Timberwood Drive Development Traffic Impact Study

Baxter, MN

BAXTE 177859 | May 20, 2024

Baxter City Council Acceptance Date: _____

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Timberwood Drive Development Traffic Impact Study

Prepared for the City of Baxter

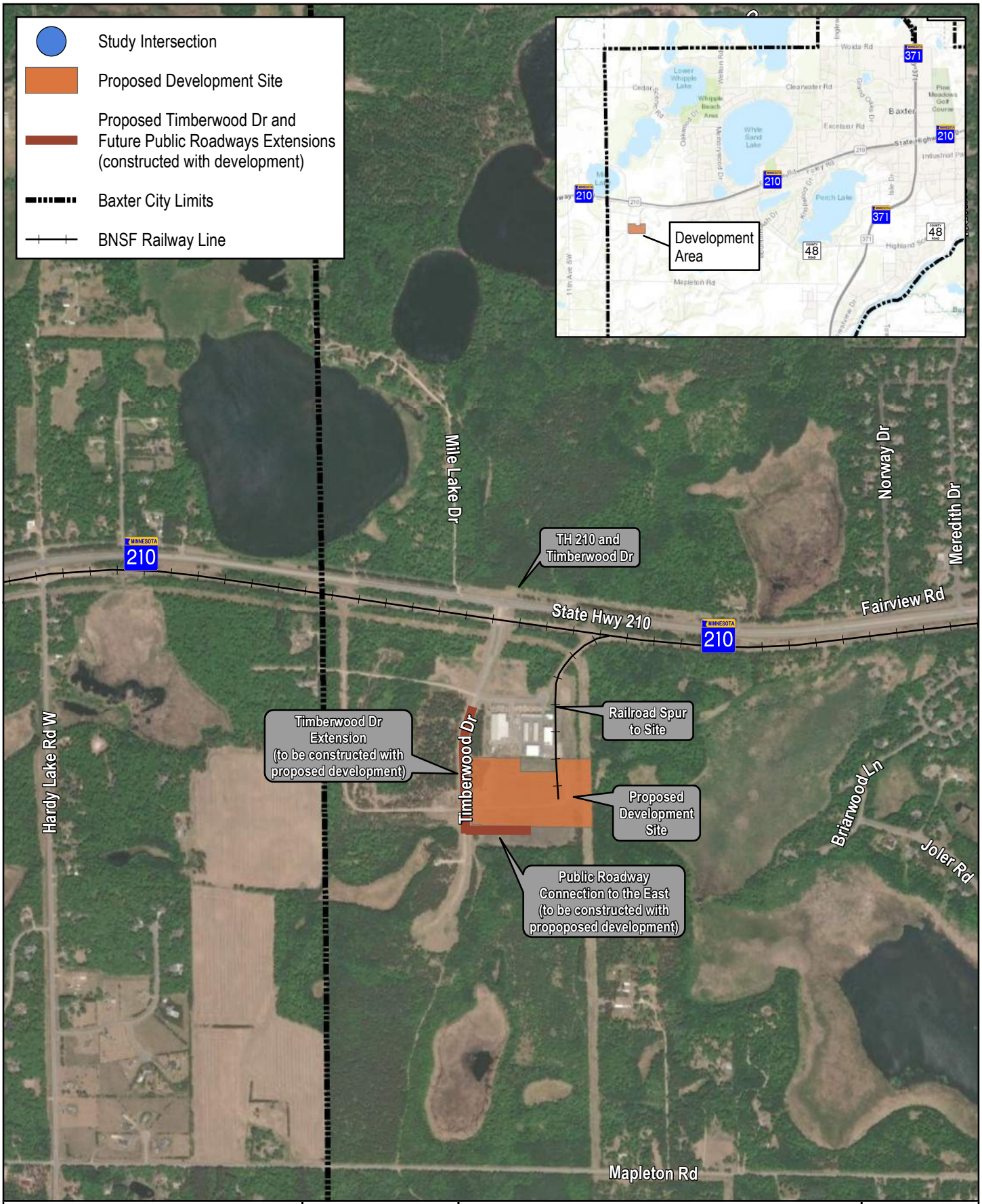
1 Introduction

This traffic impact study report provides the findings related to the analysis of the proposed distribution center development on the east side of Timberwood Drive, just south of Trunk Highway (TH) 210 near the western city limits in Baxter, MN.

The primary focus of this traffic impact study is to determine the impact of the proposed 49,500 square foot (SF) distribution center on the intersection of TH 210 and Timberwood Drive. This project will recommend a cross section for the proposed Timberwood Drive extension and a new east-west public roadway along the south side of the site which will be constructed as part of the development. A review of the proposed accesses will be completed to ensure adequate access spacing. Construction of the proposed distribution center will begin in fall 2024 with completion in 2025. The proposed site plan includes a potential for future expansion of an additional 19,000 SF, bringing the site total to 68,500 SF, which was also analyzed as part of this study to determine if the expansion would have any additional impacts.

Traffic operations analyses were completed for the existing 2024 conditions as well as future 2025 and 2030 No Build and Build conditions to represent year of opening and 5 years after opening conditions. An additional 2030 Build condition with the expanded distribution center was also analyzed to determine any necessary mitigations with the potential expansion. The only study intersection included in the analysis was TH 210 and Timberwood Drive, which is currently operating under minor stop control.

Figure 1 shows the project area, including the proposed development site, study intersection, and Timberwood Drive and new east-west public roadway extensions.



Path: C:\Traffic Projects\BAXTE Timberwood Dr TIS\GIS\Figure 1_Project Location.mxd

Project: BAXTE 177859
Print Date: 5/15/2024

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

PROJECT LOCATION

Timberwood Dr Traffic Impact Study
Baxter, MN

Figure 1

2 Existing Conditions

Timberwood Drive is a north-south major collector roadway which currently only extends approximately 1,030 feet from TH 210 to the south; there is no north leg of the intersection. Timberwood Drive currently provides access to limited industrial development and three rural single-family residences, which are located within Sylvan Township in Cass County, just west of the Baxter city limits. Timberwood Drive is planned as the major access to the future Timberwood Drive industrial park, which will extend south to connect to Mapleton Road as development continues. Timberwood Drive is currently a 4-lane divided roadway to approximately 500 feet south of TH 210, where it transitions to a 2-lane undivided roadway. There is currently no posted speed limit on Timberwood Drive so a statutory speed limit of 30 mph was assumed.

TH 210 is an east-west principal arterial roadway which extends from the North Dakota/Minnesota border in Breckenridge, MN to the Minnesota/Wisconsin border in Fond Du Lac, MN. TH 210 serves as a major regional corridor in the central portion of the State and serves as the primary east-west connection for trips within the cities of Baxter and Brainerd. TH 210 provides access to TH 371 east of the project area, which is the major north-south corridor in the region, as well as a significant amount of residential and commercial development in the area.

In the study area, TH 210 is a 2-lane undivided roadway with dedicated left and right turn lanes at Timberwood Drive. Approximately 1.6 miles east of Timberwood Drive, TH 210 expands to a 4-lane divided roadway near Meridith Drive and remains a 4-lane divides roadway through the Baxter/Brainerd area. The posted speed limit on TH 210 in the immediate study area is 60 mph.

The study intersection of TH 210 and Timberwood Drive is currently under minor stop control. There are currently dedicated left and right turn lanes on each intersection approach.

2.1 Vehicle Volumes

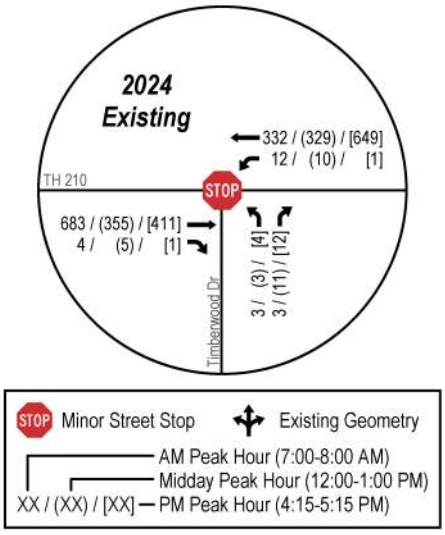
A 24-hour turning movement count was collected at the intersection of TH 210 and Timberwood Drive in March 2024. As part of the counts, passenger vehicles, heavy trucks, pedestrians, and bicycles were separated. It should be noted that the counts occurred while spring weight restrictions were in place on TH 210, which slightly changes the truck volumes on both TH 210 and Timberwood Drive. Overall, the spring weight restrictions are expected to reduce traffic volumes by less than 5%, which will not have an overall impact on the findings of this study.

Based on the traffic counts, the AM peak hour was determined to be 7 to 8 AM and the PM peak hour was determined to be 4:15 to 5:15 PM. Based on the daily time of day trip estimates for the proposed distribution center, a midday peak hour of 12 to 1 PM was also analyzed, which represents the peak for trips generated by the proposed development.

Based on the existing 2024 counts, TH 210 has approximately 3 to 4% heavy trucks and Timberwood Drive has approximately 20% heavy trucks.

Figure 2 shows the 2024 existing traffic volumes during the AM, midday, and PM peak hours as well as the existing roadway geometry and traffic control at the intersection of TH 210 and Timberwood Drive. The full 24-hour traffic counts from March 2024 can be found in **Appendix A**.

Figure 2 – 2024 Existing Traffic Volumes



2.2 Timberwood Drive Railroad Crossing

There is an existing railroad crossing on Timberwood Drive approximately 130 feet south of TH 210, which is equipped with both automated gates and overhead flashers. The railroad tracks are owned by the Burlington Northern Santa Fe (BNSF) Railway Corporation, which operates an average of 6 trains per day through the Timberwood Drive crossing; three during the day (6 AM to 6 PM) and three overnight (6 PM to 6 AM). The crossing time and duration of each train crossing vary quite a bit from day to day depending on the number of train cars.

There is an existing railroad spur that provides rail access to the Timberwood Drive Industrial Park, which extends into the eastern portion of the proposed distribution center site. There are currently no plans for the proposed development to use or extend the rail spur.

The train crossings of Timberwood Drive do not impact most of the traffic at the study intersection, which is the east-west traffic along TH 210. Traffic turning onto Timberwood Drive has ample storage along the eastbound right turn lane and westbound left turn lane to wait for gates to open. Development traffic would be hindered by each train event but is able to stack along Timberwood Drive till the train departs. With no major impact to the overall study intersection operations, the train crossing was not evaluated in this study.

3 Future Conditions

As part of the traffic impact analysis for the proposed distribution center, future 2025 and 2030 No Build and Build traffic volumes were estimated. The 2025 conditions represent the year of opening and 2030 represents 5 years after the year of opening. An additional 2030 Build scenario with the potential distribution center expansion was also analyzed. Long-term daily forecasts for Timberwood Drive when the industrial park is fully developed were also estimated to aid in recommending the cross section for the Timberwood Drive and east-west public roadway extensions.

3.1 Background Traffic Growth

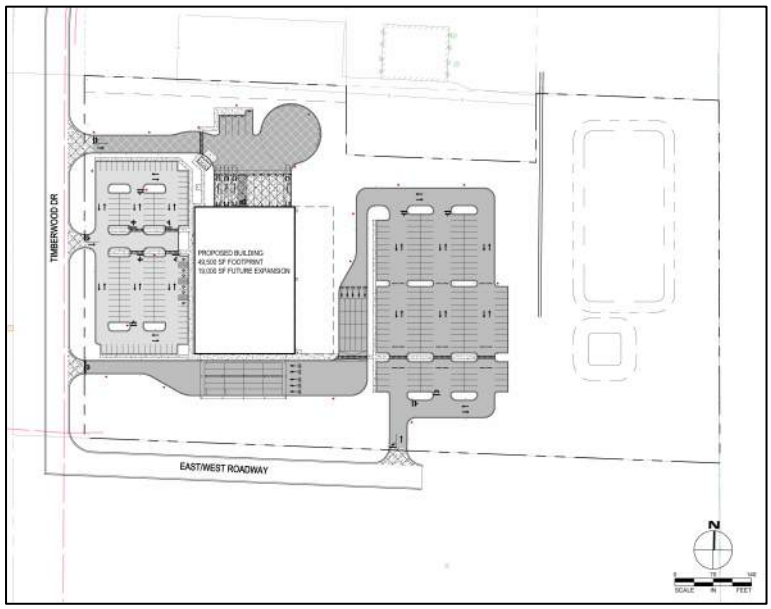
To forecast background traffic growth at the intersection of TH 210 and Timberwood Drive, MnDOT's *TH 210 Baxter Access Study*, completed in July 2021, and historical traffic growth from MnDOT's annual average daily traffic (AADT) volumes were used. The 2021 *TH 210 Baxter Access Study* used an annual growth rate of 0.5% per year, which was supported by the historical traffic volumes showing only minor growth along TH 210. Therefore, an annual growth rate of 0.5% per year was applied to existing intersection volumes to estimate the future 2025 and 2030 No Build traffic volumes.

Figures 4 and 5 show the 2025 and 2030 No Build traffic volumes during the AM, midday, and PM peak hours at the intersection of TH 210 and Timberwood Drive.

