
	WB	16	557	1	574	3.9	A	0.7	A	0.2	A	0.8	A			220	20	27													
	NB	76	1	26	103	18.0	C	14.8	B	3.9	A	14.5	B			190	36	99			667	20	20				335	20	51		
	SB	11	1	57	69	20.4	C	23.6	C	6.0	A	8.5	A			120	20	49			577	26	54								

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

HCS Roundabouts Report

General Information		Site Information		
Analyst	JDA		Intersection	CSAH 48 at Isle Dr/Ironwood...
Agency or Co.	SEH		E/W Street Name	CSAH 48
Date Performed	8/17/2022		N/S Street Name	Isle Dr/Ironwood Dr
Analysis Year	2045		Analysis Time Period, hrs	0.25
Time Analyzed	No Build AM		Peak Hour Factor	0.82
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Lane Assignment	LT		R		LT		R		LT		R		LT		R	
Volume (V), veh/h	0	73	543	143	0	445	448	90	0	73	61	414	0	34	43	22
Percent Heavy Vehicles, %	3	0	0	2	3	9	1	1	3	0	0	10	3	3	0	0
Flow Rate (v _{PCE}), pc/h	0	89	662	178	0	592	552	111	0	89	74	555	0	43	52	27
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.5352	2.5352		2.5352	2.5352	

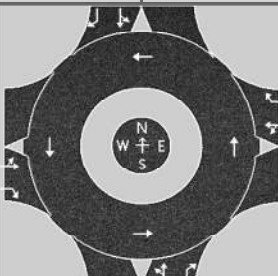
Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	751	178		1144	111		163	555		95	27	
Entry Volume, veh/h	748	177		1093	106		152	516		94	27	
Circulating Flow (v_c), pc/h	687			252			794			1233		
Exiting Flow (v_{ex}), pc/h	1260			668			274			822		
Capacity (C_{PCE}), pc/h	760	760		1129	1129		689	689		462	462	
Capacity (c), veh/h	757	757		1079	1079		641	641		458	458	
v/c Ratio (x)	0.99	0.23		1.01	0.10		0.24	0.81		0.21	0.06	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	53.1	7.4		50.4	4.2		8.5	28.7		10.9	8.6	
Lane LOS	F	A		F	A		A	D		B	A	
95% Queue, veh	16.2	0.9		21.2	0.3		0.9	8.1		0.8	0.2	
Approach Delay, s/veh	44.3			46.3			24.1			10.4		
Approach LOS	E			E			C			B		
Intersection Delay, s/veh LOS	39.1						E					

HCS Roundabouts Report

General Information		Site Information		
Analyst	JDA		Intersection	CSAH 48 at Isle Dr/Ironwood...
Agency or Co.	SEH		E/W Street Name	CSAH 48
Date Performed	8/17/2022		N/S Street Name	Isle Dr/Ironwood Dr
Analysis Year	2045		Analysis Time Period, hrs	0.25
Time Analyzed	No Build School Dismissal		Peak Hour Factor	0.77
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Lane Assignment	LT		R		LT		R		LT		R		LT		R	
Volume (V), veh/h	0	35	386	42	0	241	270	68	0	76	60	386	0	79	38	41
Percent Heavy Vehicles, %	3	3	1	7	3	1	1	1	3	0	2	13	3	1	0	0
Flow Rate (v_{PCE}), pc/h	0	47	506	58	0	316	354	89	0	99	79	566	0	104	49	53
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	553	58		670	89		178	566		153	53	
Entry Volume, veh/h	544	57		663	88		162	515		152	53	
Circulating Flow (v_c), pc/h	469			225			657			769		
Exiting Flow (v_{ex}), pc/h	1176			506			215			423		
Capacity (C_{pce}), pc/h	927	927		1157	1157		781	781		705	705	
Capacity (c), veh/h	911	911		1146	1146		711	711		702	702	
v/c Ratio (x)	0.60	0.06		0.58	0.08		0.23	0.72		0.22	0.08	

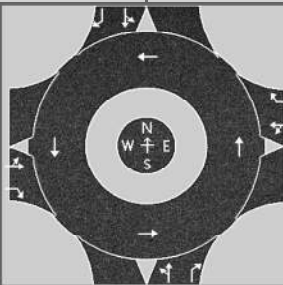
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	12.6	4.5		10.3	3.8		7.7	20.8		7.6	5.9	
Lane LOS	B	A		B	A		A	C		A	A	
95% Queue, veh	4.1	0.2		3.9	0.2		0.9	6.3		0.8	0.2	
Approach Delay, s/veh	11.8			9.5			17.7			7.2		
Approach LOS	B			A			C			A		
Intersection Delay, s/veh LOS	12.4						B					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	No Build PM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	CSAH 48 at Isle Dr/Ironwood...
E/W Street Name	CSAH 48
N/S Street Name	Isle Dr/Ironwood Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.87
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Lane Assignment	LT		R		LT		R		LT		R		LT		R	
Volume (V), veh/h	0	36	273	28	0	282	297	81	0	38	44	282	0	121	54	50
Percent Heavy Vehicles, %	3	0	2	0	3	1	1	1	3	0	2	2	3	2	2	0
Flow Rate (v _{PCE}), pc/h	0	41	320	32	0	327	345	94	0	44	52	331	0	142	63	57
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	361	32		672	94		96	331		205	57	
Entry Volume, veh/h	355	31		665	93		94	325		202	56	
Circulating Flow (v_c), pc/h	532			137			503			716		
Exiting Flow (v_{ex}), pc/h	793			446			187			422		
Capacity (C_{pce}), pc/h	875	875		1254	1254		898	898		740	740	
Capacity (c), veh/h	861	861		1241	1241		883	883		729	729	
v/c Ratio (x)	0.41	0.04		0.54	0.07		0.11	0.37		0.28	0.08	

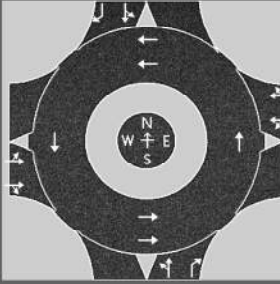
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	9.1	4.5		8.9	3.5		5.1	8.3		8.2	5.7	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	2.0	0.1		3.3	0.2		0.4	1.7		1.1	0.2	
Approach Delay, s/veh	8.8			8.2			7.6			7.7		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	8.1						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	No Build AM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	College Rd at Cypress Dr
E/W Street Name	College Rd
N/S Street Name	Cypress Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.89
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	68	289	9	0	17	354	48	0	14	116	24	0	51	110	69
Percent Heavy Vehicles, %	3	18	1	0	3	0	0	0	3	0	3	0	3	6	6	3
Flow Rate (v _{PCE}), pc/h	0	90	328	10	0	19	398	54	0	16	134	27	0	61	131	80
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

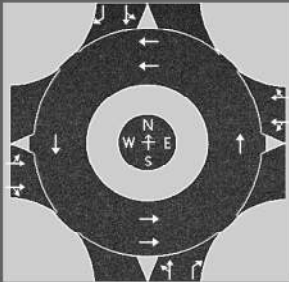
Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	201	227		221	250		150	27		192	80	
Entry Volume, veh/h	193	218		221	250		147	26		183	76	
Circulating Flow (v_c), pc/h	211			240			479			433		
Exiting Flow (v_{ex}), pc/h	416			494			278			160		
Capacity (C_{pce}), pc/h	1172	1172		1141	1141		869	945		906	983	
Capacity (c), veh/h	1125	1125		1141	1141		850	924		862	935	
v/c Ratio (x)	0.17	0.19		0.19	0.22		0.17	0.03		0.21	0.08	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	4.7	4.9		4.9	5.1		6.0	4.2		6.4	4.6	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.6	0.7		0.7	0.8		0.6	0.1		0.8	0.3	
Approach Delay, s/veh	4.8			5.0			5.7			5.8		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	5.2						A					

HCS Roundabouts Report

General Information		Site Information		
Analyst	JDA		Intersection	College Rd at Cypress Dr
Agency or Co.	SEH		E/W Street Name	College Rd
Date Performed	8/17/2022		N/S Street Name	Cypress Dr
Analysis Year	2045		Analysis Time Period, hrs	0.25
Time Analyzed	No Build School Dismissal		Peak Hour Factor	0.89
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	75	358	18	0	7	437	81	0	24	133	24	0	56	129	55
Percent Heavy Vehicles, %	3	4	1	0	3	0	0	1	3	0	1	0	3	7	1	0
Flow Rate (v _{PCE}), pc/h	0	88	406	20	0	8	491	92	0	27	151	27	0	67	146	62
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	242	272		278	313		178	27		213	62	
Entry Volume, veh/h	238	268		277	313		177	27		208	61	
Circulating Flow (v_c), pc/h	221			266			561			526		
Exiting Flow (v_{ex}), pc/h	500			580			331			174		
Capacity (C_{pce}), pc/h	1161	1161		1115	1115		806	881		832	908	
Capacity (c), veh/h	1145	1145		1113	1113		800	875		814	889	
v/c Ratio (x)	0.21	0.23		0.25	0.28		0.22	0.03		0.26	0.07	

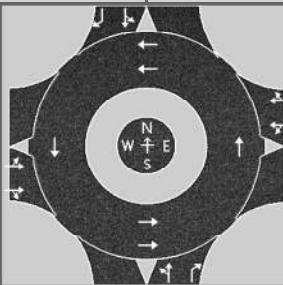
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	5.0	5.3		5.6	5.9		6.9	4.4		7.2	4.7	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.8	0.9		1.0	1.2		0.8	0.1		1.0	0.2	
Approach Delay, s/veh	5.2			5.7			6.6			6.6		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	5.8						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	No Build PM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	College Rd at Cypress Dr
E/W Street Name	College Rd
N/S Street Name	Cypress Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.96
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	85	424	85	0	11	426	83	0	19	171	25	0	93	169	54
Percent Heavy Vehicles, %	3	6	1	0	3	0	0	2	3	0	1	0	3	0	1	4
Flow Rate (v _{PCE}), pc/h	0	94	446	89	0	11	444	88	0	20	180	26	0	97	178	59
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	296	333		255	288		200	26		275	59	
Entry Volume, veh/h	291	328		254	287		198	26		272	58	
Circulating Flow (v_c), pc/h	286			294			637			475		
Exiting Flow (v_{ex}), pc/h	569			523			362			278		
Capacity (C_{pce}), pc/h	1095	1095		1087	1087		751	826		872	948	
Capacity (c), veh/h	1078	1078		1083	1083		745	820		862	937	
v/c Ratio (x)	0.27	0.30		0.23	0.26		0.27	0.03		0.32	0.06	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	5.9	6.3		5.5	5.8		7.9	4.7		7.7	4.4	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	1.1	1.3		0.9	1.1		1.1	0.1		1.4	0.2	
Approach Delay, s/veh	6.1			5.7			7.5			7.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	6.4						A					

Table C3a
CSAH 48 Corridor Study
2045 Build Conditions (CSAH 48 four lane between Isle Dr & Forestview Dr; Roundabout at CSAH 48/Forestview; Roundabout at CSAH 48/Cypress)

AM Peak Hour (7:15 to 8:15 AM)