3.2 Trip Generation and Distribution

Figure 3 shows the most recent proposed site plan for the proposed 49,500 distribution center. The plan includes the potential for a future 19,000 SF expansion, bringing the site total to 68,500 SF, which was also analyzed as part of this study. The site plan proposes four access locations; three on Timberwood Drive and one on the east-west public access roadway on the south side of the site.

Figure 3 – Proposed Site Plan



Typically, the Institute of Transportation Engineers; (ITE) Trip Generation Manual, 11th Edition would be used to estimate the number of trips generated by the proposed development during the AM, midday, and PM peak hours as well as daily trips. However, for this project, the developer provided their own trip generation information, which showed the estimated trips in and out of the site throughout the day based on similar sites throughout the country. The site operates in shifts, which generally avoid peak roadway hours due to site logistics and to improve efficiency for vehicles entering and exiting the site. As a result, trips entering and exiting the site are generally lower during the roadway peak hours, especially during the PM peak hour. Comparing to the ITE Trip Generation Manual estimates for a distribution center shows that the developer provided trips are approximately triple the daily ITE estimates and approximately double the peak hour estimates.

For this study, the midday peak hour from 12 to 1 PM was analyzed as it represents the peak hour for trips generated by the proposed distribution center. It should be noted that the AM peak hour of the roadway is 7 to 8 AM and the AM peak hour of distribution center is 8 to 9 AM; however, for this study the AM peak hour trips from the distribution center were analyzed with the roadway peak hour as a worst-case scenario. The site is expected to generate approximately 5% heavy trucks per day.

With the potential expansion of the site in the future to 68,500 SF, it is estimated that the trips generated by the site will be 39% higher.

Table 1 summarizes the trip generation estimates for the proposed distribution center for the AM, midday, and PM peak hours as well as the total daily trips; the trip generation estimates are also shown with the potential future expansion of the site.

Table 1 – Site Trip Generation

Scenario	Daily Trips	AM Peak Hour			Midday Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Proposed Site (49.5 KSF)	**760**	**57**	**33**	**90**	**34**	**58**	**92**	**2**	**10**	**12**
With expansion to 68.5 KSF	1,055	79	46	125	46	82	128	2	14	16

Trip generation estimates based on the time-of-day trip estimates provided by the developer.

The trips from the proposed distribution center were distributed through the study intersection based on the 2024 turning movement count data, which showed 75% of the trips are to/from the east and the remaining 25% of trips are to/from the west. Based on discussions with the developer, a similar distribution is expected for the proposed distribution center.

Figures 4 and 5 show the 2025 and 2030 No Build, development trips, and Build volumes during the AM, midday, and PM peak hours at the intersection of TH 10 and Timberwood Drive. **Figure 6** shows 2030 No Build, development trips, and Build volumes during the AM, midday, and PM peak hours with the potential expansion of the distribution center to 68,500 SF.

Figure 4 – 2025 Traffic Volumes

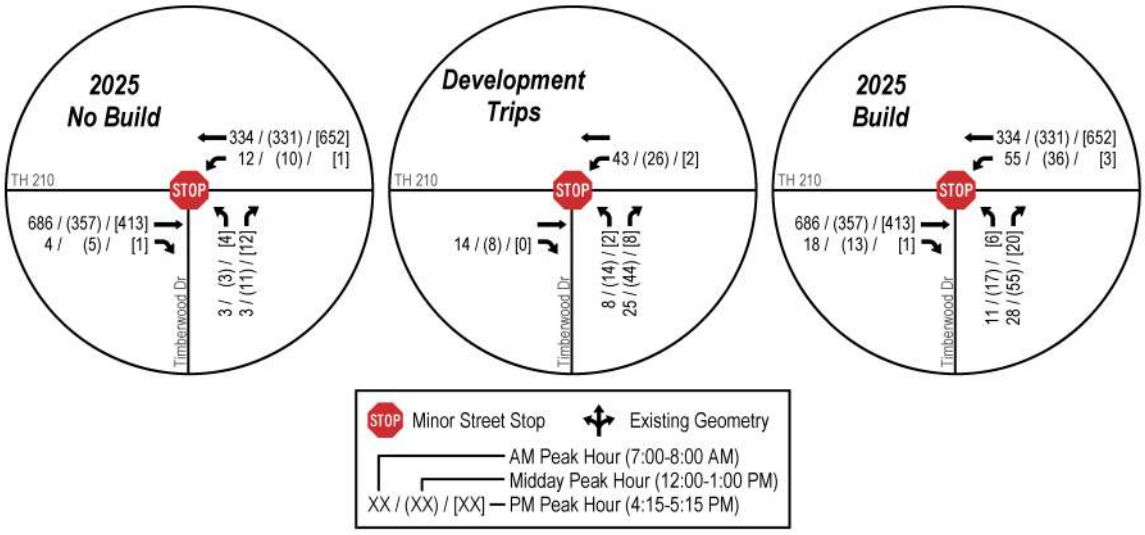


Figure 5 – 2030 Traffic Volumes

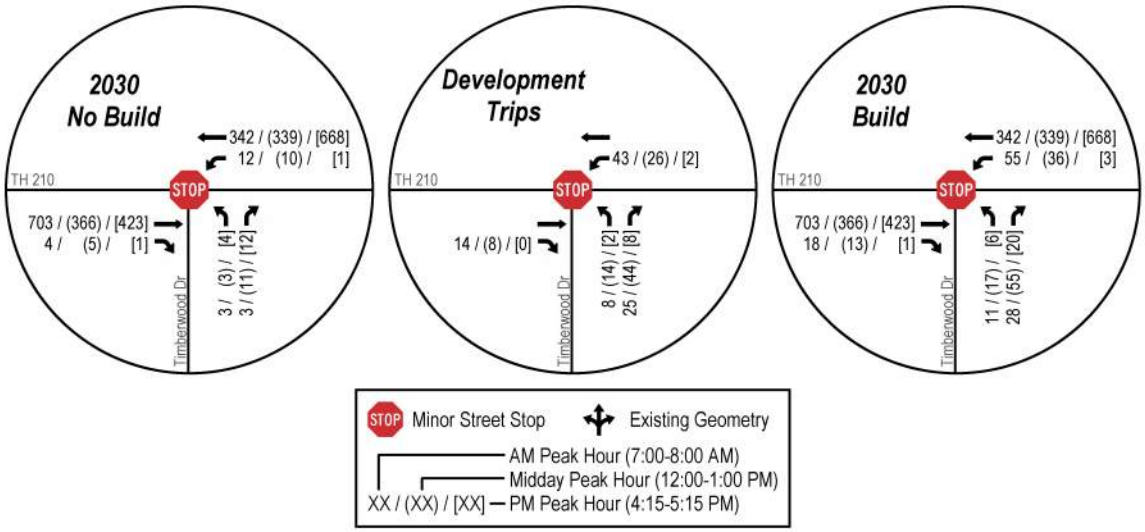
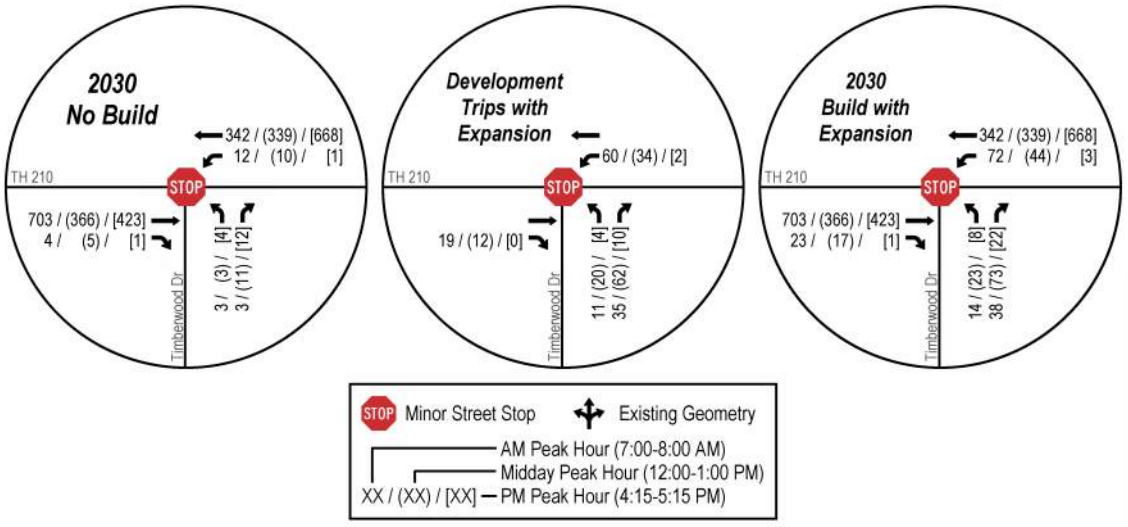


Figure 6 – 2030 Traffic Volumes with Distribution Center Expansion



3.3 Long-term Timberwood Drive Daily Traffic Forecasts

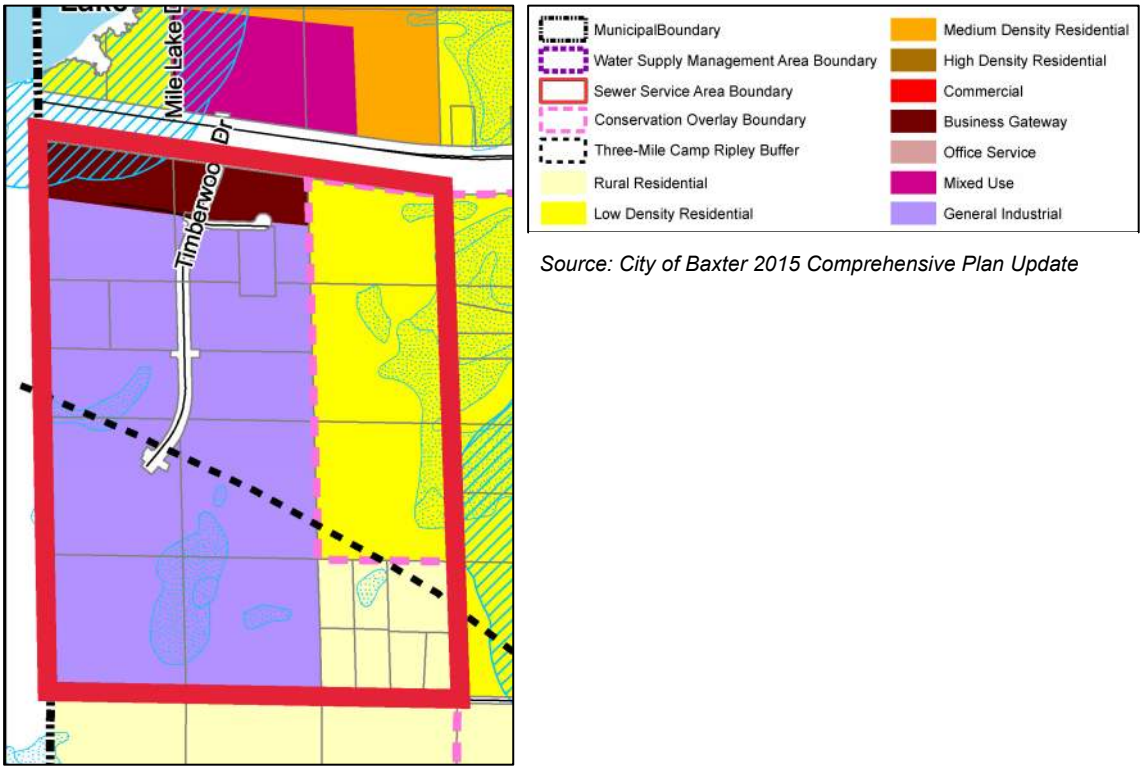
Timberwood Drive will be extended to the southern property limits for the proposed development and approximately 640 ft of a new east-west public roadway will be constructed along the south side of the site, which will eventually provide access to the east. Both roadways are currently proposed as 3-lane roadways with a two-way center left turn lane. To determine whether the 3-lane roadways would have adequate capacity, long-term daily volumes were estimated using the future land use plan from the City of Baxter's 2015 Comprehensive Plan.

Figure 7 shows the future land use in the Timberwood Drive area between TH 210 and Mapleton Road.

Two long-term development scenarios were considered; one where the parcels to the east of the Timberwood industrial park are developed as single family residential as the comprehensive plan shows and one where they are in developed with industrial land uses. Due to a large amount of wetlands east of those parcels, it is impossible to connect to the east to Briarwood Lane or Joler Road due to wetlands in the area so the only access to TH 210 would be Timberwood Drive.

It should be noted that there is an existing easement agreement, which allows for access to Timberwood Drive from the west to three single family residences that are located within Sylvan Township in Cass County, west of the Baxter city limits. It is possible that they could redevelop in the future and still have access to Timberwood Drive.

Figure 7 – Future Lane Use Plan



Source: City of Baxter 2015 Comprehensive Plan Update

Based on the future land use plan, Timberwood Drive would have a long-term daily traffic volume of between 8,200 and 8,900 vehicles per day. The proposed 3-lane roadway with a two-way left turn lane has an approximate capacity of up to 18,000 vehicles per day, therefore, the planned 3-lane cross section should provide adequate capacity long-term. The City of Baxter currently owns approximately 130 feet of right-of-way along Timberwood Drive. Timberwood Drive should be extended as a 3-lane roadway such that the eastern curb could remain in place should the roadway ever need to be expanded to 4-lanes. The 2020 *Baxter Bicycle and Pedestrian Crossing Policy* calls for a grade separated trail along Timberwood Drive in the future, which will be located on the east side of the roadway.

The local east-west roadway connection along the south side of the site is expected to carry approximately 2,000 and 2,500 vehicles per day long-term once the area to the east develops, which is well below the capacity of the proposed 3-lane roadway with a two-way left turn lane. The local roadway connection is planned to have a future grade separated trail on the south side of the roadway. Based on City Code 11-4-2(A), streets in an industrial district are required to have at least 80 feet of right of way, which could accommodate the proposed 3-lane roadway with a future boulevard separated shared use trail. Therefore, it is recommended that the east-west public roadway have 80 feet of right-of-way.

The proposed typical roadway sections for Timberwood Drive and the east-west public roadway are in **Appendix B**. The future 4-lane roadway section for Timberwood Drive is also shown.

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 intersection of TH 210 and Timberwood Drive under the following scenarios.

- 2024 Existing
- 2025 Build
- 2030 Build
- 2030 Build with distribution center expansion

4.1 Requirements for Installation of an All-way Stop

For all-way stop control installation, the study reviewed the minimum volume criteria outlined in the MnMUTCD (Chapter 2B.7). This criteria states that for any 8 hours of the day, the combined major approach volumes and combined minor approach volumes should be at or greater than the volume thresholds. An engineering study that considers factors, including warrants, should be performed to determine the "best" type of control at an intersection.

4.2 Requirements for Installation of a Traffic Signal

For traffic signal installation, many agencies typically require 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 intersection.

4.3 Warrant Analysis Assumptions

MnMUTCD 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, minimal mainline gaps, etc.), typical procedures allow for the inclusion of 50% of the minor street right turning traffic in the analysis. The 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 the guidance, the analysis of the intersection of TH 210 and Timberwood Drive includes removal of 100% of the right turning traffic on the minor approaches.

MnMUTCD 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 the guidance, the analysis of the intersection of TH 210 and Timberwood Drive includes the reduction based on speed as TH 210 has a posted speed limit of 60 mph.

4.4 Warrant Analysis Results

Based on the warrant analysis, the intersection of TH 210 and Timberwood Drive does not meet the volume thresholds for either all-way stop or traffic signal warrants for a single hour of the day under the 2024 existing conditions 2025 Build, 2030 Build, or 2030 Build volumes with distribution center expansion conditions.

Under 2030 Build conditions with the distribution center expansion, which has the highest traffic demands. A high-level analysis showed that traffic volumes could increase by approximately 400% beyond the proposed distribution center before a traffic signal or roundabout would be warranted.

Table 2 provides the all-way stop and traffic signal warrant summary for the 2024 existing, 2025 Build, 2030 Build, and 2030 Build with distribution center expansion conditions. Complete all-way stop and traffic signal analysis results can be found in **Appendix C**.

Table 2 – Warrant Analysis Results – TH 210 and Timberwood Drive

Scenario	All-way Stop Warrant	Traffic Signal Warrants		
		Warrant 1 (8 Hour)	Warrant 2 (4 hour)	Warrant 3 (Peak Hour)
2022 Existing	Not Met	Not Met	Not Met	Not Met
	0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 1 hours
2025 Build	Not Met	Not Met	Not Met	Not Met
	0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 1 hours
2030 Build	Not Met	Not Met	Not Met	Not Met
	0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 1 hours
2030 Build w/ distribution center expansion	Not Met	Not Met	Not Met	Not Met
	0 of 8 hours	0 of 8 hours	0 of 4 hours	0 of 1 hours

5 Traffic Operations Analysis

Traffic operations analyses were conducted at the intersection of TH 210 and Timberwood Drive to determine the level of service (LOS), delay, and queueing information for the AM, midday, and PM peak hour conditions.

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.

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 analysis was performed using the HCS 2023 software, which utilizes the equations and calculations from the Highway Capacity Manual. All relevant traffic operations reports can be found in **Appendix D**. It should be noted that the intersection LOS for minor stop-controlled intersections is the LOS of service of the worst minor street approach.

The following scenarios were analyzed, all with existing traffic control and geometry:

- 2024 Existing conditions
- 2025 No Build conditions
- 2025 Build conditions
- 2030 No Build conditions
- 2030 Build conditions with distribution center expansion
  - Includes potential expansion of the distribution center to 68,500 SF.

5.1 2024 Existing Conditions

Under 2024 existing conditions, the intersection of TH 210 and Timberwood Drive operates acceptably with all approaches at LOS C or better during the AM, midday, and PM peak hours. The northbound left turn movement onto TH 210 operates at LOS D during the AM peak hour but the northbound movements operate at LOS C or better during the other peaks. The westbound left turns off TH 210 operate at LOS A with minimal delay in all peak hours.

Table 4 shows the 2024 existing traffic operations at the intersection of TH 210 and Timberwood Drive during the AM, midday, and PM peak hours.

Table 4 – 2024 Existing Traffic Operations

Peak Hour	Approach	Delay (sec/veh) / LOS				
		Left	Through	Right	Approach	Intersection[1]
AM	Eastbound		0.0 / A	0.0 / A	0.0 / A	LOS C
	Westbound	9.3 / A	0.0 / A		0.3 / A	
	Northbound	27.8 / D		16.4 / C	22.1 / C	
Midday	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.2 / A	
	Eastbound	14.6 / B		10.9 / B	11.7 / B	
PM	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.0 / A	
	Eastbound	20.9 / C		10.9 / B	13.4 / B	

1 Intersection delay/LOS for minor strop-controlled intersections is the delay/LOS of the worst approach

5.2 2025 No Build Conditions

Under 2025 No Build conditions, with minimal background growth, there is minimal change in overall intersection traffic operations. The intersection of TH 210 and Timberwood Drive continues to operate with all approaches at LOS C or better during the AM, midday, and PM peak hours. The northbound left turn onto TH 210 continues to operate at LOS D during the AM peak hour but the northbound movements operate at LOS C or better otherwise. The westbound left turns off TH 210 operate at LOS A with minimal delay in all peaks.

Table 5 shows the 2025 No Build traffic operations at the intersection of TH 210 and Timberwood Drive during the AM, midday, and PM peak hours.

Table 5 – 2025 No Build Traffic Operations

Peak Hour	Approach	Delay (sec/veh) / LOS				
		Left	Through	Right	Approach	Intersection[1]
AM	Eastbound		0.0 / A	0.0 / A	0.0 / A	LOS C
	Westbound	9.3 / A	0.0 / A		0.3 / A	
	Northbound	28.0 / D		16.5 / C	22.3 / C	
Midday	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.2 / A	
	Eastbound	14.6 / B		11.0 / B	11.8 / B	
PM	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.0 / A	
	Eastbound	21.0 / C		10.9 / B	13.4 / B	

1 Intersection delay/LOS for minor strop-controlled intersections is the delay/LOS of the worst approach

5.3 2025 Build Conditions

Under 2025 Build conditions, with the proposed distribution center trips, the intersection of TH 210 and Timberwood Drive is expected to operate acceptably with all approaches at LOS C or better during the AM, midday, and PM peak hours, with minimal increase in overall delay. The northbound left turn onto TH 210 continues to operate at LOS D during the AM peak hour but the northbound movements operate at LOS C or better otherwise. The westbound left turns off TH 210 operate at LOS A with minimal delay in all peaks.

Table 6 shows the 2025 Build traffic operations at the intersection of TH 210 and Timberwood Drive during the AM, midday, and PM peak hours.

Table 6 – 2025 Build Traffic Operations

Peak Hour	Approach	Delay (sec/veh) / LOS				
		Left	Through	Right	Approach	Intersection[1]
AM	Eastbound		0.0 / A	0.0 / A	0.0 / A	LOS C
	Westbound	9.6 / A	0.0 / A		1.4 / A	
	Northbound	28.9 / D		14.8 / B	18.8 / C	
Midday	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.8 / A	
	Eastbound	16.1 / C		11.0 / B	12.2 / B	
PM	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.0 / A	
	Eastbound	21.3 / C		11.0 / B	13.3 / B	

1 Intersection delay/LOS for minor strop-controlled intersections is the delay/LOS of the worst approach

5.4 2030 No Build Conditions

Under 2030 No Build conditions, with slightly more background growth, there is still only a slight increase in overall delay at the intersection. The intersection of TH 210 and Timberwood Drive is expected to operate acceptably with all approaches at LOS C or better during the AM, midday, and PM peak hours. The northbound left turn onto TH 210 continues to operate at LOS D during the AM peak hour but the northbound movements operate at LOS C or better otherwise. The westbound left turns off TH 210 operate at LOS A with minimal delay in all peaks.

Table 7 shows the 2030 No Build traffic operations at the intersection of TH 210 and Timberwood Drive during the AM, midday, and PM peak hours.

Table 7 – 2030 No Build Traffic Operations

Peak Hour	Approach	Delay (sec/veh) / LOS				
		Left	Through	Right	Approach	Intersection[1]
AM	Eastbound		0.0 / A	0.0 / A	0.0 / A	LOS C
	Westbound	9.3 / A	0.0 / A		0.3 / A	
	Northbound	29.1 / D		16.8 / C	22.9 / C	
Midday	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.2 / A	
	Eastbound	14.9 / B		11.0 / B	11.9 / B	
PM	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.0 / A	
	Eastbound	21.6 / C		11.0 / B	13.6 / B	

1 Intersection delay/LOS for minor strop-controlled intersections is the delay/LOS of the worst approach

5.5 2030 Build Conditions

Under 2030 Build conditions, with the proposed distribution center trips, the intersection of TH 210 and Timberwood Drive is expected to operate acceptably with all approaches at LOS C or better during the AM, midday, and PM peak hours, with minimal increase in overall delay. The northbound left turn onto TH 210 continues to operate at LOS D during the AM peak hour but the northbound movements operate at LOS C or better otherwise. The westbound left turns off TH 210 operate at LOS A with minimal delay in all peaks.

Table 8 shows the 2030 Build traffic operations at the intersection of TH 210 and Timberwood Drive during the AM, midday, and PM peak hours.

Table 8 – 2030 Build Traffic Operations

Peak Hour	Approach	Delay (sec/veh) / LOS				
		Left	Through	Right	Approach	Intersection[1]
AM	Eastbound		0.0 / A	0.0 / A	0.0 / A	LOS C
	Westbound	9.7 / A	0.0 / A		1.3 / A	
	Northbound	30.0 / D		15.1 / C	19.3 / C	
Midday	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.8 / A	
	Eastbound	16.4 / C		11.1 / B	12.3 / B	
PM	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.0 / A	
	Eastbound	21.9 / C		11.0 / B	13.5 / B	

1 Intersection delay/LOS for minor strop-controlled intersections is the delay/LOS of the worst approach

5.6 2030 Build Conditions with Distribution Center Expansion

Under 2030 Build conditions, with the expanded distribution center, the site is expected to generate 39% more new development trips. However, with the increase in trips, intersection of TH 210 and Timberwood Drive is expected to operate acceptably with all approaches at LOS C or better during the AM, midday, and PM peak hours, with minimal increase in overall delay. The northbound left turn onto TH 210 continues to operate at LOS D during the AM peak hour but the northbound movements operate at LOS C or better otherwise. The westbound left turns off TH 210 operate at LOS A with minimal delay in all peaks.

Table 9 shows the 2030 Build with distribution center expansion traffic operations at the intersection of TH 210 and Timberwood Drive during the AM, midday, and PM peak hours.