AM Peak Hour (7:15 to 8:15 AM)															Vehicle Queuing Information (feet)																		
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)						Right Turn Lane						
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ ----->	% Block Left ⁽²⁾ <-----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ ----->	% Block Thru ⁽²⁾ <-----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹				
AM Peak Hour	CSAH 48 at TH 371 (Signal)	EB	314	566	111	991	64.2	E	42.6	D	4.9	A	45.1	D	41.2	D	530	242	534			1698	204	433				500	27	62			
		WB	141	519	187	847	40.2	D	55.2	E	7.7	A	42.6	D			500	85	203			1220	224	422				500	46	98			
		NB	188	410	206	804	49.6	D	50.4	D	12.6	B	40.3	D			500	117	278			1938	146	293				500	46	152			
		SB	104	215	316	635	44.6	D	51.6	D	19.6	B	34.8	C			500	70	171			2747	82	191				500	97	288			
	CSAH 48 at 3/4 Access (Minor Stop)	EB	154	722		876	14.8	B	6.1	A			7.6	A	4.6	A	300	51	126			1220		20						300	20	26	
		WB		717	57	774			1.1	A	1.0	A	1.1	A								574		20						300	20	26	
		NB											0.0	A																			
		SB				130	130					5.9	A	5.9			A												410	32	76		
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		784	10	794			3.3	A	0.6	A	3.3	A	3.5	A																	
		WB	8	565		573	8.1	A	1.9	A			2.0	A								531	20	176									
		NB	27		12	39	38.7	E			15.1	C	31.0	D								621	27	85									
		SB											0.0	A																			
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	39	757		796	3.8	A	0.8	A			0.9	A	1.5	A	130	20	39														
		WB		567	5	572			2.2	A	1.2	A	2.2	A								2175		20									
		NB											0.0	A																			
		SB	1		6	7	23.7	C			5.6	A	8.2	A								763	20	39									
	CSAH 48 at Camwood Trail (Minor Stop)	EB	30	724	4	758	5.0	A	2.3	A	1.8	A	2.4	A	2.8	A	300	20	38														
		WB	4	515	7	526	4.4	A	1.9	A	0.7	A	1.9	A			300	20	22														
		NB	23		16	39	29.3	D			12.4	B	21.3	C								678	21	61									
		SB	9		34	43	17.2	C			5.2	A	7.3	A								1158	20	30				300	20	45			
	CSAH 48 at Berrywood Dr (Minor Stop)	EB		644	2	646			0.6	A	0.6	A	0.6	A	1.2	A																	
		WB		412	2	414			2.1	A	0.6	A	2.1	A																			
		NB			1	1					3.5	A	3.5	A																			
		SB			6	6					6.1	A	6.1	A								382	20	26									
	CSAH 48 at College Rd (Signal)	EB	22	311	8	341	34.9	C	19.9	B	3.1	A	20.5	C	17.1	B	325	20	68			1118	70	139				325	20	46			
		WB	311	364	16	691	28.6	C	14.4	B	8.9	A	20.6	C			200	101	190			1050	64	157									
		NB	12	213	417	642	15.4	B	18.5	B	8.9	A	12.4	B			280	20	39			1462	80	191				560	75	175			
		SB	39	116	40	195	19.3	B	17.8	B	3.5	A	15.0	B			330	21	56			1026	49	120				220	20	31			
College Rd at TH 371 (Signal)	EB	72	91	15	178	41.9	D	45.0	D	6.2	A	40.2	D	22.6	C	360	55	121				946	48	110				320	20	39			
	WB	41	173	182	396	39.3	D	45.0	D	12.4	B	30.1	C			300	34	107			653	70	143				320	62	144				
	NB	58	757	96	911	52.3	D	21.0	C	6.6	A	21.4	C			240	45	135		1 %	2869	131	296	1 %			240	20	67				
	SB	344	579	169	1,092	34.3	C	12.7	B	4.2	A	18.1	B			240	92	177			1862	72	169				250	20	65				
College Rd at Douglas Fir Dr (Minor Stop)	EB	65	388	72	525	5.1	A	2.2	A	2.1	A	2.5	A	2.1	A	270	20	61															
	WB	38	346	10	394	3.6	A	0.6	A	0.3	A	0.8	A			220	20	46															
	NB	23		17	40	13.1	B			3.3	A	8.7	A			190	20	49									335	20	51				
	SB	1		28	29	13.9	B			3.9	A	4.3	A			120	20	20			577	20	56										

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Table C3b
CSAH 48 Corridor Study
2045 Build Conditions (CSAH 48 four lane between Isle Dr & Forestview Dr; Roundabout at CSAH 48/Forestview; Roundabout at CSAH 48/Cypress)

School Dismissal Peak Hour (2:45 to 3:45 PM)

School Dismissal Peak Hour (2:45 to 3:45 PM)															Vehicle Queuing Information (feet)																
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)					Right Turn Lane					
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ ----->	% Block Left ⁽²⁾ <-----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ ----->	% Block Thru ⁽²⁾ <-----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹		
School Dismissal Peak Hour	CSAH 48 at TH 371 (Signal)	EB	265	460	126	851	34.9	C	36.7	D	6.6	A	31.8	C	32.1	C	530	145	324			1698	156	412				500	34	73	
		WB	164	359	149	672	34.5	C	39.5	D	4.9	A	30.8	C			500	91	196			1220	113	229				500	35	74	
		NB	74	303	154	531	40.3	D	45.5	D	9.5	A	33.8	C			500	44	125			1938	108	229				500	31	85	
		SB	152	433	146	731	38.3	D	38.2	D	8.2	A	32.3	C			500	89	234			2747	123	243				500	24	119	
	CSAH 48 at 3/4 Access (Minor Stop)	EB	119	647		766	12.2	B	8.7	A			9.2	A	5.6	A	300	33	87			1220	20	20					300	20	20
		WB		562	49	611			1.2	A	0.7	A	1.2	A																	
		NB											0.0	A																	
		SB				110	110					4.9	A	4.9			A												410	29	69
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		563	20	583			2.3	A	0.5	A	2.2	A	1.9	A															
		WB	12	534		546	4.1	A	1.1	A			1.2	A								531	20	76							
		NB	11		5	16	19.1	C			6.8	A	14.3	B								621	20	44							
		SB											0.0	A																	
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	10	558		568	2.6	A	0.7	A			0.7	A	1.5	A	130	20	29												
		WB		520	5	525			2.0	A	1.1	A	2.0	A																	
		NB											0.0	A																	
		SB	5		26	31	17.3	C			5.2	A	7.5	A								763	20	40							
	CSAH 48 at Camwood Trail (Minor Stop)	EB	27	524	12	563	4.9	A	4.4	A	1.5	A	4.4	A	3.5	A	300	20	36												
		WB	6	492	6	504	5.8	A	1.5	A	0.7	A	1.5	A			300	20	23												
		NB	8		11	19	27.8	D			8.5	A	16.8	C								678	20	38							
		SB	7		25	32	26.8	D			5.0	A	9.9	A								1158	20	33				300	20	48	
	CSAH 48 at Berrywood Dr (Minor Stop)	EB		423		423			0.7	A			0.7	A	2.0	A															
		WB		400	8	408			3.4	A	0.7	A	3.3	A																	
		NB			1	1					6.6	A	6.6	A								382	20	20							
		SB			5	5					5.5	A	5.5	A								664	20	28							
CSAH 48 at College Rd (Signal)	EB	56	341	7	404	32.0	C	16.1	B	3.0	A	18.0	B	15.5	B	325	39	104			1118	73	149				325	20	27		
	WB	232	422	21	675	25.1	C	13.0	B	8.5	A	17.0	B			200	77	156			1050	69	153								
	NB	26	144	301	471	20.9	C	15.7	B	8.6	A	11.7	B			280	20	59			1462	57	141				560	71	213		
	SB	17	119	79	215	16.8	B	20.9	C	4.6	A	14.8	B			330	20	43			1026	53	133				220	20	54		
College Rd at TH 371 (Signal)	EB	257	247	65	569	48.6	D	48.0	D	6.9	A	43.4	D	33.5	C	360	181	322				946	104	198				320	29	60	
	WB	73	251	262	586	47.7	D	60.7	E	14.9	B	38.8	D			300	55	137			653	107	194				320	81	176		
	NB	68	598	51	717	69.9	E	25.5	C	6.1	A	28.2	C			240	56	145		1 %	2869	135	280	1 %			240	20	63		
	SB	198	593	170	961	65.8	E	22.0	C	4.7	A	28.3	C			240	99	176			1862	115	217				250	20	70		
College Rd at Douglas Fir Dr (Minor Stop)	EB	33	430	36	499	5.9	A	2.7	A	2.2	A	2.9	A	2.7	A	270	20	74													
	WB	25	478	5	508	3.5	A	0.6	A	0.4	A	0.7	A			220	20	28			897		20					335	20	38	
	NB	51		28	79	16.7	C			4.0	A	12.0	B			190	29	77													
	SB	4		44	48	21.2	C			6.5	A	7.8	A			120	20	36			577	23	74								

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Table C3c

CSAH 48 Corridor Study

2045 Build Conditions (CSAH 48 four lane between Isle Dr & Forestview Dr; Roundabout at CSAH 48/Forestview; Roundabout at CSAH 48/Cypress)

PM Peak Hour (4:15 to 5:15 PM)

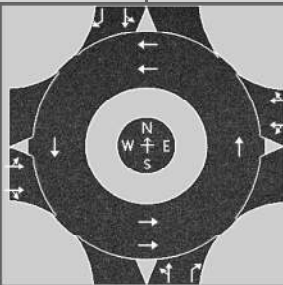
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)					Right Turn Lane					
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ ----->	% Block Left ⁽²⁾ <-----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ ----->	% Block Thru ⁽²⁾ <-----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹		
PM Peak Hour	CSAH 48 at TH 371 (Signal)	EB	159	375	142	676	35.6	D	47.0	D	9.6	A	36.4	D	37.0	D	530	91	218			1698	144	267				500	45	125	
		WB	231	375	181	787	40.3	D	43.7	D	7.9	A	34.2	C			500	139	290			1220	127	260				500	47	107	
		NB	129	444	181	754	37.2	D	51.7	D	9.2	A	38.8	D			500	69	196			1938	162	321				500	33	97	
		SB	228	568	156	952	40.1	D	46.0	D	9.1	A	38.3	D			500	133	313			2747	178	373				500	25	92	
	CSAH 48 at 3/4 Access (Minor Stop)	EB	146	638		784	10.6	B	3.5	A			4.9	A	3.6	A	300	43	94			1220		20							
		WB		619	80	699			0.9	A	0.7	A	0.9	A								574	20	20				300		20	
		NB											0.0	A																	
		SB			168	168					9.0	A	9.0	A														410	39	87	
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		489	27	516			1.7	A	0.5	A	1.6	A	1.7	A															
		WB	18	608		626	2.8	A	1.4	A			1.4	A								531	20	76							
		NB	15		12	27	13.3	B			4.9	A	9.7	A								621	20	39							
		SB											0.0	A																	
	CSAH 48 at Evergreen Dr (Minor Stop)	EB	9	492		501	3.3	A	0.4	A			0.5	A	1.8	A	130	20	29												
		WB		587	2	589			2.4	A	2.4	A	2.4	A																	
		NB											0.0	A																	
		SB	11		39	50	12.7	B			5.7	A	7.2	A								763	20	53							
	CSAH 48 at Camwood Trail (Minor Stop)	EB	37	445	21	503	4.3	A	3.5	A	0.9	A	3.4	A	3.0	A	300	20	36												
		WB	18	539	10	567	4.9	A	1.8	A	1.1	A	1.9	A					300	20	30										
		NB	9		8	17	21.6	C			7.1	A	14.4	B								678	20	37							
		SB	11		41	52	21.5	C			4.6	A	8.0	A								1158	20	32				300	20	39	
	CSAH 48 at Berrywood Dr (Minor Stop)	EB		301		301			0.3	A			0.3	A	2.3	A															
		WB		419	5	424			3.5	A	0.9	A	3.5	A																	
		NB											0.0	A																	
		SB			15	15					5.7	A	5.7	A										664	20	46					
CSAH 48 at College Rd (Signal)	EB	52	447	11	510	31.3	C	16.5	B	2.5	A	17.7	B	16.0	B	325	37	91			1118	93	184				325	20	32		
	WB	245	455	21	721	25.5	C	12.9	B	7.9	A	17.1	B					200	77	149			1050	73	180						
	NB	24	92	238	354	20.3	C	17.6	B	6.9	A	10.8	B					280	20	55			1462	36	92			560	45	124	
	SB	30	133	60	223	18.9	B	21.8	C	4.8	A	16.9	B					330	20	56			1026	54	127			220	20	48	
College Rd at TH 371 (Signal)	EB	319	285	98	702	51.2	D	43.1	D	9.9	A	42.4	D	34.3	C	360	232	378			946	107	196				320	38	90		
	WB	75	228	374	677	41.8	D	54.9	D	22.0	C	35.3	D					300	51	140			653	88	158			320	129	270	
	NB	58	692	34	784	71.5	E	34.7	C	8.9	A	36.1	D					240	55	192	5 %	2869	190	401	6 %		240	20	155		
	SB	179	779	198	1,156	62.2	E	25.4	C	5.2	A	27.5	C					240	86	184	1 %	1862	166	308	1 %		250	20	102		
College Rd at Douglas Fir Dr (Minor Stop)	EB	16	443	31	490	6.3	A	2.7	A	2.3	A	2.8	A	3.1	A	270	20	40													
	WB	16	557	1	574	3.7	A	0.7	A	0.3	A	0.8	A					220	20	28			897		20						
	NB	76	1	26	103	18.2	C	9.4	A	4.2	A	14.3	B					190	36	84			667	20	27			335	20	48	
	SB	11	1	57	69	14.7	B	22.6	C	6.1	A	7.6	A					120	20	46			577	26	64						

- NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	Build AM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	CSAH 48 at Isle Dr/Ironwood...
E/W Street Name	CSAH 48
N/S Street Name	Isle Dr/Ironwood Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.82
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	73	543	143	0	445	448	90	0	73	61	414	0	34	43	22
Percent Heavy Vehicles, %	3	0	0	2	3	9	1	1	3	0	0	10	3	3	0	0
Flow Rate (v _{PCE}), pc/h	0	89	662	178	0	592	552	111	0	89	74	555	0	43	52	27
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	437	492		590	665		163	555		95	27	
Entry Volume, veh/h	435	491		564	636		152	516		94	27	
Circulating Flow (v_c), pc/h	687			252			794			1233		
Exiting Flow (v_{ex}), pc/h	1260			668			274			822		
Capacity (C_{pce}), pc/h	760	760		1129	1129		650	723		434	498	
Capacity (c), veh/h	757	757		1079	1079		605	672		430	493	
v/c Ratio (x)	0.57	0.65		0.52	0.59		0.25	0.77		0.22	0.05	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	13.8	16.3		9.5	10.9		9.2	24.6		11.8	8.0	
Lane LOS	B	C		A	B		A	C		B	A	
95% Queue, veh	3.7	4.8		3.1	4.0		1.0	7.2		0.8	0.2	
Approach Delay, s/veh	15.2			10.3			21.1			11.0		
Approach LOS	C			B			C			B		
Intersection Delay, s/veh LOS	14.3						B					

HCS Roundabouts Report

General Information		Site Information		
Analyst	JDA		Intersection	CSAH 48 at Isle Dr/Ironwood...
Agency or Co.	SEH		E/W Street Name	CSAH 48
Date Performed	8/17/2022		N/S Street Name	Isle Dr/Ironwood Dr
Analysis Year	2045		Analysis Time Period, hrs	0.25
Time Analyzed	Build School Dismissal		Peak Hour Factor	0.77
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	35	386	42	0	241	270	68	0	76	60	386	0	79	38	41
Percent Heavy Vehicles, %	3	3	1	7	3	1	1	1	3	0	2	13	3	1	0	0
Flow Rate (v_{PCE}), pc/h	0	47	506	58	0	316	354	89	0	99	79	566	0	104	49	53
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	287	324		357	402		178	566		153	53	
Entry Volume, veh/h	282	318		353	398		162	515		152	53	
Circulating Flow (v_c), pc/h	469			225			657			769		
Exiting Flow (v_{ex}), pc/h	1176			506			215			423		
Capacity (C_{pce}), pc/h	927	927		1157	1157		738	812		665	739	
Capacity (c), veh/h	911	911		1146	1146		672	740		662	735	
v/c Ratio (x)	0.31	0.35		0.31	0.35		0.24	0.70		0.23	0.07	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	7.3	7.8		6.1	6.5		8.3	18.7		8.2	5.6	
Lane LOS	A	A		A	A		A	C		A	A	
95% Queue, veh	1.3	1.6		1.3	1.6		0.9	5.7		0.9	0.2	
Approach Delay, s/veh	7.6			6.3			16.2			7.5		
Approach LOS	A			A			C			A		
Intersection Delay, s/veh LOS	9.8						A					

HCS Roundabouts Report

General Information		Site Information		
Analyst	JDA		Intersection	CSAH 48 at Isle Dr/Ironwood...
Agency or Co.	SEH		E/W Street Name	CSAH 48
Date Performed	8/17/2022		N/S Street Name	Isle Dr/Ironwood Dr
Analysis Year	2045		Analysis Time Period, hrs	0.25
Time Analyzed	Build PM		Peak Hour Factor	0.87
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	36	273	28	0	282	297	81	0	38	44	282	0	121	54	50
Percent Heavy Vehicles, %	3	0	2	0	3	1	1	1	3	0	2	2	3	2	2	0
Flow Rate (v _{PCE}), pc/h	0	41	320	32	0	327	345	94	0	44	52	331	0	142	63	57
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	185	208		360	406		96	331		205	57	
Entry Volume, veh/h	182	205		356	402		94	325		202	56	
Circulating Flow (v_c), pc/h	532			137			503			716		
Exiting Flow (v_{ex}), pc/h	793			446			187			422		
Capacity (C_{pce}), pc/h	875	875		1254	1254		850	926		699	773	
Capacity (c), veh/h	861	861		1241	1241		835	910		688	761	
v/c Ratio (x)	0.21	0.24		0.29	0.32		0.11	0.36		0.29	0.07	

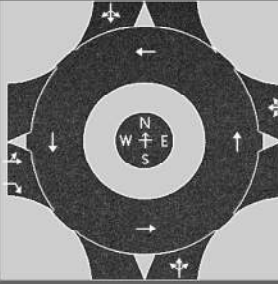
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	6.4	6.7		5.5	5.9		5.4	7.9		8.9	5.5	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.8	0.9		1.2	1.4		0.4	1.6		1.2	0.2	
Approach Delay, s/veh	6.5			5.7			7.4			8.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	6.6						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	Build AM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	CSAH 48 at Forestview Dr
E/W Street Name	CSAH 48
N/S Street Name	Forestview Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.88
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		R				LTR				LTR				LTR	
Volume (V), veh/h	0	39	613	70	0	26	550	26	0	187	36	92	0	89	13	37
Percent Heavy Vehicles, %	3	3	5	1	3	4	7	0	3	2	6	1	3	2	0	3
Flow Rate (v _{PCE}), pc/h	0	46	731	80	0	31	669	30	0	217	43	106	0	103	15	43
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436			4.9763			4.9763			4.9763	
Follow-Up Headway, s	2.5352	2.5352			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	777	80			730			366			161	
Entry Volume, veh/h	744	77			685			358			158	
Circulating Flow (v_c), pc/h	149			306			880			917		
Exiting Flow (v_{ex}), pc/h	940			929			119			126		
Capacity (C_{pce}), pc/h	1240	1240			1010			562			542	
Capacity (c), veh/h	1187	1187			948			551			531	
v/c Ratio (x)	0.63	0.06			0.72			0.65			0.30	

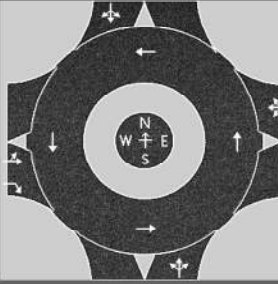
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	11.1	3.6			16.6			21.2			11.1	
Lane LOS	B	A			C			C			B	
95% Queue, veh	4.6	0.2			6.5			4.7			1.2	
Approach Delay, s/veh	10.4			16.6			21.2			11.1		
Approach LOS	B			C			C			B		
Intersection Delay, s/veh LOS	14.5						B					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	Build School Dismissal
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	CSAH 48 at Forestview Dr
E/W Street Name	CSAH 48
N/S Street Name	Forestview Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.86
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		R				LTR				LTR				LTR	
Volume (V), veh/h	0	54	458	135	0	76	447	22	0	111	21	52	0	73	28	53
Percent Heavy Vehicles, %	3	2	12	2	3	1	1	0	3	3	0	2	3	1	4	2
Flow Rate (v _{PCE}), pc/h	0	64	596	160	0	89	525	26	0	133	24	62	0	86	34	63
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436			4.9763			4.9763			4.9763	
Follow-Up Headway, s	2.5352	2.5352			2.6087			2.6087			2.6087	

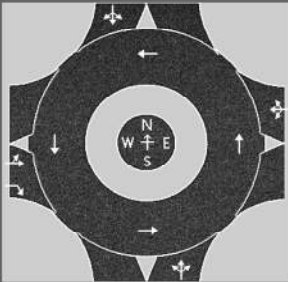
Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	660	160			640			219			183	
Entry Volume, veh/h	605	147			634			214			180	
Circulating Flow (v_c), pc/h	209			221			746			747		
Exiting Flow (v_{ex}), pc/h	744			721			114			283		
Capacity (C_{pce}), pc/h	1174	1174			1101			645			644	
Capacity (c), veh/h	1076	1076			1091			630			632	
v/c Ratio (x)	0.56	0.14			0.58			0.34			0.28	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	10.4	4.6			10.7			10.3			9.4	
Lane LOS	B	A			B			B			A	
95% Queue, veh	3.6	0.5			3.9			1.5			1.2	
Approach Delay, s/veh	9.2			10.7			10.3			9.4		
Approach LOS	A			B			B			A		
Intersection Delay, s/veh LOS	9.9						A					

HCS Roundabouts Report

General Information			Site Information		
Analyst	JDA		Intersection	CSAH 48 at Forestview Dr	
Agency or Co.	SEH		E/W Street Name	CSAH 48	
Date Performed	8/17/2022		N/S Street Name	Forestview Dr	
Analysis Year	2045		Analysis Time Period, hrs	0.25	
Time Analyzed	Build PM		Peak Hour Factor	0.95	
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter	