Table 9 – 2030 Build with Distribution Center Expansion Traffic Operations

Peak Hour	Approach	Delay (sec/veh) / LOS				
		Left	Through	Right	Approach	Intersection[1]
AM	Eastbound		0.0 / A	0.0 / A	0.0 / A	LOS C
	Westbound	9.8 / A	0.0 / A		1.7 / A	
	Northbound	32.4 / D		15.3 / C	19.9 / C	
Midday	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.3 / A	0.0 / A		0.9 / A	
	Eastbound	17.1 / C		11.2 / B	12.6 / B	
PM	Northbound		0.0 / A	0.0 / A	0.0 / A	LOS B
	Southbound	8.2 / A	0.0 / A		0.0 / A	
	Eastbound	22.1 / C		11.1 / B	14.0 / B	

1 Intersection delay/LOS for minor strop-controlled intersections is the delay/LOS of the worst approach

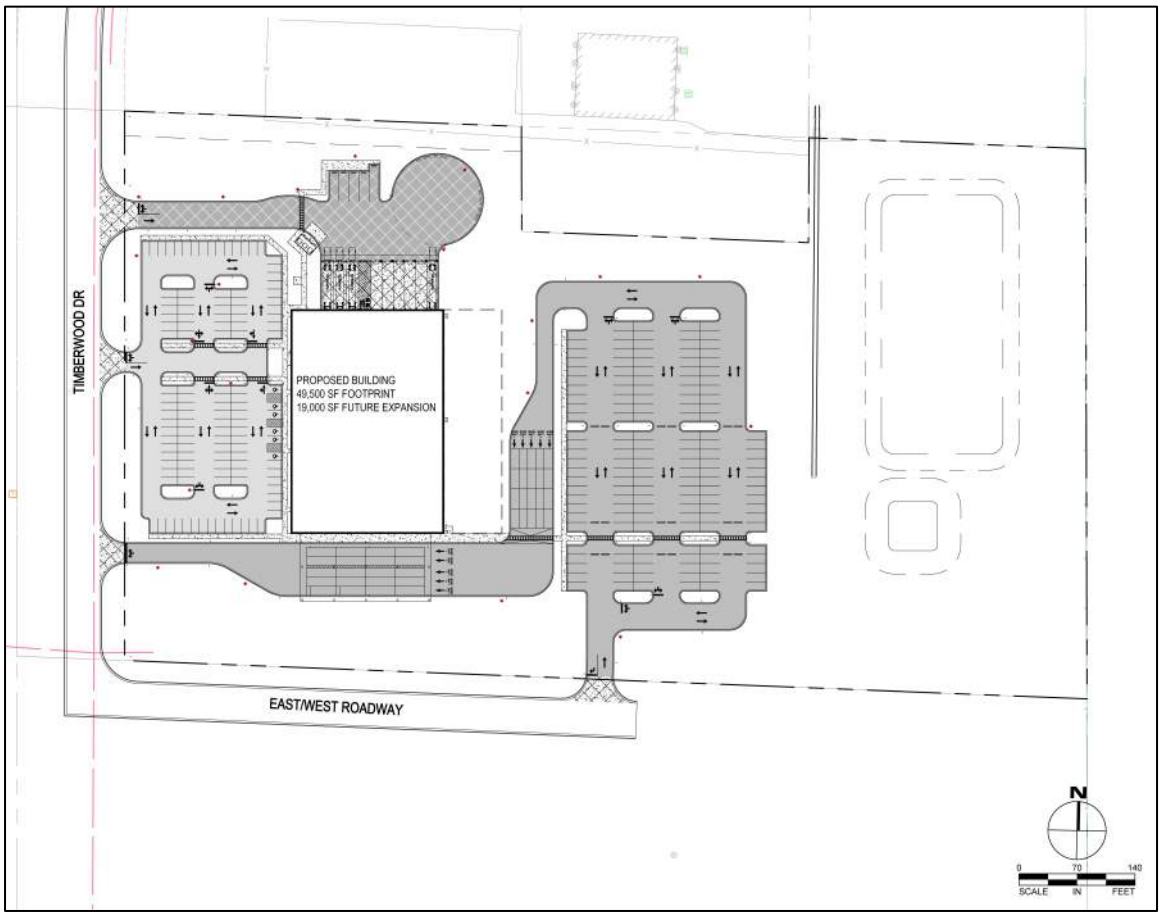
6 Access Review

The City Code provides access spacing standards for developments within the City of Baxter. Based on City Code 10-5-2(D), accesses must be spaced at least 100 feet apart and 100 feet from the nearest intersection to provide safe access to and from the site.

The proposed distribution center has four proposed access locations, which are described below and shown in **Figure 8**. Each of the proposed accesses are spaced at least 100 feet apart and 100 feet from the nearest intersections, therefore, the proposed accesses meet the access spacing standards from the City Code.

- **Timberwood Drive Accesses (3 locations) –** the northernmost access is located approximately 700 feet south of Independence Road, with the next access approximately 180 feet south and the final access approximately 225 feet further south, which is approximately 175 feet north of the public roadway intersection.
- **East-West Public Roadway Access (1 location) –**located approximately 600 feet east of Timberwood Drive.

Figure 8 – Site Access Plan



7 Conclusion

The proposed 49,500 square foot (SF) distribution center, located on the east side of Timberwood Drive just south of TH 210, is expected to generate approximately 760 trips per day. The site plan for the distribution center shows the potential for future expansion to a full build-out of 68,500 SF, which would increase the daily trips to a total of 1,055. As part of the project, Timberwood Drive will be extended to the southern limits of the development and a new east-west public roadway will be built across part of the southern side of the site. In the long-term, the new east-west public roadway along the south side of the site will eventually be further extended to provide access to development to the east. The site has three proposed accesses on Timberwood Drive and one on the new east-west public roadway.

The Timberwood Drive and new east-west public roadway extensions are currently planned as 3-lane roadways with a two-way center left turn lane. To determine whether the 3-lane roadways would have adequate capacity, long-term daily forecast volumes were estimated using the future land use plan from the City of Baxter's 2015 Comprehensive Plan. Two long-term development scenarios were considered; one where the parcels to the east of the Timberwood Drive industrial park are developed as single family residential as the comprehensive plan shows and one where that area is developed with industrial land uses.

Based on the future land use plan, Timberwood Drive would have a long-term daily traffic volume of between 8,200 and 8,900 vehicles per day, which is well below the expected capacity of up to 18,000 vehicles per day for a 3-lane roadway. The City of Baxter currently owns approximately 130 feet of right-of-way along Timberwood Drive. Timberwood Drive should be extended as a 3-lane roadway such that the eastern curb could remain in place should the roadway ever need to be expanded to 4-lanes. A future grade separated trail is planned on the east side of Timberwood Drive.

The local east-west roadway connection along the south side of the site is expected to carry approximately 2,000 and 2,500 vehicles per day long-term once the area to the east develops, which is well below the capacity of the proposed 3-lane roadway with a two-way left turn lane. The local roadway connection is planned to have a future grade separated trail on the south side of the roadway.

Warrant analysis was completed for the intersection of TH 210 and Timberwood Drive under 2024 existing, 2025 Build, 2030 Build, and 2030 Build with distribution center expansion conditions. Based on the warrant analysis, the intersection of TH 210 and Timberwood Drive does not meet the volume thresholds for either all-way stop or traffic signal warrants for a single hour of the day under any of the scenarios.

Traffic operations were analyzed for the intersection of TH 210 and Timberwood Drive under 2024 existing, 2025 No Build, 2025 Build, 2030 No Build, 2030 Build, and 2030 Build with distribution center expansion conditions. The 2025 analysis represents the year of opening, and the 2030 analysis represents 5 years after opening.

Under each scenario, the intersection and each approach operated at LOS C or better during the AM, midday, and PM peak hours. The northbound left turn onto TH 210 operates at LOS D during the AM peak hour under each scenario but the northbound movements operate at LOS C or better otherwise. The westbound left turns off TH 210 operate at LOS A with minimal delay in

all peaks. The added trips from the proposed distribution center resulted in limited increase in overall delay at the study intersection.

The existing railroad crossing on Timberwood Drive just south of TH 210 currently serves an average of six trains per day. The time and duration of the trains varies from day to day, so it is difficult to plan/schedule peak development trips around the train crossings. If the development peak traffic volumes coincide with a train event, there will be delays and queuing as the train crosses Timberwood Drive; however, the queues are expected to dissipate relatively quickly once the train passes.

There is an existing railroad spur that provides rail access to the Timberwood Drive Industrial Park, which extends into the eastern portion of the proposed distribution center site. There are currently no plans for the proposed development to use or extend the rail spur.

The four proposed site accesses are spaced at least 100 feet apart and 100 feet from any intersection, which satisfies the standards in City Code 10-5-2(D).

7.1 Recommendation

Based on the analysis of the proposed 49,500 square foot distribution center, no geometric or traffic control changes are needed at the intersection of TH 210 and Timberwood Drive to maintain acceptable traffic operations with the increased trips from the proposed development. The site plan shows a potential future expansion of up to 68,500 square feet. The analysis of the site with the future expansion is expected to operate acceptably with no geometric or traffic control changes being needed.

As part of the project, Timberwood Drive will be extended to the southern limits of the development and a new east-west public roadway will be built across part of the southern side of the current development site. The new east-west public roadway will eventually be further extended to provide access to development lands to the east. The proposed development site has three proposed accesses on Timberwood Drive and one on the new east-west public roadway. Both of these roadways should be constructed as 3-lane roadways with a two-way center left turn lane. Timberwood Drive should be extended as a 3-lane roadway such that the eastern curb could remain in place should the roadway ever need to be expanded to 4-lanes. The proposed 3-lane roadway and potential future 4-lane roadway can all be accommodated within the existing 130 feet of right-of-way on Timberwood Drive.

Based on City Code 11-4-2(A), streets in an industrial district are required to have at least 80 feet of right of way, which could accommodate the proposed 3-lane roadway with a future boulevard separated shared use trail. Therefore, it is recommended that the east-west public roadway have 80 feet of right-of-way.

The proposed typical roadway sections for Timberwood Drive and the east-west public roadway are in **Appendix B**. The future 4-lane roadway section for Timberwood Drive is also shown.

Appendix A

2024 Turning Movement Count

Location: TH 210 at Timberwood Drive
Count Date: 3/19/2024
Counted By: CountCloud

TURNING MOVEMENT COUNT DATA

All Vehicles + Total Peds/Bikes

	N/A				TH 210				Timberwood Drive				TH 210				
	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Int. Total
0:00	0	0	0	0	0	3	0	0	0	0	0	0	0	2	0	0	5
0:15	0	0	0	0	0	2	0	0	0	0	0	0	0	5	0	0	7
0:30	0	0	0	0	0	8	0	0	0	0	0	0	0	1	0	0	9
0:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4
1:15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
1:30	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
1:45	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	4
2:00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2:15	0	0	0	0	0	3	0	0	0	0	0	0	0	5	0	0	8
2:30	0	0	0	0	0	3	0	0	0	0	0	0	0	2	0	0	5
2:45	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
3:00	0	0	0	0	0	3	0	0	0	0	0	0	0	6	0	0	9
3:15	0	0	0	0	0	4	0	0	0	0	0	0	0	5	0	0	9
3:30	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	4
3:45	0	0	0	0	0	3	0	0	0	0	0	0	0	6	0	0	9
4:00	0	0	0	0	0	4	0	0	0	0	0	0	0	8	0	0	12
4:15	0	0	0	0	0	3	0	0	0	0	0	0	0	13	0	0	16
4:30	0	0	0	0	1	3	0	0	0	0	0	0	0	11	0	0	15
4:45	0	0	0	0	0	5	0	0	0	0	0	0	0	26	0	0	31
5:00	0	0	0	0	0	9	0	0	0	0	0	0	0	26	0	0	35
5:15	0	0	0	0	0	18	0	0	0	0	0	0	0	27	0	0	45
5:30	0	0	0	0	0	18	0	0	0	0	0	0	0	39	1	0	58
5:45	0	0	0	0	1	15	0	0	0	0	0	0	0	44	0	0	60
6:00	0	0	0	0	1	22	0	0	0	0	0	0	0	47	0	0	70
6:15	0	0	0	0	2	34	0	0	0	0	3	0	0	57	1	0	97
6:30	0	0	0	0	0	36	0	0	0	0	0	0	0	109	5	0	150
6:45	0	0	0	0	4	45	0	0	0	0	1	0	0	97	0	0	147
7:00	0	0	0	0	3	75	0	0	1	0	0	0	0	135	2	0	216
7:15	0	0	0	0	2	79	0	0	0	0	1	0	0	172	1	0	255
7:30	0	0	0	0	3	78	0	0	1	0	2	0	0	195	0	0	279
7:45	0	0	0	0	4	100	0	0	1	0	0	0	0	181	1	0	287
8:00	0	0	0	0	4	89	0	0	0	0	1	0	0	120	1	0	215
8:15	0	0	0	0	5	75	0	0	0	0	4	0	0	129	0	0	213
8:30	0	0	0	0	3	64	0	0	0	0	0	0	0	101	0	0	168
8:45	0	0	0	0	4	55	0	0	0	0	2	0	0	121	1	0	183
9:00	0	0	0	0	1	50	0	0	1	0	2	0	0	86	4	0	144
9:15	0	0	0	0	1	47	0	0	3	0	0	0	0	77	1	0	129
9:30	0	0	0	0	3	58	0	0	0	0	1	0	0	102	1	0	165
9:45	0	0	0	0	2	59	0	0	0	0	1	0	0	82	0	0	144
10:00	0	0	0	0	4	66	0	0	0	0	1	0	0	77	1	0	149
10:15	0	0	0	0	0	60	0	0	0	0	2	0	0	67	1	0	130
10:30	0	0	0	0	4	77	0	0	4	0	4	0	0	101	1	0	191
10:45	0	0	0	0	0	67	0	0	0	0	2	0	0	96	0	0	165
11:00	0	0	0	0	2	86	0	0	3	0	3	0	0	88	0	0	182
11:15	0	0	0	0	3	74	0	0	0	0	1	0	0	94	1	0	173
11:30	0	0	0	0	2	67	0	0	1	0	4	0	0	110	1	0	185
11:45	0	0	0	0	4	75	0	0	0	0	4	0	0	77	0	0	160
12:00	0	0	0	0	2	73	0	0	1	0	2	0	0	101	1	0	180
12:15	0	0	0	0	3	85	0	0	1	0	5	0	0	94	1	0	189
12:30	0	0	0	0	4	89	0	0	0	0	2	0	0	80	2	0	177
12:45	0	0	0	0	1	82	0	0	1	0	2	0	0	80	1	0	167
13:00	0	0	0	0	0	87	0	0	1	0	0	0	0	84	1	0	173
13:15	0	0	0	0	3	92	0	0	1	0	4	0	0	89	1	0	190
13:30	0	0	0	0	4	93	0	0	0	0	1	0	0	92	0	0	190
13:45	0	0	0	0	2	106	0	0	1	0	4	0	0	82	1	0	196
14:00	0	0	0	0	1	109	0	0	0	0	2	0	0	73	3	0	188
14:15	0	0	0	0	1	106	0	0	0	0	5	0	0	87	0	0	199
14:30	0	0	0	0	2	112	0	0	0	0	6	0	0	95	0	0	215
14:45	0	0	0	0	2	110	0	0	0	0	3	0	0	90	0	0	205
15:00	0	0	0	0	4	128	0	0	1	0	2	0	0	108	0	0	243
15:15	0	0	0	0	1	114	0	0	1	0	3	0	0	120	0	0	239
15:30	0	0	0	0	1	155	0	0	3	0	1	0	0	120	0	0	280
15:45	0	0	0	0	0	150	0	0	0	0	1	0	0	95	0	0	246

Location: TH 210 at Timberwood Drive
Count Date: 3/19/2024
Counted By: CountCloud

TURNING MOVEMENT COUNT DATA

All Vehicles + Total Peds/Bikes

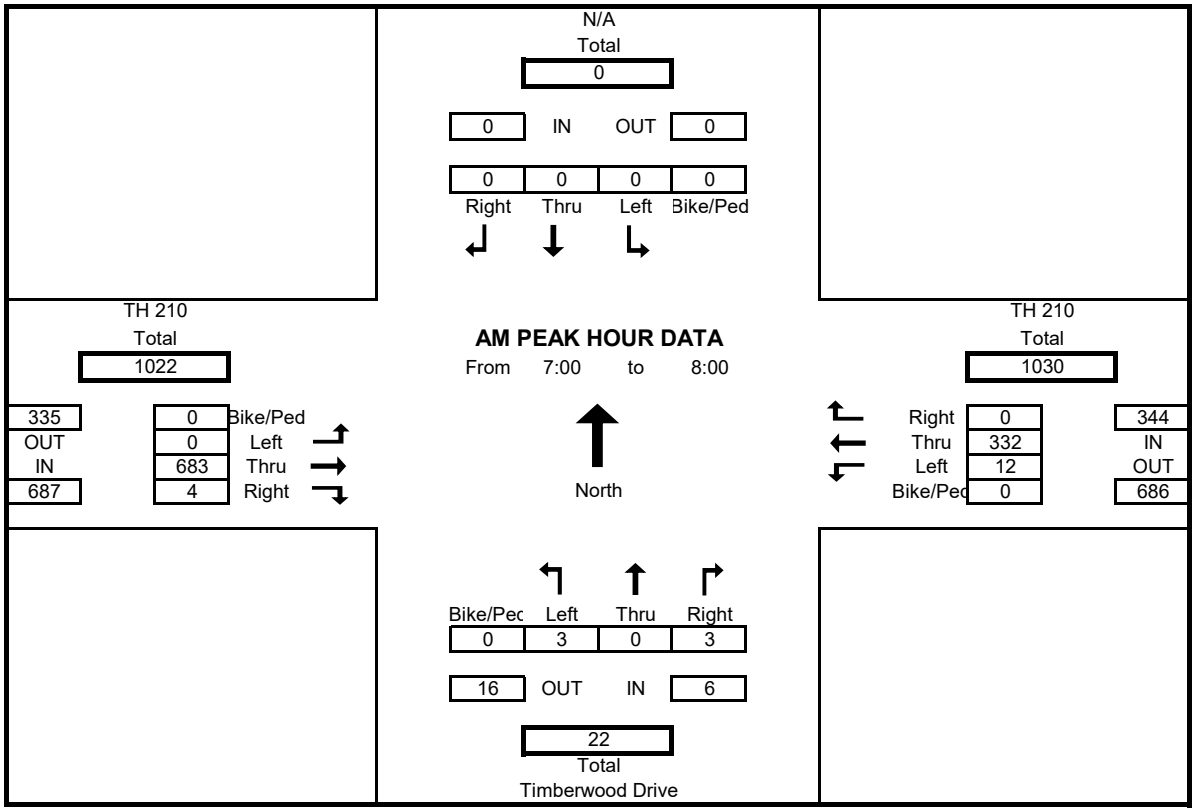
	N/A				TH 210				Timberwood Drive				TH 210				
	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Left	Thru	Right	Ped/Bike	Int. Total
16:00	0	0	0	0	0	150	0	0	0	0	4	0	0	107	0	0	261
16:15	0	0	0	0	1	167	0	0	1	0	1	0	0	90	1	0	261
16:30	0	0	0	0	0	158	0	0	3	0	7	0	0	117	0	0	285
16:45	0	0	0	0	0	161	0	0	0	0	4	0	0	96	0	0	261
17:00	0	0	0	0	0	163	0	0	0	0	0	0	0	108	0	0	271
17:15	0	0	0	0	0	152	0	0	0	0	0	0	0	97	0	0	249
17:30	0	0	0	0	1	136	0	0	1	0	0	0	0	100	0	0	238
17:45	0	0	0	0	0	110	0	0	0	0	1	0	0	70	0	0	181
18:00	0	0	0	0	0	88	0	0	0	0	2	0	0	64	0	0	154
18:15	0	0	0	0	0	87	0	0	0	0	0	0	0	51	0	0	138
18:30	0	0	0	0	0	79	0	0	0	0	0	0	0	61	0	0	140
18:45	0	0	0	0	2	67	0	0	0	0	1	0	0	38	0	0	108
19:00	0	0	0	0	0	68	0	0	0	0	0	0	0	33	0	0	101
19:15	0	0	0	0	0	68	0	0	0	0	0	0	0	31	0	0	99
19:30	0	0	0	0	0	61	0	0	0	0	0	0	0	19	0	0	80
19:45	0	0	0	0	0	44	0	0	0	0	1	0	0	15	0	0	60
20:00	0	0	0	0	0	57	0	0	0	0	0	0	0	26	0	0	83
20:15	0	0	0	0	0	49	0	0	0	0	0	0	0	24	0	0	73
20:30	0	0	0	0	0	47	0	0	0	0	0	0	0	22	0	0	69
20:45	0	0	0	0	0	56	0	0	0	0	0	0	0	14	0	0	70
21:00	0	0	0	0	1	50	0	0	0	0	0	0	0	16	0	0	67
21:15	0	0	0	0	0	27	0	0	0	0	0	0	0	22	0	0	49
21:30	0	0	0	0	1	26	0	0	0	0	0	0	0	10	0	0	37
21:45	0	0	0	0	0	15	0	0	0	0	0	0	0	14	0	0	29
22:00	0	0	0	0	0	14	0	0	0	0	0	0	0	11	0	0	25
22:15	0	0	0	0	0	25	0	0	0	0	0	0	0	7	0	0	32
22:30	0	0	0	0	0	21	0	0	0	0	0	0	0	10	0	0	31
22:45	0	0	0	0	0	14	0	0	0	0	0	0	0	3	0	0	17
23:00	0	0	0	0	0	13	0	0	0	0	0	0	0	10	0	0	23
23:15	0	0	0	0	0	9	0	0	0	0	0	0	0	8	0	0	17
23:30	0	0	0	0	0	4	0	0	0	0	0	0	0	6	0	0	10
23:45	0	0	0	0	0	4	0	0	0	0	0	0	0	3	0	0	7
Total	0	0	0	0	100	5534	0	0	31	0	103	0	0	5549	36	0	10021
Cars+	0	0	0	0	79	5343	0	0	26	0	82	0	0	5376	31	0	10937
Trucks	0	0	0	0	21	191	0	0	5	0	21	0	0	173	5	0	416
% Trucks	0.0	0.0	0.0	0.0	21.0	3.5	0.0	0.0	16.1	0.0	20.4	0.0	0.0	3.1	13.9	0.0	
	0.0				3.8				19.4				3.2				4.2

Location: TH 210 at Timberwood Drive
Count Date: 3/19/2024
Counted By: CountCloud

AM PEAK HOUR TURNING MOVEMENT DATA

All Vehicles

	N/A				TH 210				Timberwood Drive				TH 210				
	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	Bike/Ped	Left	Thru	Right	Bike/Ped	Left	Thru	Right	Bike/Ped	Left	Thru	Right	Bike/Ped	Int. Total
7:00	0	0	0	0	3	75	0	0	1	0	0	0	0	135	2	0	216
7:15	0	0	0	0	2	79	0	0	0	0	1	0	0	172	1	0	255
7:30	0	0	0	0	3	78	0	0	1	0	2	0	0	195	0	0	279
7:45	0	0	0	0	4	100	0	0	1	0	0	0	0	181	1	0	287
Total	0	0	0	0	12	332	0	0	3	0	3	0	0	683	4	0	1037
% App. Total	0.0	0.0	0.0		3.5	96.5	0.0		50.0	0.0	50.0		0.0	99.4	0.6		
PHF	0.000	0.000	0.000	0.000	0.750	0.830	0.000	0.000	0.750	0.000	0.375	0.000	0.000	0.876	0.500	0.000	0.903
% Trucks	0.0	0.0	0.0	0.0	0.0	7.8	0.0	0.0	66.7	0.0	66.7	0.0	0.0	1.9	0.0	0.0	
	0.0				7.6				66.7				1.9				4.1

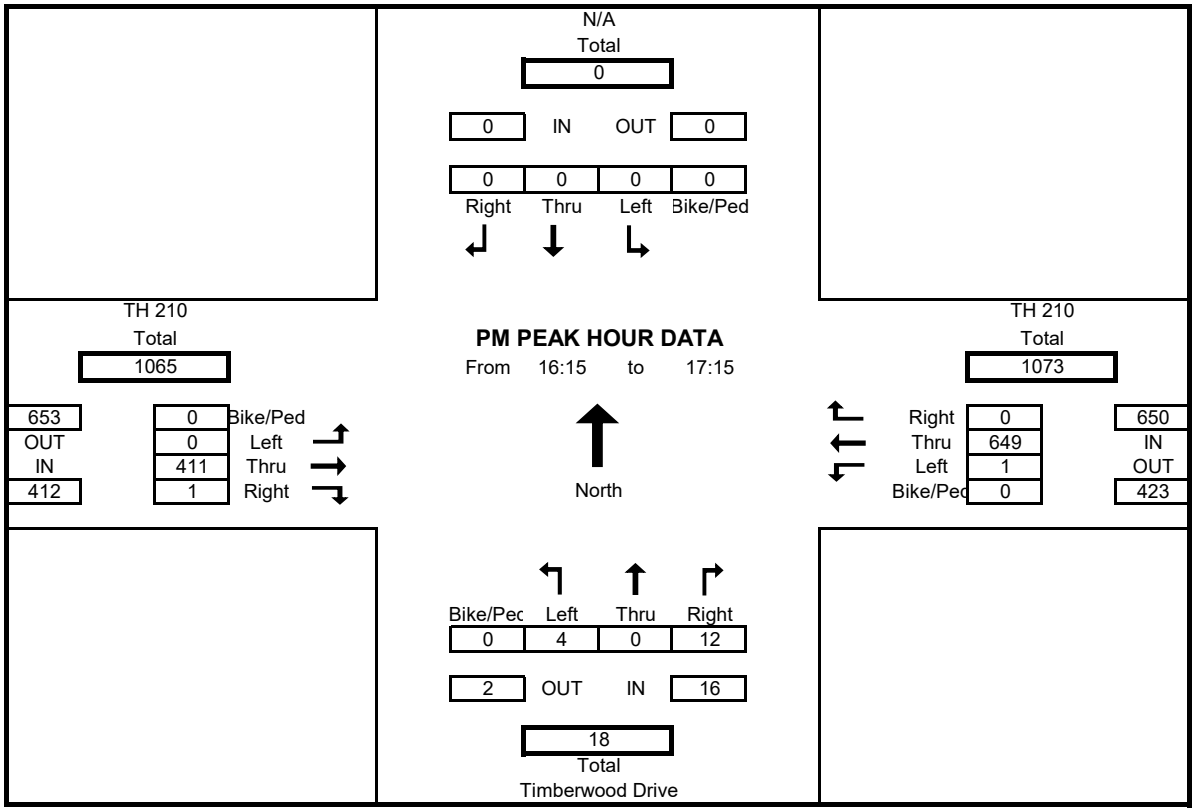


Location: TH 210 at Timberwood Drive
Count Date: 3/19/2024
Counted By: CountCloud