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		R				LTR				LTR				LTR	
Volume (V), veh/h	0	83	357	198	0	89	495	39	0	119	23	60	0	99	38	85
Percent Heavy Vehicles, %	3	2	3	2	3	1	1	3	3	2	0	2	3	2	3	2
Flow Rate (v _{PCE}), pc/h	0	89	387	213	0	95	526	42	0	128	24	64	0	106	41	91
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436			4.9763			4.9763			4.9763	
Follow-Up Headway, s	2.5352	2.5352			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	476	213			663			216			238	
Entry Volume, veh/h	464	208			656			212			233	
Circulating Flow (v_c), pc/h	242			241			582			749		
Exiting Flow (v_{ex}), pc/h	557			745			155			349		
Capacity (C_{pce}), pc/h	1139	1139			1079			762			643	
Capacity (c), veh/h	1111	1111			1067			749			629	
v/c Ratio (x)	0.42	0.19			0.61			0.28			0.37	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	7.6	4.9			11.7			8.1			10.9	
Lane LOS	A	A			B			A			B	
95% Queue, veh	2.1	0.7			4.4			1.2			1.7	
Approach Delay, s/veh	6.8			11.7			8.1			10.9		
Approach LOS	A			B			A			B		
Intersection Delay, s/veh LOS	9.3						A					

HCS Roundabouts Report

General Information		Site Information		
Analyst	JDA		Intersection	CSAH 48 at Cypress Dr
Agency or Co.	SEH		E/W Street Name	CSAH 48
Date Performed	8/17/2022		N/S Street Name	Cypress Dr
Analysis Year	2045		Analysis Time Period, hrs	0.25
Time Analyzed	Build AM		Peak Hour Factor	0.83
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0
Lane Assignment			LT				TR								LR	
Volume (V), veh/h	0	102	647		0		418	0					0	8		108
Percent Heavy Vehicles, %	3	1	4		3		8	0					3	0		1
Flow Rate (v _{PCE}), pc/h	0	124	811		0		544	0					0	10		131
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1								1			
Pedestrians Crossing, p/h	0				0								0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763						4.9763	
Follow-Up Headway, s		2.6087			2.6087						2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		935			544						141	
Entry Volume, veh/h		903			504						140	
Circulating Flow (v_c), pc/h	10			124			945			544		
Exiting Flow (v_{ex}), pc/h	821			675			124			0		
Capacity (C_{pce}), pc/h		1366			1216						792	
Capacity (c), veh/h		1319			1126						785	
v/c Ratio (x)		0.68			0.45						0.18	

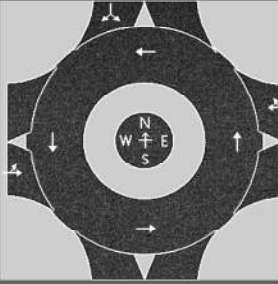
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		11.8			8.0						6.5	
Lane LOS		B			A						A	
95% Queue, veh		5.9			2.4						0.6	
Approach Delay, s/veh	11.8			8.0						6.5		
Approach LOS	B			A						A		
Intersection Delay, s/veh LOS	10.1						B					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	Build School Dismissal
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	CSAH 48 at Cypress Dr
E/W Street Name	CSAH 48
N/S Street Name	Cypress Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.81
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0
Lane Assignment			LT				TR								LR	
Volume (V), veh/h	0	119	423		0		398	7					0	5		106
Percent Heavy Vehicles, %	3	1	12		3		1	0					3	0		1
Flow Rate (v _{PCE}), pc/h	0	148	585		0		496	9					0	6		132
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1								1			
Pedestrians Crossing, p/h	0				0								0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763						4.9763	
Follow-Up Headway, s		2.6087			2.6087						2.6087	

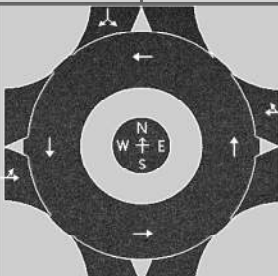
Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		733			505						138	
Entry Volume, veh/h		669			500						137	
Circulating Flow (v_c), pc/h	6			148			739			496		
Exiting Flow (v_{ex}), pc/h	591			628			157			0		
Capacity (C_{pce}), pc/h		1372			1187						832	
Capacity (c), veh/h		1252			1175						824	
v/c Ratio (x)		0.53			0.43						0.17	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		8.8			7.4						6.1	
Lane LOS		A			A						A	
95% Queue, veh		3.3			2.2						0.6	
Approach Delay, s/veh	8.8			7.4						6.1		
Approach LOS	A			A						A		
Intersection Delay, s/veh LOS	8.0						A					

HCS Roundabouts Report

General Information			Site Information		
Analyst	JDA		Intersection	CSAH 48 at Cypress Dr	
Agency or Co.	SEH		E/W Street Name	CSAH 48	
Date Performed	8/17/2022		N/S Street Name	Cypress Dr	
Analysis Year	2045		Analysis Time Period, hrs	0.25	
Time Analyzed	Build PM		Peak Hour Factor	0.93	
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter	

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0
Lane Assignment			LT				TR								LR	
Volume (V), veh/h	0	156	308		0		426	8					0	6		141
Percent Heavy Vehicles, %	3	1	3		3		1	0					3	0		1
Flow Rate (v _{PCE}), pc/h	0	169	341		0		463	9					0	6		153
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1								1			
Pedestrians Crossing, p/h	0				0								0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763						4.9763	
Follow-Up Headway, s		2.6087			2.6087						2.6087	

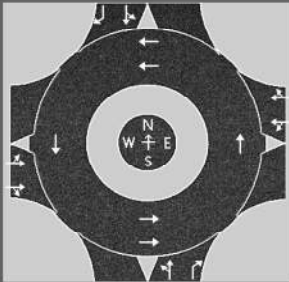
Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		510			472						159	
Entry Volume, veh/h		498			467						157	
Circulating Flow (v_c), pc/h	6			169			516			463		
Exiting Flow (v_{ex}), pc/h	347			616			178			0		
Capacity (C_{PCE}), pc/h		1372			1161						861	
Capacity (c), veh/h		1340			1150						852	
v/c Ratio (x)		0.37			0.41						0.18	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.1			7.3						6.1	
Lane LOS		A			A						A	
95% Queue, veh		1.7			2.0						0.7	
Approach Delay, s/veh	6.1			7.3						6.1		
Approach LOS	A			A						A		
Intersection Delay, s/veh LOS	6.6						A					

HCS Roundabouts Report

General Information		Site Information		
Analyst	JDA		Intersection	College Rd at Cypress Dr
Agency or Co.	SEH		E/W Street Name	College Rd
Date Performed	8/17/2022		N/S Street Name	Cypress Dr
Analysis Year	2045		Analysis Time Period, hrs	0.25
Time Analyzed	Build AM		Peak Hour Factor	0.89
Project Description	CSAH 48 Corridor Study		Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	68	289	9	0	17	354	48	0	14	116	24	0	51	110	69
Percent Heavy Vehicles, %	3	18	1	0	3	0	0	0	3	0	3	0	3	6	6	3
Flow Rate (v_{PCE}), pc/h	0	90	328	10	0	19	398	54	0	16	134	27	0	61	131	80
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	201	227		221	250		150	27		192	80	
Entry Volume, veh/h	193	218		221	250		147	26		183	76	
Circulating Flow (v_c), pc/h	211			240			479			433		
Exiting Flow (v_{ex}), pc/h	416			494			278			160		
Capacity (C_{pce}), pc/h	1172	1172		1141	1141		869	945		906	983	
Capacity (c), veh/h	1125	1125		1141	1141		850	924		862	935	
v/c Ratio (x)	0.17	0.19		0.19	0.22		0.17	0.03		0.21	0.08	

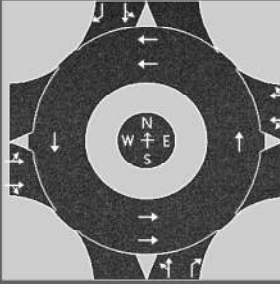
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	4.7	4.9		4.9	5.1		6.0	4.2		6.4	4.6	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.6	0.7		0.7	0.8		0.6	0.1		0.8	0.3	
Approach Delay, s/veh	4.8			5.0			5.7			5.8		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	5.2						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	Build School Dismissal
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	College Rd at Cypress Dr
E/W Street Name	College Rd
N/S Street Name	Cypress Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.89
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	75	358	18	0	7	437	81	0	24	133	24	0	56	129	55
Percent Heavy Vehicles, %	3	4	1	0	3	0	0	1	3	0	1	0	3	7	1	0
Flow Rate (v _{PCE}), pc/h	0	88	406	20	0	8	491	92	0	27	151	27	0	67	146	62
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	242	272		278	313		178	27		213	62	
Entry Volume, veh/h	238	268		277	313		177	27		208	61	
Circulating Flow (v_c), pc/h	221			266			561			526		
Exiting Flow (v_{ex}), pc/h	500			580			331			174		
Capacity (C_{pce}), pc/h	1161	1161		1115	1115		806	881		832	908	
Capacity (c), veh/h	1145	1145		1113	1113		800	875		814	889	
v/c Ratio (x)	0.21	0.23		0.25	0.28		0.22	0.03		0.26	0.07	

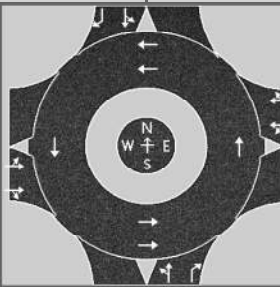
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	5.0	5.3		5.6	5.9		6.9	4.4		7.2	4.7	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	0.8	0.9		1.0	1.2		0.8	0.1		1.0	0.2	
Approach Delay, s/veh	5.2			5.7			6.6			6.6		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	5.8						A					

HCS Roundabouts Report

General Information

Analyst	JDA
Agency or Co.	SEH
Date Performed	8/17/2022
Analysis Year	2045
Time Analyzed	Build PM
Project Description	CSAH 48 Corridor Study



Site Information

Intersection	College Rd at Cypress Dr
E/W Street Name	College Rd
N/S Street Name	Cypress Dr
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.96
Jurisdiction	Baxter

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	1	0	0	1	1
Lane Assignment	LT		TR		LT		TR		LT		R		LT		R	
Volume (V), veh/h	0	85	424	85	0	11	426	83	0	19	171	25	0	93	169	54
Percent Heavy Vehicles, %	3	6	1	0	3	0	0	2	3	0	1	0	3	0	1	4
Flow Rate (v _{PCE}), pc/h	0	94	446	89	0	11	444	88	0	20	180	26	0	97	178	59
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s	4.5436	4.5436		4.5436	4.5436		4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway, s	2.5352	2.5352		2.5352	2.5352		2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	296	333		255	288		200	26		275	59	
Entry Volume, veh/h	291	328		254	287		198	26		272	58	
Circulating Flow (v_c), pc/h	286			294			637			475		
Exiting Flow (v_{ex}), pc/h	569			523			362			278		
Capacity (C_{pce}), pc/h	1095	1095		1087	1087		751	826		872	948	
Capacity (c), veh/h	1078	1078		1083	1083		745	820		862	937	
v/c Ratio (x)	0.27	0.30		0.23	0.26		0.27	0.03		0.32	0.06	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	5.9	6.3		5.5	5.8		7.9	4.7		7.7	4.4	
Lane LOS	A	A		A	A		A	A		A	A	
95% Queue, veh	1.1	1.3		0.9	1.1		1.1	0.1		1.4	0.2	
Approach Delay, s/veh	6.1			5.7			7.5			7.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	6.4						A					

Table C4a
CSAH 48 Corridor Study
2045 Build Conditions (CSAH 48 four lane between Isle Dr & Forestview Dr; Roundabout at CSAH 48/Forestview; Roundabout at CSAH 48/Cypress)

AM Peak Hour (7:15 to 8:15 AM)

AM Peak Hour (7:15 to 8:15 AM)															Vehicle Queuing Information (feet)															
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)					Right Turn Lane				
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ →	% Block Left ⁽²⁾ ←	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ →	% Block Thru ⁽²⁾ ←	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	
AM Peak Hour	CSAH 48 at TH 371 (Signal)	EB	314	566	111	991	71.4	E	40.7	D	4.7	A	46.7	D	42.1	D	530	269	584	→	←	1698	210	498	→	←	500	26	58	
		WB	140	519	187	846	38.0	D	55.8	E	8.5	A	42.5	D			500	80	183			1220	221	462			500	50	115	
		NB	188	410	206	804	46.4	D	52.0	D	12.6	B	40.7	D			500	111	265			1938	150	282			500	44	137	
		SB	104	216	316	636	43.9	D	53.3	D	21.5	C	36.3	D			500	63	139			2747	83	198			500	101	293	
	CSAH 48 at 3/4 Access (Minor Stop)	EB	154	722		876	15.1	C	6.0	A			7.6	A	4.7	A	300	50	151											
		WB		716	57	773			1.1	A	0.9	A	1.1	A								574		20			300	20	22	
		NB											0.0	A																
		SB				130	130					6.2	A	6.2			A										410	34	75	
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		784	10	794			3.3	A	0.8	A	3.3	A	3.3	A						531	20	184						
		WB	8	564		572	7.7	A	1.6	A			1.7	A									621	27	95					
		NB	27		12	39	35.2	E			12.9	B	27.8	D																
		SB											0.0	A																
	CSAH 48 at Camwood Trail (Minor Stop)	EB	69	723	4	796	5.4	A	2.5	A	1.3	A	2.7	A	3.2	A	300	20	61											
		WB	4	510	12	526	5.2	A	2.0	A	0.7	A	2.0	A			300	20	23								300		20	
		NB	23		16	39	32.8	D			8.1	A	22.4	C								678	22	62						
		SB	10		39	49	24.5	C			5.3	A	8.6	A								1158	20	34			300	20	50	
	CSAH 48 at Berrywood Dr (Minor Stop)	EB		644	2	646			0.6	A	0.3	A	0.6	A	1.2	A														
		WB		412	2	414			2.1	A	0.7	A	2.1	A																
		NB			1	1					2.8	A	2.8	A								382	20	20						
		SB			6	6					4.6	A	4.6	A								664	20	31						
	CSAH 48 at College Rd (Signal)	EB	22	311	8	341	37.9	D	21.0	C	3.8	A	21.7	C	17.5	B	325	20	71			1118	73	143			325	20	48	
		WB	311	364	16	691	30.2	C	13.9	B	8.4	A	21.1	C			200	105	204			1050	61	144						
		NB	12	213	417	642	18.7	B	19.1	B	8.5	A	12.5	B			280	20	41			1462	81	173			560	74	155	
		SB	39	116	40	195	19.4	B	17.3	B	3.4	A	14.9	B			330	23	66			1026	47	139			220	20	30	
	College Rd at TH 371 (Signal)	EB	72	91	15	178	41.4	D	43.5	D	6.4	A	39.4	D	23.0	C	360	59	148			946	48	106			320	20	33	
		WB	42	173	182	397	45.5	D	45.3	D	12.8	B	31.3	C			300	37	105			653	70	138			320	59	147	
		NB	58	757	96	911	50.5	D	21.9	C	6.9	A	22.1	C			240	45	130		1 %	2869	138	288	1 %		240	20	72	
		SB	344	579	169	1,092	33.5	C	13.2	B	4.1	A	18.2	B			240	93	159			1862	72	180			250	20	53	
College Rd at Douglas Fir Dr (Minor Stop)	EB	65	388	72	525	5.0	A	2.2	A	2.0	A	2.5	A	2.0	A	270	20	61												
	WB	38	346	10	394	3.2	A	0.5	A	0.4	A	0.7	A			220	20	35			897		20				335	20	43	
	NB	24		17	41	12.3	B			3.3	A	8.6	A			190	20	50												
	SB	1		28	29	7.9	A			4.0	A	4.1	A			120	20	20			577	20	45							

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Table C4b
CSAH 48 Corridor Study
2045 Build Conditions (CSAH 48 four lane between Isle Dr & Forestview Dr; Roundabout at CSAH 48/Forestview; Roundabout at CSAH 48/Cypress)
School Dismissal Peak Hour (2:45 to 3:45 PM)

School Dismissal Peak Hour (2:45 to 3:45 PM)															Vehicle Queuing Information (feet)																
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)					Right Turn Lane					
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ →	% Block Left ⁽²⁾ ←	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ →	% Block Thru ⁽²⁾ ←	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹		
School Dismissal Peak Hour	CSAH 48 at TH 371 (Signal)	EB	265	460	126	851	35.5	D	37.5	D	6.9	A	32.6	C	32.8	C	530	144	327			1698	165	393			500	34	78		
		WB	164	358	149	671	33.8	C	40.9	D	5.4	A	31.5	C			500	89	184			1220	115	219			500	37	86		
		NB	74	303	154	531	38.6	D	46.7	D	9.2	A	34.7	C			500	41	108			1938	113	232			500	29	94		
		SB	152	433	147	732	37.0	D	40.0	D	8.1	A	32.9	C			500	86	218			2747	128	286			500	26	106		
	CSAH 48 at 3/4 Access (Minor Stop)	EB	119	647		766	12.6	B	8.8	A			9.4	A	5.7	A	300	34	100												
		WB		561	49	610			1.2	A	0.8	A	1.2	A															300	20	20
		NB											0.0	A																	
		SB				110	110					4.8	A	4.8			A												410	31	72
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		563	20	583			2.4	A	0.4	A	2.3	A	2.0	A						531	20	86							
		WB	12	533		545	3.8	A	1.2	A			1.3	A									621	20	37						
		NB	11		5	16	14.9	B			4.4	A	11.4	B																	
		SB											0.0	A																	
	CSAH 48 at Camwood Trail (Minor Stop)	EB	37	519	12	568	5.0	A	4.4	A	1.5	A	4.4	A	3.7	A	300	20	41												
		WB	6	487	11	504	7.3	A	1.7	A	0.9	A	1.7	A			300	20	26												
		NB	8		11	19	32.3	D			8.0	A	17.0	C								678	20	43							
		SB	12		50	62	25.5	D			4.9	A	9.4	A								1158	20	46			300	20	48		
	CSAH 48 at Berrywood Dr (Minor Stop)	EB		423		423			0.7	A			0.7	A	2.0	A															
		WB		400	8	408			3.4	A	1.0	A	3.3	A																	
		NB			1	1					2.4	A	2.4	A								382	20	20							
		SB			5	5					3.4	A	3.4	A								664	20	28							
	CSAH 48 at College Rd (Signal)	EB	56	341	7	404	32.0	C	16.5	B	2.6	A	18.3	B	15.3	B	325	39	101			1118	70	138			325	20	27		
		WB	232	422	21	675	24.5	C	13.0	B	7.6	A	16.6	B			200	74	146			1050	68	143							
		NB	26	144	301	471	18.0	B	16.3	B	8.1	A	11.4	B			280	20	45			1462	57	144			560	67	175		
		SB	17	119	79	215	17.9	B	21.1	C	4.6	A	14.7	B			330	20	32			1026	49	127			220	20	56		
College Rd at TH 371 (Signal)	EB	257	247	65	569	50.2	D	47.9	D	6.4	A	44.5	D	33.2	C	360	184	334			946	104	194			320	26	62			
	WB	74	251	262	587	45.7	D	57.4	E	15.8	B	37.9	D			300	55	152			653	105	209			320	82	218			
	NB	68	598	51	717	68.6	E	26.1	C	5.8	A	28.3	C			240	56	154		1 %	2869	140	275	1 %		240	20	60			
	SB	198	593	170	961	65.3	E	22.3	C	5.1	A	27.5	C			240	94	174			1862	116	228			250	20	68			
College Rd at Douglas Fir Dr (Minor Stop)	EB	33	430	36	499	6.4	A	2.6	A	2.3	A	2.8	A	2.6	A	270	20	79													
	WB	25	478	5	508	3.2	A	0.6	A	0.3	A	0.7	A			220	20	31			897		20								
	NB	52		28	80	15.8	C			3.7	A	11.4	B			190	29	74								335	20	33			
	SB	4		44	48	17.0	C			6.2	A	7.2	A			120	20	29			577	23	77								

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Table C4c
CSAH 48 Corridor Study
2045 Build Conditions (CSAH 48 four lane between Isle Dr & Forestview Dr; Roundabout at CSAH 48/Forestview; Roundabout at CSAH 48/Cypress)
PM Peak Hour (4:15 to 5:15 PM)