PM PEAK HOUR TURNING MOVEMENT DATA

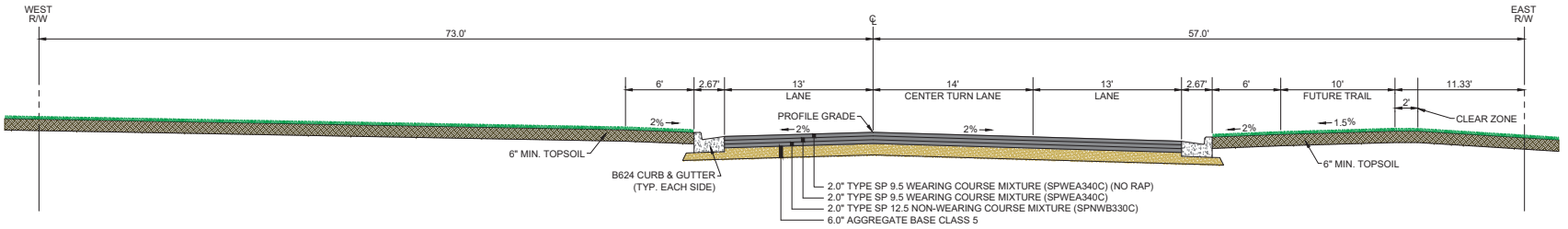
All Vehicles

	N/A				TH 210				Timberwood Drive				TH 210				
	Southbound				Westbound				Northbound				Eastbound				
Start Time	Left	Thru	Right	Bike/Ped	Left	Thru	Right	Bike/Ped	Left	Thru	Right	Bike/Ped	Left	Thru	Right	Bike/Ped	Int. Total
16:15	0	0	0	0	1	167	0	0	1	0	1	0	0	90	1	0	261
16:30	0	0	0	0	0	158	0	0	3	0	7	0	0	117	0	0	285
16:45	0	0	0	0	0	161	0	0	0	0	4	0	0	96	0	0	261
17:00	0	0	0	0	0	163	0	0	0	0	0	0	0	108	0	0	271
Total	0	0	0	0	1	649	0	0	4	0	12	0	0	411	1	0	1078
% App. Total	0.0	0.0	0.0		0.2	99.8	0.0		25.0	0.0	75.0		0.0	99.8	0.2		
PHF	0.000	0.000	0.000	0.000	0.250	0.972	0.000	0.000	0.333	0.000	0.429	0.000	0.000	0.878	0.250	0.000	0.946
% Trucks	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	
	0.0				1.1				0.0				1.0				1.0

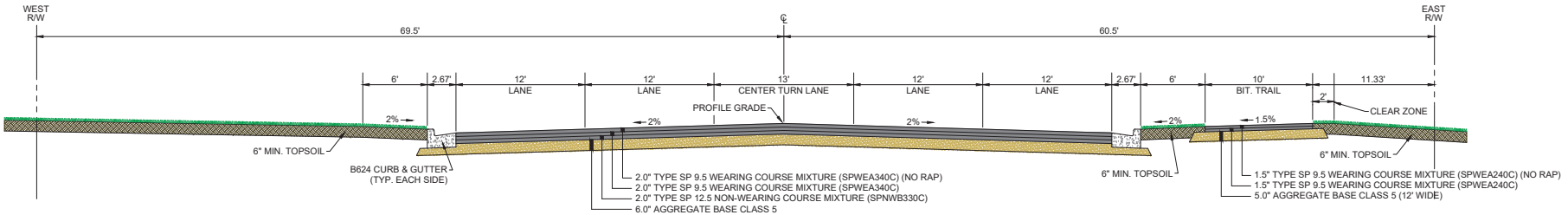


Appendix B

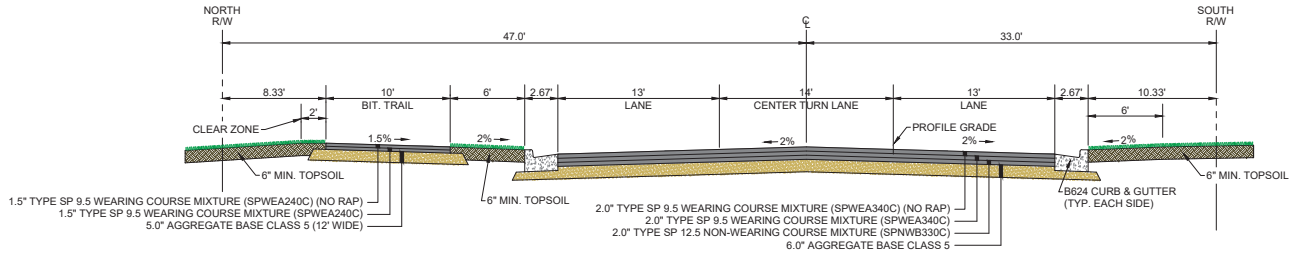
Timberwood Drive and East-West Public Proposed Roadway Sections



PROPOSED ROADWAY SECTION
TIMBERWOOD DRIVE



FUTURE 4-LANE ROADWAY SECTION
TIMBERWOOD DRIVE



PROPOSED ROADWAY SECTION
EAST - WEST ROAD

NOTES:
1. CENTERLINE OF ROADWAY IS SHIFTED 7' SOUTH PLACING THE EXISTING SANITARY SEWER MANHOLE ON THE PAVEMENT MARKING BETWEEN THE WESTBOUND LANE AND CENTER TURN LANE. FUTURE SANITARY SEWER MANHOLES SHOULD BE PLACED IN THE MIDDLE OF THE 14' CENTER TURN LANE.

WIDSETH
ARCHITECTS ■ ENGINEERS ■ SCIENTISTS ■ SURVEYORS

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

ARIC WELCH — DATE — LIC. NO. 41189

BY	REVISIONS DESCRIPTION	REV#	DATE

DATE: FEB 2024
SCALE: AS SHOWN
DRAWN BY: ALW
CHECKED BY: ALW
JOB NUMBER: 2024-10123

2025 CLEARWATER ROAD UTILITY AND ROADWAY IMPROVEMENTS
CITY OF BAXTER
BAXTER, MINNESOTA
TYPICAL SECTIONS

SHEET NO.
FIG 7

Appendix C

Warrant Analysis Results

TH 210 at Timberwood Dr - Existing 2024
ALL WAY STOP
WARRANT ANALYSIS

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024
OPERATOR: JDA

85th% Speed	Approach Description		Direction:	Lanes	Approach Total
60	Major App1:	TH 210	EB	1	5585
60	Major App3:	TH 210	WB	1	5634
30	Minor App2:	Timberwood D	NB	1	134
30	Minor App4:	N/A	SB	1	0

0.70 SPEED FACTOR USED? **Yes**

Minimum Volume Requirement
210 **140**

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MINOR APPROACH TOTAL Σ (APP.2 + APP. 4)	WARRANT MET MAJOR / MINOR
0:00 - 1:00	8	13	0	0	21	0	NO / NO
1:00 - 2:00	4	8	0	0	12	0	NO / NO
2:00 - 3:00	9	8	0	0	17	0	NO / NO
3:00 - 4:00	20	11	0	0	31	0	NO / NO
4:00 - 5:00	58	16	0	0	74	0	NO / NO
5:00 - 6:00	137	61	0	0	198	0	NO / NO
6:00 - 7:00	316	144	4	0	460	4	YES / NO
7:00 - 8:00	687	344	6	0	1031	6	YES / NO
8:00 - 9:00	473	299	7	0	772	7	YES / NO
9:00 - 10:00	353	221	8	0	574	8	YES / NO
10:00 - 11:00	344	278	13	0	622	13	YES / NO
11:00 - 12:00	371	313	16	0	684	16	YES / NO
12:00 - 13:00	360	339	14	0	699	14	YES / NO
13:00 - 14:00	350	387	12	0	737	12	YES / NO
14:00 - 15:00	348	443	16	0	791	16	YES / NO
15:00 - 16:00	443	553	12	0	996	12	YES / NO
16:00 - 17:00	411	637	20	0	1048	20	YES / NO
17:00 - 18:00	375	562	2	0	937	2	YES / NO
18:00 - 19:00	214	323	3	0	537	3	YES / NO
19:00 - 20:00	98	241	1	0	339	1	YES / NO
20:00 - 21:00	86	209	0	0	295	0	YES / NO
21:00 - 22:00	62	120	0	0	182	0	NO / NO
22:00 - 23:00	31	74	0	0	105	0	NO / NO
23:00 - 24:00	27	30	0	0	57	0	NO / NO
Daily	**5585**	**5634**	**134**	**0**			

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

All-way Stop Warrant: **Not satisfied**

REMARKS:

TH 210 at Timberwood Dr - Existing 2024
SIGNAL WARRANT ANALYSIS
Warrant 1 and Summary

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024
OPERATOR: JDA

85th% Speed	Approach Description		Direction:	Lanes	Approach
60	Major App1:	TH 210	EB	1	5585
60	Major App3:	TH 210	WB	1	5634
30	Minor App2:	Timberwood Dr	NB	1	31
30	Minor App4:	N/A	SB	1	0

40 MPH OR FASTER?	YES
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	**YES**
CORRECTABLE CRASHES: (12-month period)	0

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	350	525	420
Minor Approach	105	53	84

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	8	13	0	0	21	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	4	8	0	0	12	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	9	8	0	0	17	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	20	11	0	0	31	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	58	16	0	0	74	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	137	61	0	0	198	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	316	144	0	0	460	0	YES / NO	NO / NO	YES / NO
7:00 - 8:00	687	344	3	0	1031	3	YES / NO	YES / NO	YES / NO
8:00 - 9:00	473	299	0	0	772	0	YES / NO	YES / NO	YES / NO
9:00 - 10:00	353	221	4	0	574	4	YES / NO	YES / NO	YES / NO
10:00 - 11:00	344	278	4	0	622	4	YES / NO	YES / NO	YES / NO
11:00 - 12:00	371	313	4	0	684	4	YES / NO	YES / NO	YES / NO
12:00 - 13:00	360	339	3	0	699	3	YES / NO	YES / NO	YES / NO
13:00 - 14:00	350	387	3	0	737	3	YES / NO	YES / NO	YES / NO
14:00 - 15:00	348	443	0	0	791	0	YES / NO	YES / NO	YES / NO
15:00 - 16:00	443	553	5	0	996	5	YES / NO	YES / NO	YES / NO
16:00 - 17:00	411	637	4	0	1048	4	YES / NO	YES / NO	YES / NO
17:00 - 18:00	375	562	1	0	937	1	YES / NO	YES / NO	YES / NO
18:00 - 19:00	214	323	0	0	537	0	YES / NO	YES / NO	YES / NO
19:00 - 20:00	98	241	0	0	339	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	86	209	0	0	295	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	62	120	0	0	182	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	31	74	0	0	105	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	27	30	0	0	57	0	NO / NO	NO / NO	NO / NO
Totals	**5585**	**5634**	**31**	**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:

TH 210 at Timberwood Dr - Existing 2024
SIGNAL WARRANT ANALYSIS
Warrants 2 and 3

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024

OPERATOR: JDA

85th% Speed	Approach Description		Lanes	Approach
60	Major App1:	TH 210	1	5585
60	Major App3:	TH 210	1	5634
30	Minor App2:	Timberwood Dr	1	31
30	Minor App4:	N/A	1	0

40 MPH OR FASTER?	YES
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	**YES**

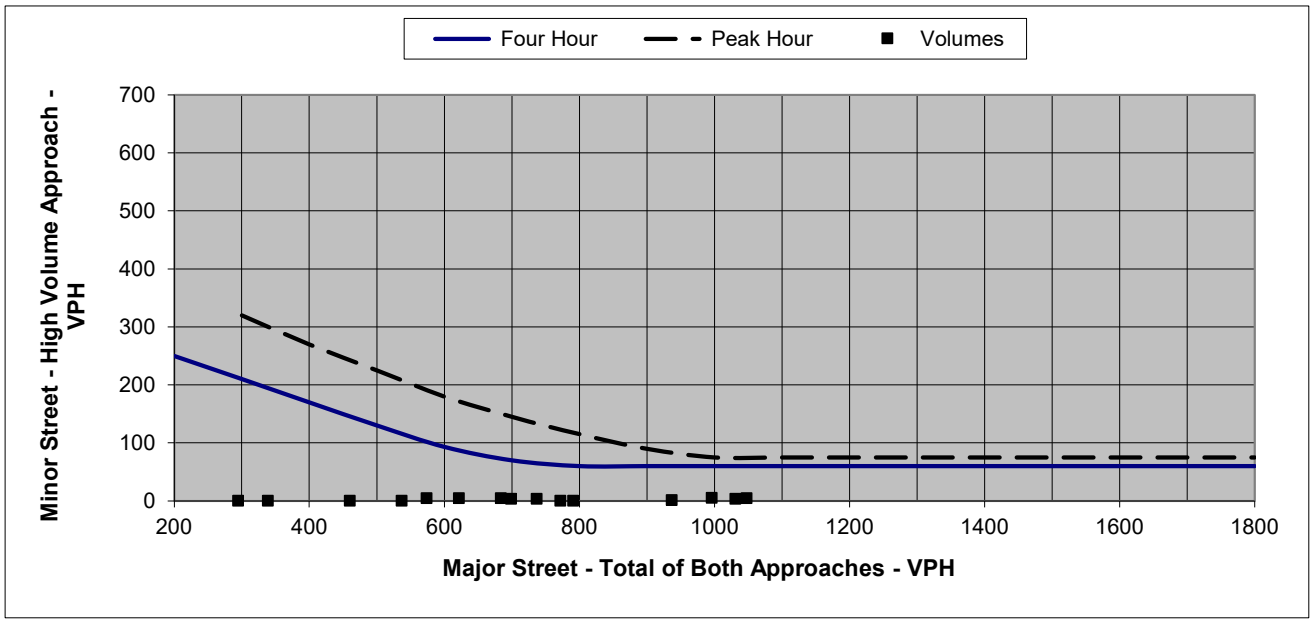


Figure 1. Four Hour and Peak Hour Warrant Analysis
Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200	250	
300	210	320
400	170	270
500	130	225
600	93	180
700	70	145
800	60	115
900	60	90
1000	60	75
1100	60	75
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:	
			Warrant 2	Warrant 3
HOUR	Sum Major App.	Max Minor App.	Four Hour	Peak Hour
0:00 - 1:00	21	0	NO	NO
1:00 - 2:00	12	0	NO	NO
2:00 - 3:00	17	0	NO	NO
3:00 - 4:00	31	0	NO	NO
4:00 - 5:00	74	0	NO	NO
5:00 - 6:00	198	0	NO	NO
6:00 - 7:00	460	0	NO	NO
7:00 - 8:00	1031	3	NO	NO
8:00 - 9:00	772	0	NO	NO
9:00 - 10:00	574	4	NO	NO
10:00 - 11:00	622	4	NO	NO
11:00 - 12:00	684	4	NO	NO
12:00 - 13:00	699	3	NO	NO
13:00 - 14:00	737	3	NO	NO
14:00 - 15:00	791	0	NO	NO
15:00 - 16:00	996	5	NO	NO
16:00 - 17:00	1048	4	NO	NO
17:00 - 18:00	937	1	NO	NO
18:00 - 19:00	537	0	NO	NO
19:00 - 20:00	339	0	NO	NO
20:00 - 21:00	295	0	NO	NO
21:00 - 22:00	182	0	NO	NO
22:00 - 23:00	105	0	NO	NO
23:00 - 24:00	57	0	NO	NO