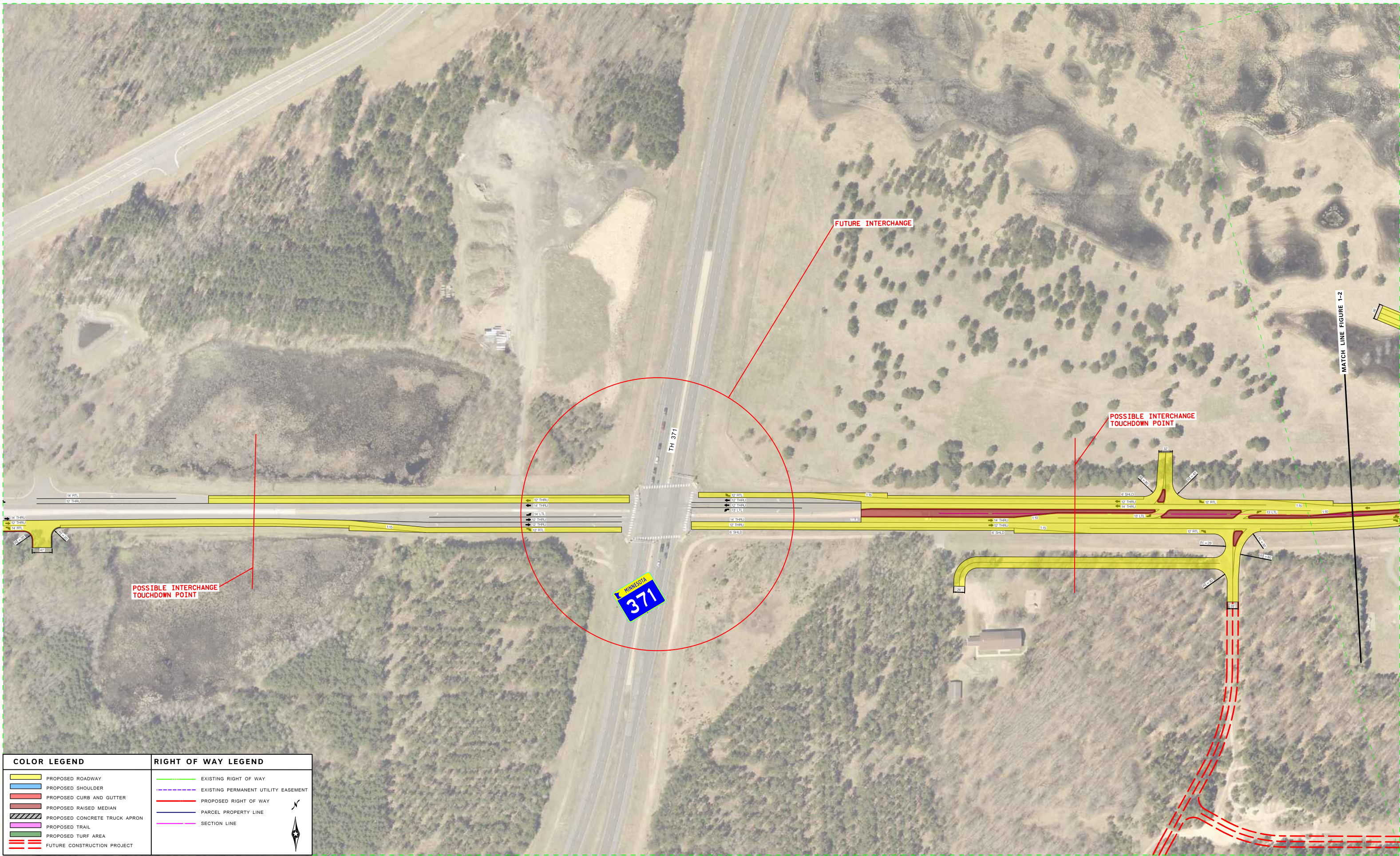
PM Peak Hour (4:15 to 5:15 PM)															Vehicle Queuing Information (feet)															
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Left Turn Lane				Through Lane (s)						Right Turn Lane			
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Thru ⁽²⁾ <---->	% Block Left ⁽²⁾ <----	Link Length (feet)	Avg. Queue (feet) ¹	Max Queue (feet) ¹	% Block Right ⁽²⁾ <---->	% Block Thru ⁽²⁾ <----	Storage (feet) ³	Avg. Queue (feet) ¹	Max Queue (feet) ¹	
PM Peak Hour	CSAH 48 at TH 371 (Signal)	EB	160	374	142	676	37.4	D	46.8	D	9.6	A	36.6	D	37.2	D	530	95	232			1698	140	237				500	45	127
		WB	232	374	181	787	43.4	D	43.9	D	7.8	A	35.4	D			500	143	296			1220	124	232				500	46	113
		NB	129	443	182	754	38.5	D	50.6	D	9.5	A	38.4	D			500	74	200			1938	160	286				500	36	98
		SB	228	567	157	952	41.0	D	44.7	D	9.3	A	38.1	D			500	129	293			2747	176	384				500	26	101
	CSAH 48 at 3/4 Access (Minor Stop)	EB	146	638		784	10.6	B	3.4	A			4.7	A	3.5	A	300	42	96			1220	20	20						
		WB		619	80	699			0.9	A	0.7	A	0.9	A								574		20						
		NB											0.0	A																
		SB				168	168					8.7	A	8.7			A											410	38	83
	CSAH 48 at Scenic River Dr (Minor Stop)	EB		489	27	516			1.7	A	0.4	A	1.6	A	1.5	A												325		20
		WB	18	608		626	2.9	A	1.2	A			1.2	A								531	20	68						
		NB	15		12	27	12.1	B			4.9	A	8.5	A								621	20	45						
		SB											0.0	A																
	CSAH 48 at Camwood Trail (Minor Stop)	EB	46	434	21	501	5.1	A	3.5	A	0.8	A	3.6	A	3.6	A	300	20	41											
		WB	18	537	12	567	4.1	A	2.2	A	1.0	A	2.2	A			300	20	27									300		20
		NB	9		8	17	23.9	C			7.6	A	16.2	C								678	20	50						
		SB	22		80	102	20.6	C			6.1	A	9.2	A								1158	20	53				300	26	64
	CSAH 48 at Berrywood Dr (Minor Stop)	EB		301		301			0.3	A			0.3	A	2.3	A														
		WB		419	5	424			3.6	A	0.9	A	3.6	A																
		NB											0.0	A																
		SB			15	15					5.7	A	5.7	A								664	20	42						
	CSAH 48 at College Rd (Signal)	EB	52	447	11	510	32.0	C	16.4	B	3.2	A	17.7	B	15.8	B	325	33	85			1118	91	172				325	20	33
		WB	245	455	21	721	24.9	C	12.5	B	7.9	A	16.6	B			200	78	150			1050	73	158						
		NB	24	92	238	354	21.0	C	17.8	B	7.0	A	11.1	B			280	20	51			1462	36	104				560	46	123
		SB	30	133	60	223	19.1	B	21.8	C	4.7	A	16.8	B			330	20	58			1026	54	129				220	20	49
	College Rd at TH 371 (Signal)	EB	319	285	98	702	50.0	D	42.4	D	9.6	A	41.2	D	33.7	C	360	227	380			946	110	263				320	38	98
		WB	75	228	374	677	39.6	D	56.4	E	22.5	C	36.3	D			300	49	115			653	93	172				320	129	284
		NB	58	692	34	784	72.5	E	32.5	C	7.6	A	34.2	C			240	52	174		5 %	2869	172	384	5 %			240	20	55
		SB	179	779	198	1,156	61.7	E	25.3	C	5.6	A	27.2	C			240	82	184		2 %	1862	165	301	1 %			250	20	77
College Rd at Douglas Fir Dr (Minor Stop)	EB	16	443	31	490	7.5	A	2.7	A	2.3	A	2.8	A	3.3	A	270	20	41												
	WB	16	557	1	574	3.0	A	0.7	A	0.8	A	0.8	A			220	20	28			897		20							
	NB	76	1	26	103	19.3	C	14.3	B	3.9	A	15.4	C			190	40	110			667	20	23				335	20	51	
	SB	11	1	57	69	16.2	C	10.0	B	6.8	A	8.4	A			120	20	39			577	25	69							

NOTES 1. If the reported queue is greater than zero (0), but less than 20 ft, a minimum of 20 ft is reported.
2. Block Percentage is proportion of analysis time (1 hour) the storage lane or through lane is blocked or blocking.
3. Multiple storage lanes of different length are averaged together to show the "Effective Storage Length" per lane.

Appendix D

Preliminary Layouts

11/30/2022 11:02:21 AM
shotchkin
X:\AE\BAXTE\165756\4-prelim-dsgn-rpts\43-prelim-dsgn\Figures\CD165756_Figs.dgn
FIG1



COLOR LEGEND	RIGHT OF WAY LEGEND
PROPOSED ROADWAY	EXISTING RIGHT OF WAY
PROPOSED SHOULDER	EXISTING PERMANENT UTILITY EASEMENT
PROPOSED CURB AND GUTTER	PROPOSED RIGHT OF WAY
PROPOSED RAISED MEDIAN	PARCEL PROPERTY LINE
PROPOSED CONCRETE TRUCK APRON	SECTION LINE
PROPOSED TRAIL	
PROPOSED TURF AREA	
FUTURE CONSTRUCTION PROJECT	

DATE
11/30/2022



COLOR LEGEND	RIGHT OF WAY LEGEND
PROPOSED ROADWAY	EXISTING RIGHT OF WAY
PROPOSED SHOULDER	EXISTING PERMANENT UTILITY EASEMENT
PROPOSED CURB AND GUTTER	PROPOSED RIGHT OF WAY
PROPOSED RAISED MEDIAN	PARCEL PROPERTY LINE
PROPOSED CONCRETE TRUCK APRON	SECTION LINE
PROPOSED TRAIL	
PROPOSED TURF AREA	
FUTURE CONSTRUCTION PROJECT	

DATE

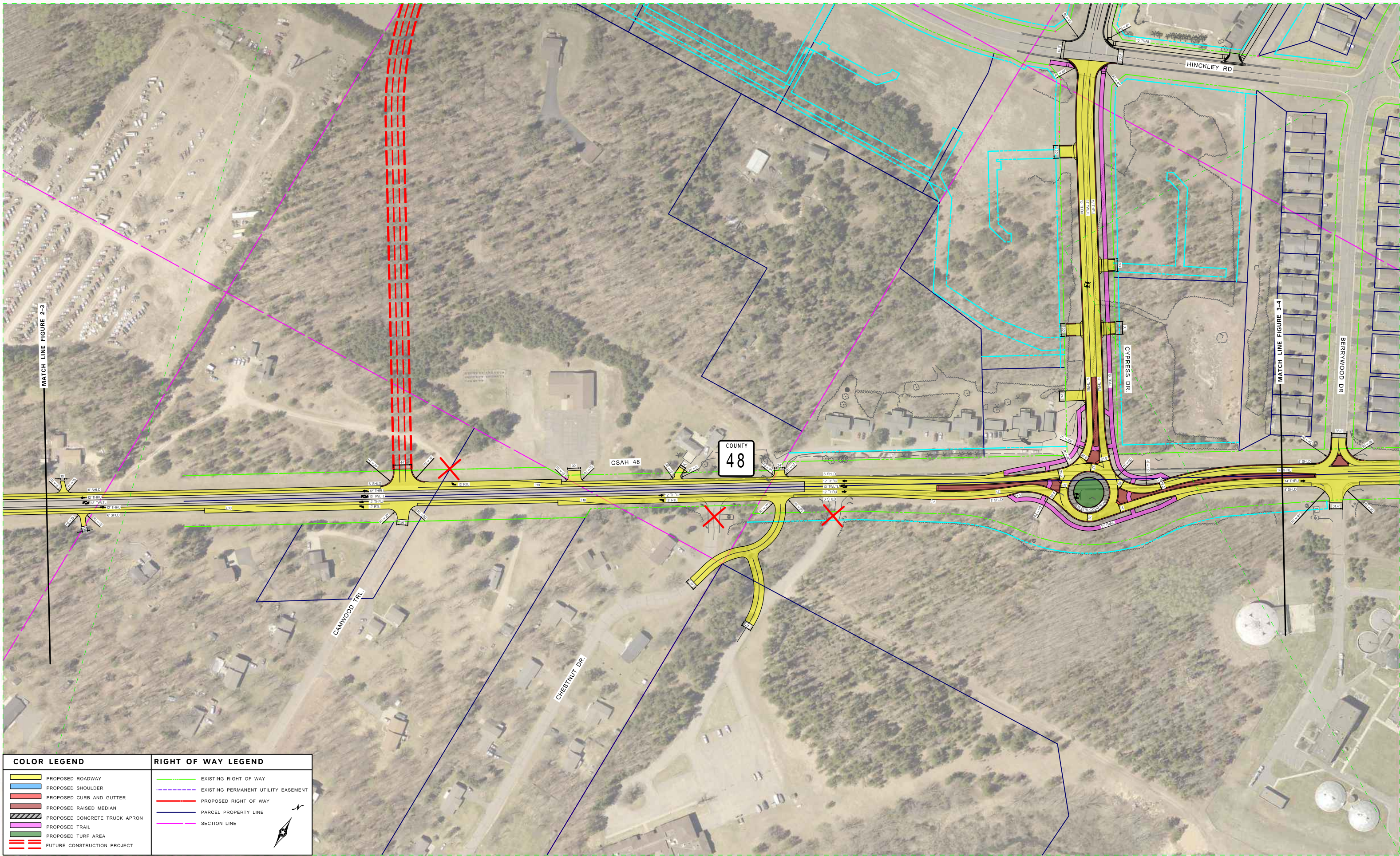
11/30/2022

scale 25

100 0 100 200

feet

12/13/2022 8:41:20 AM
shotchkin
X:\AE\B\BAXTE\165756\4-prelim-dsgn-rpts\43-prelim-dsgn\Figures\CD165756_Figs.dgn
FIG3



COLOR LEGEND	RIGHT OF WAY LEGEND
PROPOSED ROADWAY	EXISTING RIGHT OF WAY
PROPOSED SHOULDER	EXISTING PERMANENT UTILITY EASEMENT
PROPOSED CURB AND GUTTER	PROPOSED RIGHT OF WAY
PROPOSED RAISED MEDIAN	PARCEL PROPERTY LINE
PROPOSED CONCRETE TRUCK APRON	SECTION LINE
PROPOSED TRAIL	
PROPOSED TURF AREA	
FUTURE CONSTRUCTION PROJECT	

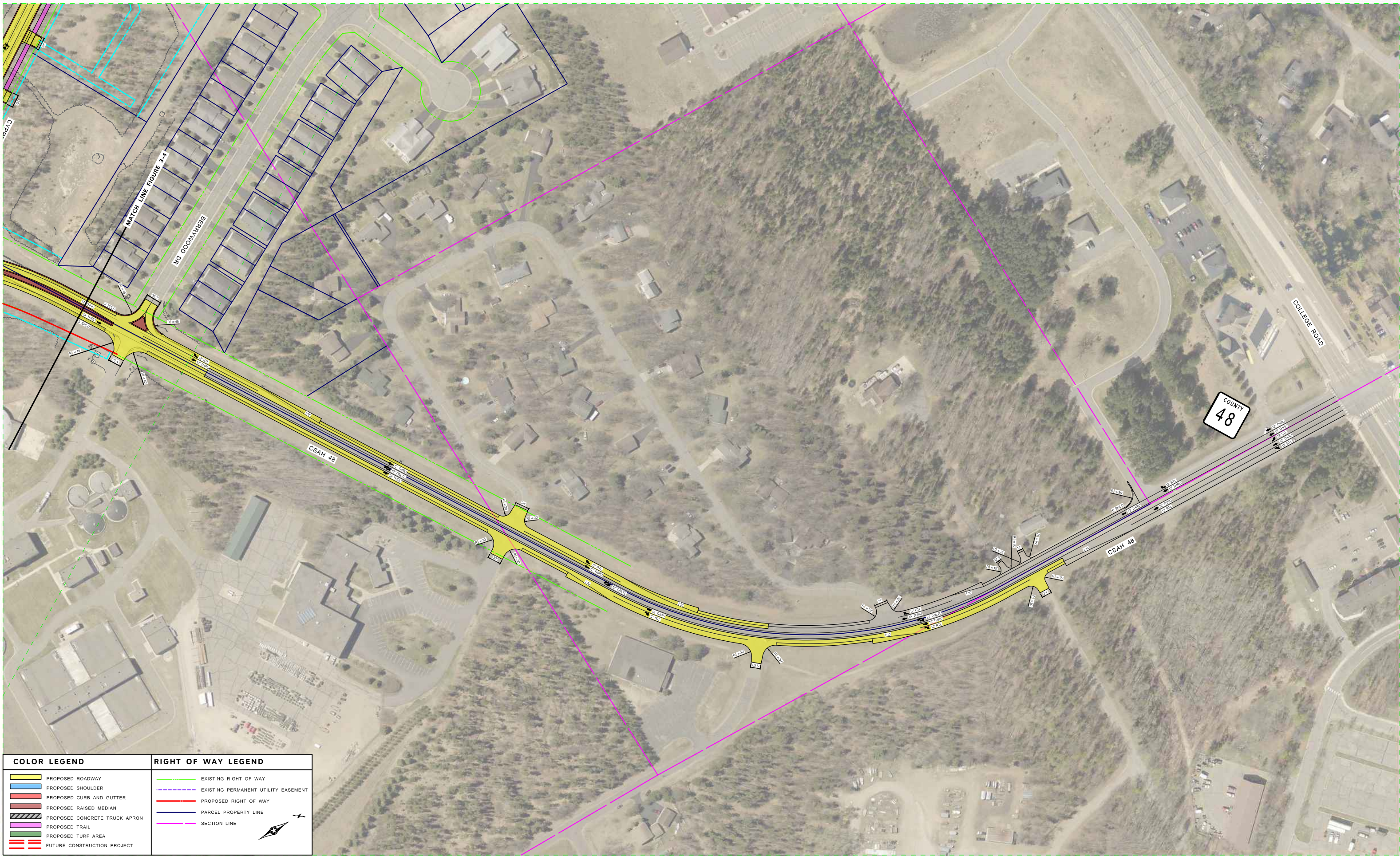
DATE
12/13/2022

1000200

0100200

scale 25feet

8:42:56 AM
12/13/2022
shotchkin
X:\AE\B\BAXTE\165756\4-prelim-dsgn-rpts\43-prelim-dsgn\Figures\CD165756_Figs.dgn
FIG4



COLOR LEGEND	RIGHT OF WAY LEGEND
PROPOSED ROADWAY	EXISTING RIGHT OF WAY
PROPOSED SHOULDER	EXISTING PERMANENT UTILITY EASEMENT
PROPOSED CURB AND GUTTER	PROPOSED RIGHT OF WAY
PROPOSED RAISED MEDIAN	PARCEL PROPERTY LINE
PROPOSED CONCRETE TRUCK APRON	SECTION LINE
PROPOSED TRAIL	
PROPOSED TURF AREA	
FUTURE CONSTRUCTION PROJECT	

DATE
12/13/2022



100 0 100 200

scale 25 feet

Appendix E

CAP-X Analysis Results

Capacity Analysis for Planning of Junctions

Input Worksheet

Project Name:	CSAH 48 Corridor Study
Project Number:	BAXTE 165756
Location	CSAH 48/TH 371 - 2045 AM Peak Hour
Date	August 22, 2022

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Truck	Volume Growth
Eastbound	0	386	566	126	4.00%	0.00%
Westbound	0	182	519	369	5.00%	0.00%
Southbound	0	448	159	485	3.00%	0.00%
Northbound	0	246	256	302	4.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00		2.00
Critical Lane Volume				1600		

Equivalent Passenger Car Volume				
	Volume (Veh/hr)			
	U-Turn 	Left 	Thru 	Right 
Eastbound	0	401	589	131
Westbound	0	191	545	387
Southbound	0	461	164	500
Northbound	0	256	266	314

Notes:	
Left-Turn Adjustment Factor	Conversion of left-turning vehicles to equivalent through vehicles
Right-turn Adjustment Factor	Conversion of right-turning vehicles to equivalent through vehicles
U-turn Adjustment Factor	Conversion of U-turning vehicles to equivalent through vehicles
Truck to PCE Factor	1 truck = X Passenger Car Equivalents
Critical Lane Volume Sum Limit	Saturation Value for Critical Lane Volume Sum at an intersection

Capacity Analysis for Planning of Junctions

Input Worksheet

Project Name:	CSAH 48 Corridor Study	Critical Lane Volume Sum			
Project Number:	BAXTE 165756	Acceptable Configurations			
Location	CSAH 48/TH 371 - 2045 AM Peak Hour	< 1200	1200 - 1399	1400 - 1599	≥ 1600
Date	August 22, 2022	16	4	1	11

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	FULL									1373	0.86	0.86	9
2	Conventional Shared RT LN	CSRL									1660	1.04	1.04	12
3.1	Quadrant Roadway	S-W			812	0.51			898	0.56	1113	0.70	0.70	3
3.2		N-E	1060	0.66			1388	0.87			1083	0.68	0.87	10
3.3		S-E			1156	0.72	1156	0.72			1083	0.68	0.72	4
3.4		N-W	1159	0.72					1180	0.74	825	0.52	0.74	5
4.1	Partial Displaced Left Turn	N-S	819	0.51	447	0.28					1180	0.74	0.74	5
4.2		E-W					726	0.45	823	0.51	1075	0.67	0.67	2
5	Displaced Left Turn	FULL	819	0.51	447	0.28	726	0.45	823	0.51	907	0.57	0.57	1
6.1	Restricted Crossing U-Turn	N-S	1483	0.93	1656	1.03	1723	1.08	2548	1.59			1.59	15
6.2		E-W	1724	1.08	1509	0.94	1214	0.76	1342	0.84			1.08	13
7.1	Median U-Turn	N-S	1121	0.70	1496	0.93					1592	0.99	0.99	11
7.2		E-W					1383	0.86	1376	0.86	2058	1.29	1.29	14
8.1	Partial Median U-Turn	N-S	883	0.55	994	0.62					1353	0.85	0.85	7
8.2		E-W					1063	0.66	799	0.50	1353	0.85	0.85	7

Capacity Analysis for Planning of Junctions

Input Worksheet

Results for Roundabouts

#	TYPE OF ROUNDABOUT	Zone 1 (North)			Zone 3 (East)			Zone 2 (South)			Zone 4 (West)			Overall v/c Ratio	Ranking
		Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3		
9.1	50 ICD	<u>32.69</u>			<u>5.32</u>			<u>-1.93</u>			<u>12.33</u>			32.69	7
9.2	75 ICD	<u>9.48</u>			<u>4.16</u>			<u>-2.71</u>			<u>6.17</u>			9.48	6
9.3	1 X 1	<u>2.68</u>			<u>2.24</u>			<u>3.16</u>			<u>2.50</u>			3.16	5
9.4	1 X 2	<u>1.99</u>			<u>1.39</u>	<u>0.85</u>		<u>2.04</u>			<u>1.03</u>	<u>1.47</u>		2.04	4
9.5	2 X 1	<u>1.30</u>	<u>1.39</u>		<u>1.76</u>			<u>1.47</u>	<u>1.69</u>		<u>1.90</u>			1.90	3
9.6	2 X 2	<u>1.01</u>	<u>1.03</u>		<u>0.82</u>	<u>1.11</u>		<u>1.02</u>	<u>1.09</u>		<u>1.14</u>	<u>0.67</u>		1.14	2
9.7	3 X 3	<u>0.56</u>	<u>0.70</u>	<u>1.02</u>	<u>0.42</u>	<u>0.90</u>	<u>0.66</u>	<u>0.52</u>	<u>0.89</u>	<u>1.13</u>	<u>0.22</u>	<u>0.75</u>	<u>1.06</u>	1.13	1

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	N-S					804	<u>0.50</u>	1168	<u>0.73</u>					0.73	10
10.2		E-W					871	<u>0.54</u>	838	<u>0.52</u>					0.54	4
11.1	Partial Cloverleaf	N-S					582	<u>0.36</u>	746	<u>0.47</u>					0.47	2
11.2		E-W					897	<u>0.66</u>	790	<u>0.49</u>					0.56	5
13.1	Displaced Left Turn	N-S	819	<u>0.51</u>			676	<u>0.42</u>	670	<u>0.42</u>			447	<u>0.28</u>	0.51	3
13.2		E-W	927	<u>0.58</u>			907	<u>0.57</u>	794	<u>0.50</u>			856	<u>0.53</u>	0.58	6
14.1	Double Crossover Diamond	N-S	741	<u>0.46</u>	514	<u>0.32</u>	646	<u>0.40</u>	439	<u>0.27</u>	683	<u>0.43</u>	315	<u>0.20</u>	0.46	1
14.2		E-W	989	<u>0.62</u>	896	<u>0.56</u>	738	<u>0.46</u>	503	<u>0.31</u>	893	<u>0.56</u>	894	<u>0.56</u>	0.62	7
15.1	Single Point	N-S	789	<u>0.49</u>			1040	<u>0.65</u>					332	<u>0.21</u>	0.65	9
15.2		E-W	989	<u>0.62</u>			748	<u>0.47</u>					894	<u>0.56</u>	0.62	7

Capacity Analysis for Planning of Junctions

Input Worksheet

Project Name:	CSAH 48 Corridor Study
Project Number:	BAXTE 165756
Location	CSAH 48/TH 371 - 2045 School Dismissal Peak Hour
Date	August 22, 2022