TH 210 at Timberwood Dr - 2025 Build
ALL WAY STOP
WARRANT ANALYSIS

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024

OPERATOR: JDA

85th% Speed	Approach Description		Direction:	Lanes	Approach Total
60	Major App1:	TH 210	EB	1	5698
60	Major App3:	TH 210	WB	1	5939
30	Minor App2:	Timberwood D	NB	1	514
30	Minor App4:	N/A	SB	1	0

0.70 SPEED FACTOR USED? **Yes**

Minimum Volume Requirement	
210	**140**

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MINOR APPROACH TOTAL Σ (APP.2 + APP. 4)	WARRANT MET MAJOR / MINOR
0:00 - 1:00	8	16	1	0	24	1	NO / NO
1:00 - 2:00	4	11	1	0	15	1	NO / NO
2:00 - 3:00	18	34	3	0	52	3	NO / NO
3:00 - 4:00	20	12	3	0	32	3	NO / NO
4:00 - 5:00	60	18	7	0	78	7	NO / NO
5:00 - 6:00	141	70	1	0	211	1	YES / NO
6:00 - 7:00	317	144	4	0	461	4	YES / NO
7:00 - 8:00	695	355	7	0	1050	7	YES / NO
8:00 - 9:00	491	342	40	0	833	40	YES / NO
9:00 - 10:00	366	255	44	0	621	44	YES / NO
10:00 - 11:00	349	292	64	0	641	64	YES / NO
11:00 - 12:00	384	351	46	0	735	46	YES / NO
12:00 - 13:00	371	363	72	0	734	72	YES / NO
13:00 - 14:00	350	388	40	0	738	40	YES / NO
14:00 - 15:00	348	449	18	0	797	18	YES / NO
15:00 - 16:00	446	557	16	0	1003	16	YES / NO
16:00 - 17:00	413	641	24	0	1054	24	YES / NO
17:00 - 18:00	377	568	12	0	945	12	YES / NO
18:00 - 19:00	218	337	9	0	555	9	YES / NO
19:00 - 20:00	106	269	37	0	375	37	YES / NO
20:00 - 21:00	94	237	44	0	331	44	YES / NO
21:00 - 22:00	62	121	20	0	183	20	NO / NO
22:00 - 23:00	31	75	0	0	106	0	NO / NO
23:00 - 24:00	29	34	1	0	63	1	NO / NO
Daily	**5698**	**5939**	**514**	**0**			

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

All-way Stop Warrant: **Not satisfied**

REMARKS:

TH 210 at Timberwood Dr - 2025 Build
SIGNAL WARRANT ANALYSIS
Warrant 1 and Summary

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024
OPERATOR: JDA

85th% Speed	Approach Description		Direction:	Lanes	Approach
60	Major App1:	TH 210	EB	1	5698
60	Major App3:	TH 210	WB	1	5939
30	Minor App2:	Timberwood Dr	NB	1	124
30	Minor App4:	N/A	SB	1	0

40 MPH OR FASTER?	YES
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	**YES**
CORRECTABLE CRASHES: (12-month period)	0

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	350	525	420
Minor Approach	105	53	84

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	8	16	0	0	24	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	4	11	0	0	15	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	18	34	0	0	52	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	20	12	0	0	32	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	60	18	2	0	78	2	NO / NO	NO / NO	NO / NO
5:00 - 6:00	141	70	0	0	211	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	317	144	0	0	461	0	YES / NO	NO / NO	YES / NO
7:00 - 8:00	695	355	3	0	1050	3	YES / NO	YES / NO	YES / NO
8:00 - 9:00	491	342	8	0	833	8	YES / NO	YES / NO	YES / NO
9:00 - 10:00	366	255	12	0	621	12	YES / NO	YES / NO	YES / NO
10:00 - 11:00	349	292	17	0	641	17	YES / NO	YES / NO	YES / NO
11:00 - 12:00	384	351	12	0	735	12	YES / NO	YES / NO	YES / NO
12:00 - 13:00	371	363	17	0	734	17	YES / NO	YES / NO	YES / NO
13:00 - 14:00	350	388	11	0	738	11	YES / NO	YES / NO	YES / NO
14:00 - 15:00	348	449	0	0	797	0	YES / NO	YES / NO	YES / NO
15:00 - 16:00	446	557	7	0	1003	7	YES / NO	YES / NO	YES / NO
16:00 - 17:00	413	641	6	0	1054	6	YES / NO	YES / NO	YES / NO
17:00 - 18:00	377	568	3	0	945	3	YES / NO	YES / NO	YES / NO
18:00 - 19:00	218	337	2	0	555	2	YES / NO	YES / NO	YES / NO
19:00 - 20:00	106	269	8	0	375	8	YES / NO	NO / NO	NO / NO
20:00 - 21:00	94	237	10	0	331	10	NO / NO	NO / NO	NO / NO
21:00 - 22:00	62	121	6	0	183	6	NO / NO	NO / NO	NO / NO
22:00 - 23:00	31	75	0	0	106	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	29	34	0	0	63	0	NO / NO	NO / NO	NO / NO
Totals	**5698**	**5939**	**124**	**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:

TH 210 at Timberwood Dr - 2025 Build
SIGNAL WARRANT ANALYSIS
Warrants 2 and 3

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024

OPERATOR: JDA

40 MPH OR FASTER?	YES
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	**YES**

85th% Speed	Approach Description		Lanes	Approach
60	Major App1:	TH 210	1	5698
60	Major App3:	TH 210	1	5939
30	Minor App2:	Timberwood Dr	1	124
30	Minor App4:	N/A	1	0

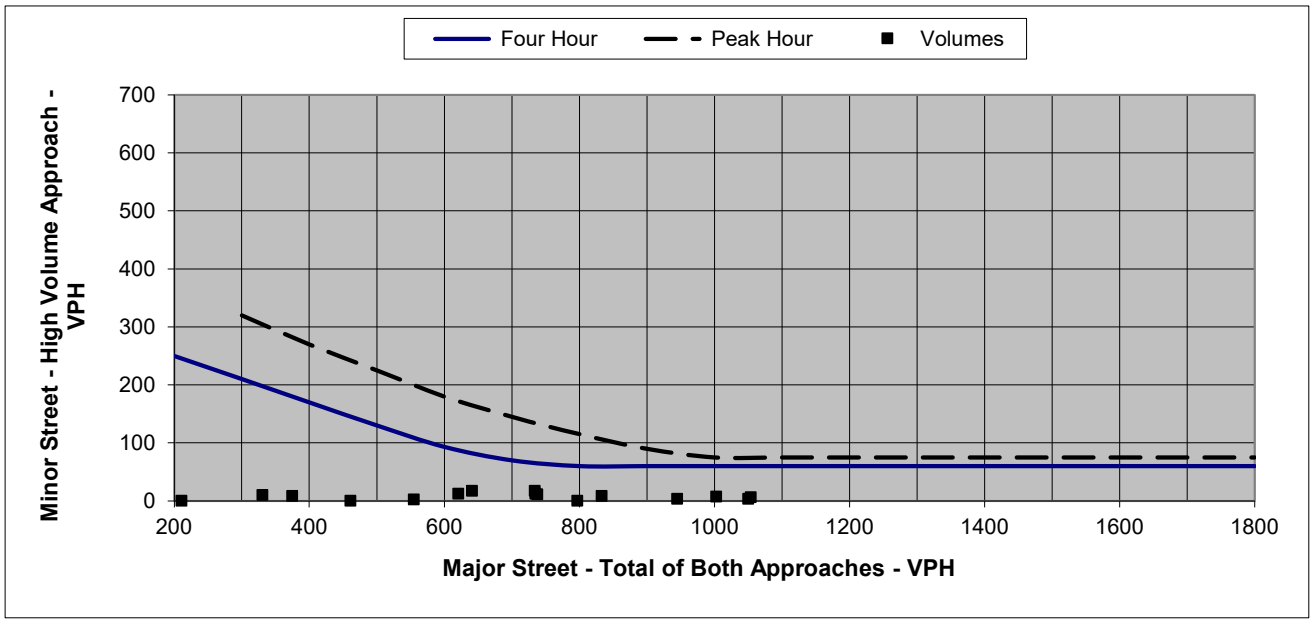


Figure 1. Four Hour and Peak Hour Warrant Analysis

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	250	
300	210	320
400	170	270
500	130	225
600	93	180
700	70	145
800	60	115
900	60	90
1000	60	75
1100	60	75
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:	
			Warrant 2	Warrant 3
HOUR	Sum Major App.	Max Minor App.	Four Hour	Peak Hour
0:00 - 1:00	24	0	NO	NO
1:00 - 2:00	15	0	NO	NO
2:00 - 3:00	52	0	NO	NO
3:00 - 4:00	32	0	NO	NO
4:00 - 5:00	78	2	NO	NO
5:00 - 6:00	211	0	NO	NO
6:00 - 7:00	461	0	NO	NO
7:00 - 8:00	1050	3	NO	NO
8:00 - 9:00	833	8	NO	NO
9:00 - 10:00	621	12	NO	NO
10:00 - 11:00	641	17	NO	NO
11:00 - 12:00	735	12	NO	NO
12:00 - 13:00	734	17	NO	NO
13:00 - 14:00	738	11	NO	NO
14:00 - 15:00	797	0	NO	NO
15:00 - 16:00	1003	7	NO	NO
16:00 - 17:00	1054	6	NO	NO
17:00 - 18:00	945	3	NO	NO
18:00 - 19:00	555	2	NO	NO
19:00 - 20:00	375	8	NO	NO
20:00 - 21:00	331	10	NO	NO
21:00 - 22:00	183	6	NO	NO
22:00 - 23:00	106	0	NO	NO
23:00 - 24:00	63	0	NO	NO

TH 210 at Timberwood Dr - 2030 Build
ALL WAY STOP
WARRANT ANALYSIS

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024

OPERATOR: JDA

85th% Speed	Approach Description		Direction:	Lanes	Approach Total
60	Major App1:	TH 210	EB	1	5842
60	Major App3:	TH 210	WB	1	6086
30	Minor App2:	Timberwood D	NB	1	514
30	Minor App4:	N/A	SB	1	0

0.70 SPEED FACTOR USED? **Yes**

Minimum Volume Requirement	
210	**140**

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MINOR APPROACH TOTAL Σ (APP.2 + APP. 4)	WARRANT MET MAJOR / MINOR
0:00 - 1:00	8	16	1	0	24	1	NO / NO
1:00 - 2:00	4	11	1	0	15	1	NO / NO
2:00 - 3:00	18	34	3	0	52	3	NO / NO
3:00 - 4:00	20	12	3	0	32	3	NO / NO
4:00 - 5:00	61	18	7	0	79	7	NO / NO
5:00 - 6:00	145	72	1	0	217	1	YES / NO
6:00 - 7:00	325	148	4	0	473	4	YES / NO
7:00 - 8:00	711	363	7	0	1074	7	YES / NO
8:00 - 9:00	502	351	40	0	853	40	YES / NO
9:00 - 10:00	375	262	44	0	637	44	YES / NO
10:00 - 11:00	358	300	64	0	658	64	YES / NO
11:00 - 12:00	394	360	46	0	754	46	YES / NO
12:00 - 13:00	380	373	72	0	753	72	YES / NO
13:00 - 14:00	361	399	40	0	760	40	YES / NO
14:00 - 15:00	359	457	18	0	816	18	YES / NO
15:00 - 16:00	457	570	16	0	1027	16	YES / NO
16:00 - 17:00	424	657	24	0	1081	24	YES / NO
17:00 - 18:00	386	581	12	0	967	12	YES / NO
18:00 - 19:00	225	347	9	0	572	9	YES / NO
19:00 - 20:00	109	276	37	0	385	37	YES / NO
20:00 - 21:00	97	243	44	0	340	44	YES / NO
21:00 - 22:00	63	125	20	0	188	20	NO / NO
22:00 - 23:00	31	77	0	0	108	0	NO / NO
23:00 - 24:00	29	34	1	0	63	1	NO / NO
Daily	**5842**	**6086**	**514**	**0**			