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Truck	Volume Growth
Eastbound	0	522	460	191	5.00%	0.00%
Westbound	0	237	359	411	1.00%	0.00%
Southbound	0	350	295	316	3.00%	0.00%
Northbound	0	142	184	205	5.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00		2.00
Critical Lane Volume				1600		

Equivalent Passenger Car Volume				
	Volume (Veh/hr)			
	U-Turn 	Left 	Thru 	Right 
Eastbound	0	548	483	201
Westbound	0	239	363	415
Southbound	0	361	304	325
Northbound	0	149	193	215

Notes:	
Left-Turn Adjustment Factor	Conversion of left-turning vehicles to equivalent through vehicles
Right-turn Adjustment Factor	Conversion of right-turning vehicles to equivalent through vehicles
U-turn Adjustment Factor	Conversion of U-turning vehicles to equivalent through vehicles
Truck to PCE Factor	1 truck = X Passenger Car Equivalents
Critical Lane Volume Sum Limit	Saturation Value for Critical Lane Volume Sum at an intersection

Capacity Analysis for Planning of Junctions

Input Worksheet

Project Name:	CSAH 48 Corridor Study	Critical Lane Volume Sum			
Project Number:	BAXTE 165756	Acceptable Configurations			
Location	CSAH 48/TH 371 - 2045 School Dismissal Peak Hour	< 1200	1200 - 1399	1400 - 1599	≥ 1600
Date	August 22, 2022	15	5	1	11

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	FULL									1255	0.78	0.78	7
2	Conventional Shared RT LN	CSRL									1613	1.01	1.01	12
3.1	Quadrant Roadway	S-W			886	0.55			1149	0.72	871	0.54	0.72	6
3.2		N-E	1230	0.77			1346	0.84			898	0.56	0.84	8
3.3		S-E			822	0.51	822	0.51			898	0.56	0.56	1
3.4		N-W	886	0.55					1138	0.71	760	0.48	0.71	4
4.1	Partial Displaced Left Turn	N-S	751	0.47	428	0.27					1138	0.71	0.71	4
4.2		E-W					674	0.42	833	0.52	1053	0.66	0.66	3
5	Displaced Left Turn	FULL	751	0.47	428	0.27	674	0.42	833	0.52	957	0.60	0.60	2
6.1	Restricted Crossing U-Turn	N-S	1248	0.78	1567	0.98	1419	0.89	2259	1.41			1.41	15
6.2		E-W	1759	1.10	1249	0.78	936	0.59	1447	0.90			1.10	13
7.1	Median U-Turn	N-S	980	0.61	1415	0.88					1559	0.97	0.97	11
7.2		E-W					1380	0.86	1366	0.85	1940	1.21	1.21	14
8.1	Partial Median U-Turn	N-S	681	0.43	730	0.46					1386	0.87	0.87	9
8.2		E-W					1194	0.75	915	0.57	1386	0.87	0.87	9

Capacity Analysis for Planning of Junctions

Input Worksheet

Results for Roundabouts

#	TYPE OF ROUNDABOUT	Zone 1 (North)			Zone 3 (East)			Zone 2 (South)			Zone 4 (West)			Overall v/c Ratio	Ranking
		Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3		
9.1	50 ICD	<u>3.88</u>			<u>10.83</u>			<u>-1.53</u>			<u>7.88</u>			10.83	7
9.2	75 ICD	<u>3.08</u>			<u>6.81</u>			<u>-2.29</u>			<u>4.77</u>			6.81	6
9.3	1 X 1	<u>1.86</u>			<u>2.69</u>			<u>1.98</u>			<u>2.19</u>			2.69	5
9.4	1 X 2	<u>1.48</u>			<u>1.73</u>	<u>0.97</u>		<u>1.31</u>			<u>0.91</u>	<u>1.29</u>		1.73	3
9.5	2 X 1	<u>0.96</u>	<u>0.89</u>		<u>2.05</u>			<u>0.87</u>	<u>1.11</u>		<u>1.68</u>			2.05	4
9.6	2 X 2	<u>0.80</u>	<u>0.71</u>		<u>0.73</u>	<u>0.98</u>		<u>0.62</u>	<u>0.73</u>		<u>1.38</u>	<u>0.74</u>		1.38	2
9.7	3 X 3	<u>0.34</u>	<u>0.58</u>	<u>0.69</u>	<u>0.62</u>	<u>1.03</u>	<u>0.74</u>	<u>0.29</u>	<u>0.55</u>	<u>0.73</u>	<u>0.27</u>	<u>0.59</u>	<u>0.90</u>	1.03	1

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	N-S					779	<u>0.49</u>	1228	<u>0.77</u>					0.77	10
10.2		E-W					789	<u>0.49</u>	831	<u>0.52</u>					0.52	6
11.1	Partial Cloverleaf	N-S					489	<u>0.31</u>	551	<u>0.34</u>					0.34	1
11.2		E-W					1041	<u>0.77</u>	878	<u>0.55</u>					0.65	8
13.1	Displaced Left Turn	N-S	807	<u>0.50</u>			619	<u>0.39</u>	820	<u>0.51</u>			483	<u>0.30</u>	0.51	5
13.2		E-W	833	<u>0.52</u>			957	<u>0.60</u>	579	<u>0.36</u>			674	<u>0.42</u>	0.60	7
14.1	Double Crossover Diamond	N-S	807	<u>0.50</u>	584	<u>0.37</u>	703	<u>0.44</u>	443	<u>0.28</u>	748	<u>0.47</u>	483	<u>0.30</u>	0.50	4
14.2		E-W	638	<u>0.40</u>	772	<u>0.48</u>	706	<u>0.44</u>	379	<u>0.24</u>	723	<u>0.45</u>	675	<u>0.42</u>	0.48	3
15.1	Single Point	N-S	859	<u>0.54</u>			1109	<u>0.69</u>					508	<u>0.32</u>	0.69	9
15.2		E-W	638	<u>0.40</u>			720	<u>0.45</u>					675	<u>0.42</u>	0.45	2

Capacity Analysis for Planning of Junctions

Input Worksheet

Project Name:	CSAH 48 Corridor Study
Project Number:	BAXTE 165756
Location	CSAH 48/TH 371 - 2045 PM Peak Hour
Date	August 22, 2022

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Truck	Volume Growth
Eastbound	0	478	375	240	1.00%	0.00%
Westbound	0	306	375	555	1.00%	0.00%
Southbound	0	407	395	354	4.00%	0.00%
Northbound	0	187	352	215	3.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00		2.00
Critical Lane Volume				1600		

Equivalent Passenger Car Volume				
	Volume (Veh/hr)			
	U-Turn 	Left 	Thru 	Right 
Eastbound	0	483	379	242
Westbound	0	309	379	561
Southbound	0	423	411	368
Northbound	0	193	363	221

Notes:	
Left-Turn Adjustment Factor	Conversion of left-turning vehicles to equivalent through vehicles
Right-turn Adjustment Factor	Conversion of right-turning vehicles to equivalent through vehicles
U-turn Adjustment Factor	Conversion of U-turning vehicles to equivalent through vehicles
Truck to PCE Factor	1 truck = X Passenger Car Equivalents
Critical Lane Volume Sum Limit	Saturation Value for Critical Lane Volume Sum at an intersection

Capacity Analysis for Planning of Junctions

Input Worksheet

Project Name:	CSAH 48 Corridor Study	<u>Critical Lane Volume Sum</u>			
Project Number:	BAXTE 165756	<u>Acceptable Configurations</u>			
Location	CSAH 48/TH 371 - 2045 PM Peak Hour	< 1200	1200 - 1399	1400 - 1599	≥ 1600
Date	August 22, 2022	15	2	3	12

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	FULL									1374	0.86	0.86	7
2	Conventional Shared RT LN	CSRL									1766	1.10	1.10	11
3.1	Quadrant Roadway	S-W			917	0.57			1178	0.74	1093	0.68	0.74	6
3.2		N-E	1410	0.88			1532	0.96			864	0.54	0.96	10
3.3		S-E			952	0.60	952	0.60			1093	0.68	0.68	2
3.4		N-W	970	0.61					1169	0.73	1020	0.64	0.73	4
4.1	Partial Displaced Left Turn	N-S	868	0.54	563	0.35					1169	0.73	0.73	4
4.2		E-W					726	0.45	794	0.50	1135	0.71	0.71	3
5	Displaced Left Turn	FULL	868	0.54	563	0.35	726	0.45	794	0.50	954	0.60	0.60	1
6.1	Restricted Crossing U-Turn	N-S	1461	0.91	1466	0.92	1441	0.90	2178	1.36			1.36	14
6.2		E-W	2182	1.36	1682	1.05	1320	0.82	1595	1.00			1.36	15
7.1	Median U-Turn	N-S	1229	0.77	1521	0.95					1781	1.11	1.11	12
7.2		E-W					1470	0.92	1467	0.92	2159	1.35	1.35	13
8.1	Partial Median U-Turn	N-S	842	0.53	917	0.57					1488	0.93	0.93	8
8.2		E-W					1228	0.77	938	0.59	1488	0.93	0.93	8

Capacity Analysis for Planning of Junctions

Input Worksheet

Results for Roundabouts

#	TYPE OF ROUNDABOUT	Zone 1 (North)			Zone 3 (East)			Zone 2 (South)			Zone 4 (West)			Overall v/c Ratio	Ranking
		Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3		
9.1	50 ICD	10.11			-8.98			-2.76			-27.21			10.11	6
9.2	75 ICD	6.09			-27.97			-4.59			23.93			23.93	7
9.3	1 X 1	2.57			3.06			2.49			3.12			3.12	5
9.4	1 X 2	1.97			1.87	1.20		1.69			1.25	1.88		1.97	3
9.5	2 X 1	1.34	1.22		2.17			1.20	1.29		2.29			2.29	4
9.6	2 X 2	1.08	0.94		0.96	1.37		0.87	0.88		1.40	0.85		1.40	2
9.7	3 X 3	0.46	0.83	0.93	0.71	1.09	0.87	0.34	0.80	0.88	0.41	0.79	1.30	1.30	1

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	N-S					951	0.59	1314	0.82					0.82	10
10.2		E-W					757	0.47	816	0.51					0.51	4
11.1	Partial Cloverleaf	N-S					620	0.39	723	0.45					0.45	2
11.2		E-W					998	0.88	852	0.53					0.62	6
13.1	Displaced Left Turn	N-S	1014	0.63			754	0.47	843	0.53			615	0.38	0.63	7
13.2		E-W	794	0.50			954	0.60	604	0.38			726	0.45	0.60	5
14.1	Double Crossover Diamond	N-S	1014	0.63	742	0.46	840	0.53	638	0.40	786	0.49	615	0.38	0.63	7
14.2		E-W	719	0.45	717	0.45	654	0.41	446	0.28	745	0.47	661	0.41	0.47	3
15.1	Single Point	N-S	1083	0.68			1159	0.72					645	0.40	0.72	9
15.2		E-W	719	0.45			666	0.42					661	0.41	0.45	1

Building a Better World for All of Us[®]

Sustainable buildings, sound infrastructure, safe transportation systems, clean water, renewable energy and a balanced environment. Building a Better World for All of Us communicates a company-wide commitment to act in the best interests of our clients and the world around us.

We're confident in our ability to balance these requirements.

JOIN OUR SOCIAL COMMUNITIES