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

All-way Stop Warrant: **Not satisfied**

REMARKS:

TH 210 at Timberwood Dr - 2030 Build
SIGNAL WARRANT ANALYSIS
Warrant 1 and Summary

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024
OPERATOR: JDA

85th% Speed	Approach Description		Direction:	Lanes	Approach
60	Major App1:	TH 210	EB	1	5842
60	Major App3:	TH 210	WB	1	6086
30	Minor App2:	Timberwood Dr	NB	1	124
30	Minor App4:	N/A	SB	1	0

40 MPH OR FASTER?	YES
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	**YES**
CORRECTABLE CRASHES: (12-month period)	0

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	350	525	420
Minor Approach	105	53	84

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	8	16	0	0	24	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	4	11	0	0	15	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	18	34	0	0	52	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	20	12	0	0	32	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	61	18	2	0	79	2	NO / NO	NO / NO	NO / NO
5:00 - 6:00	145	72	0	0	217	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	325	148	0	0	473	0	YES / NO	NO / NO	YES / NO
7:00 - 8:00	711	363	3	0	1074	3	YES / NO	YES / NO	YES / NO
8:00 - 9:00	502	351	8	0	853	8	YES / NO	YES / NO	YES / NO
9:00 - 10:00	375	262	12	0	637	12	YES / NO	YES / NO	YES / NO
10:00 - 11:00	358	300	17	0	658	17	YES / NO	YES / NO	YES / NO
11:00 - 12:00	394	360	12	0	754	12	YES / NO	YES / NO	YES / NO
12:00 - 13:00	380	373	17	0	753	17	YES / NO	YES / NO	YES / NO
13:00 - 14:00	361	399	11	0	760	11	YES / NO	YES / NO	YES / NO
14:00 - 15:00	359	457	0	0	816	0	YES / NO	YES / NO	YES / NO
15:00 - 16:00	457	570	7	0	1027	7	YES / NO	YES / NO	YES / NO
16:00 - 17:00	424	657	6	0	1081	6	YES / NO	YES / NO	YES / NO
17:00 - 18:00	386	581	3	0	967	3	YES / NO	YES / NO	YES / NO
18:00 - 19:00	225	347	2	0	572	2	YES / NO	YES / NO	YES / NO
19:00 - 20:00	109	276	8	0	385	8	YES / NO	NO / NO	NO / NO
20:00 - 21:00	97	243	10	0	340	10	NO / NO	NO / NO	NO / NO
21:00 - 22:00	63	125	6	0	188	6	NO / NO	NO / NO	NO / NO
22:00 - 23:00	31	77	0	0	108	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	29	34	0	0	63	0	NO / NO	NO / NO	NO / NO
Totals	**5842**	**6086**	**124**	**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:

TH 210 at Timberwood Dr - 2030 Build
SIGNAL WARRANT ANALYSIS
Warrants 2 and 3

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 4/15/2024

OPERATOR: JDA

40 MPH OR FASTER?	YES
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	**YES**

85th% Speed	Approach Description		Lanes	Approach
60	Major App1:	TH 210	1	5842
60	Major App3:	TH 210	1	6086
30	Minor App2:	Timberwood Dr	1	124
30	Minor App4:	N/A	1	0

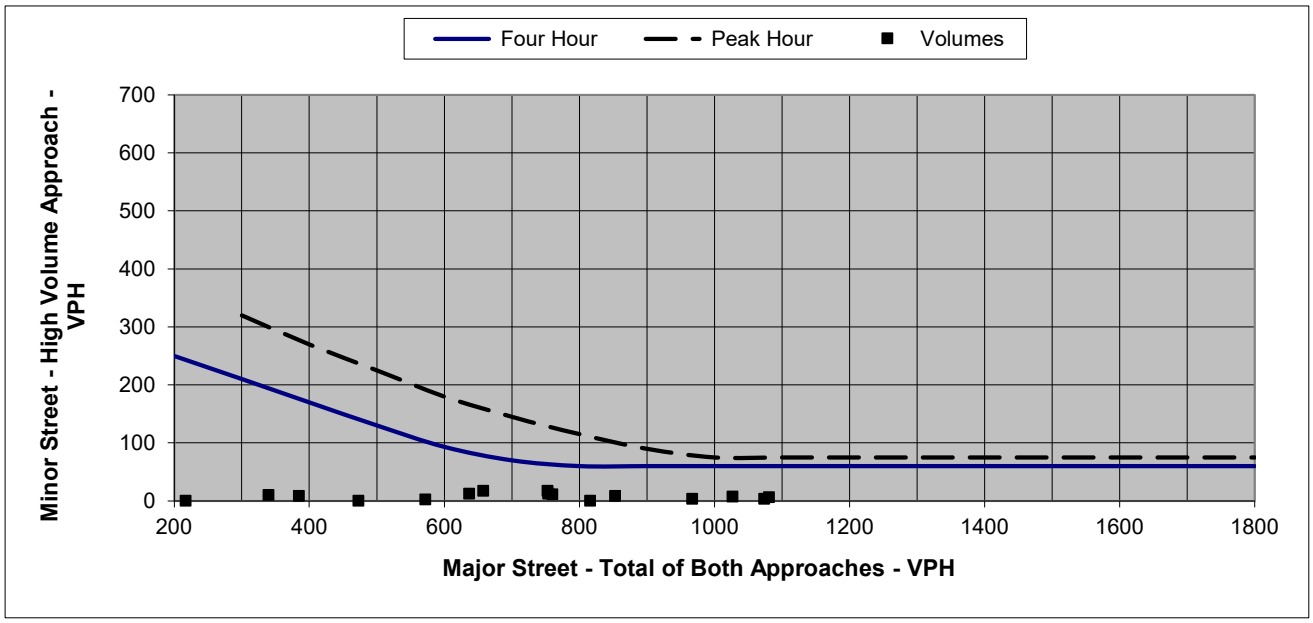


Figure 1. Four Hour and Peak Hour Warrant Analysis

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	250	
300	210	320
400	170	270
500	130	225
600	93	180
700	70	145
800	60	115
900	60	90
1000	60	75
1100	60	75
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:	
			Warrant 2	Warrant 3
HOUR	Sum Major App.	Max Minor App.	Four Hour	Peak Hour
0:00 - 1:00	24	0	NO	NO
1:00 - 2:00	15	0	NO	NO
2:00 - 3:00	52	0	NO	NO
3:00 - 4:00	32	0	NO	NO
4:00 - 5:00	79	2	NO	NO
5:00 - 6:00	217	0	NO	NO
6:00 - 7:00	473	0	NO	NO
7:00 - 8:00	1074	3	NO	NO
8:00 - 9:00	853	8	NO	NO
9:00 - 10:00	637	12	NO	NO
10:00 - 11:00	658	17	NO	NO
11:00 - 12:00	754	12	NO	NO
12:00 - 13:00	753	17	NO	NO
13:00 - 14:00	760	11	NO	NO
14:00 - 15:00	816	0	NO	NO
15:00 - 16:00	1027	7	NO	NO
16:00 - 17:00	1081	6	NO	NO
17:00 - 18:00	967	3	NO	NO
18:00 - 19:00	572	2	NO	NO
19:00 - 20:00	385	8	NO	NO
20:00 - 21:00	340	10	NO	NO
21:00 - 22:00	188	6	NO	NO
22:00 - 23:00	108	0	NO	NO
23:00 - 24:00	63	0	NO	NO

TH 210 at Timberwood Dr - 2030 Build with Expansion
ALL WAY STOP
WARRANT ANALYSIS

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 5/6/2024
OPERATOR: JDA

85th% Speed	Approach Description		Direction:	Lanes	Approach Total
60	Major App1:	TH 210	EB	1	5879
60	Major App3:	TH 210	WB	1	6194
30	Minor App2:	Timberwood D	NB	1	661
30	Minor App4:	N/A	SB	1	0

0.70 SPEED FACTOR USED? **Yes**

Minimum Volume Requirement	
210	**140**

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MINOR APPROACH TOTAL Σ (APP.2 + APP. 4)	WARRANT MET MAJOR / MINOR
0:00 - 1:00	8	16	1	0	24	1	NO / NO
1:00 - 2:00	4	11	1	0	15	1	NO / NO
2:00 - 3:00	21	44	3	0	65	3	NO / NO
3:00 - 4:00	20	12	3	0	32	3	NO / NO
4:00 - 5:00	61	18	9	0	79	9	NO / NO
5:00 - 6:00	147	74	1	0	221	1	YES / NO
6:00 - 7:00	325	148	4	0	473	4	YES / NO
7:00 - 8:00	713	367	7	0	1080	7	YES / NO
8:00 - 9:00	508	367	53	0	875	53	YES / NO
9:00 - 10:00	379	276	60	0	655	60	YES / NO
10:00 - 11:00	360	306	86	0	666	86	YES / NO
11:00 - 12:00	400	374	58	0	774	58	YES / NO
12:00 - 13:00	382	383	96	0	765	96	YES / NO
13:00 - 14:00	361	399	50	0	760	50	YES / NO
14:00 - 15:00	359	457	18	0	816	18	YES / NO
15:00 - 16:00	457	570	16	0	1027	16	YES / NO
16:00 - 17:00	424	657	24	0	1081	24	YES / NO
17:00 - 18:00	386	581	16	0	967	16	YES / NO
18:00 - 19:00	227	353	11	0	580	11	YES / NO
19:00 - 20:00	113	288	53	0	401	53	YES / NO
20:00 - 21:00	101	255	62	0	356	62	YES / NO
21:00 - 22:00	63	125	28	0	188	28	NO / NO
22:00 - 23:00	31	77	0	0	108	0	NO / NO
23:00 - 24:00	29	36	1	0	65	1	NO / NO
Daily	**5879**	**6194**	**661**	**0**			

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

All-way Stop Warrant: **Not satisfied**

REMARKS:

TH 210 at Timberwood Dr - 2030 Build with Expansion
SIGNAL WARRANT ANALYSIS
Warrant 1 and Summary

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 5/6/2024
OPERATOR: JDA

85th% Speed	Approach Description		Direction:	Lanes	Approach
60	Major App1:	TH 210	EB	1	5879
60	Major App3:	TH 210	WB	1	6194
30	Minor App2:	Timberwood Dr	NB	1	162
30	Minor App4:	N/A	SB	1	0

40 MPH OR FASTER?	YES
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	**YES**
CORRECTABLE CRASHES: (12-month period)	0

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	350	525	420
Minor Approach	105	53	84

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	8	16	0	0	24	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	4	11	0	0	15	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	21	44	0	0	65	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	20	12	0	0	32	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	61	18	2	0	79	2	NO / NO	NO / NO	NO / NO
5:00 - 6:00	147	74	0	0	221	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	325	148	0	0	473	0	YES / NO	NO / NO	YES / NO
7:00 - 8:00	713	367	3	0	1080	3	YES / NO	YES / NO	YES / NO
8:00 - 9:00	508	367	12	0	875	12	YES / NO	YES / NO	YES / NO
9:00 - 10:00	379	276	16	0	655	16	YES / NO	YES / NO	YES / NO
10:00 - 11:00	360	306	23	0	666	23	YES / NO	YES / NO	YES / NO
11:00 - 12:00	400	374	14	0	774	14	YES / NO	YES / NO	YES / NO
12:00 - 13:00	382	383	23	0	765	23	YES / NO	YES / NO	YES / NO
13:00 - 14:00	361	399	13	0	760	13	YES / NO	YES / NO	YES / NO
14:00 - 15:00	359	457	0	0	816	0	YES / NO	YES / NO	YES / NO
15:00 - 16:00	457	570	7	0	1027	7	YES / NO	YES / NO	YES / NO
16:00 - 17:00	424	657	6	0	1081	6	YES / NO	YES / NO	YES / NO
17:00 - 18:00	386	581	5	0	967	5	YES / NO	YES / NO	YES / NO
18:00 - 19:00	227	353	2	0	580	2	YES / NO	YES / NO	YES / NO
19:00 - 20:00	113	288	12	0	401	12	YES / NO	NO / NO	NO / NO
20:00 - 21:00	101	255	16	0	356	16	YES / NO	NO / NO	NO / NO
21:00 - 22:00	63	125	8	0	188	8	NO / NO	NO / NO	NO / NO
22:00 - 23:00	31	77	0	0	108	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	29	36	0	0	65	0	NO / NO	NO / NO	NO / NO
Totals	**5879**	**6194**	**162**	**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:

TH 210 at Timberwood Dr - 2030 Build with Expansion
SIGNAL WARRANT ANALYSIS
Warrants 2 and 3

LOCATION: TH 210 at Timberwood Dr
COUNTY: Crow Wing
REF. POINT: 0
DATE: 5/6/2024

OPERATOR: JDA

40 MPH OR FASTER?	YES
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	**YES**

85th% Speed	Approach Description		Lanes	Approach
60	Major App1:	TH 210	1	5879
60	Major App3:	TH 210	1	6194
30	Minor App2:	Timberwood Dr	1	162
30	Minor App4:	N/A	1	0

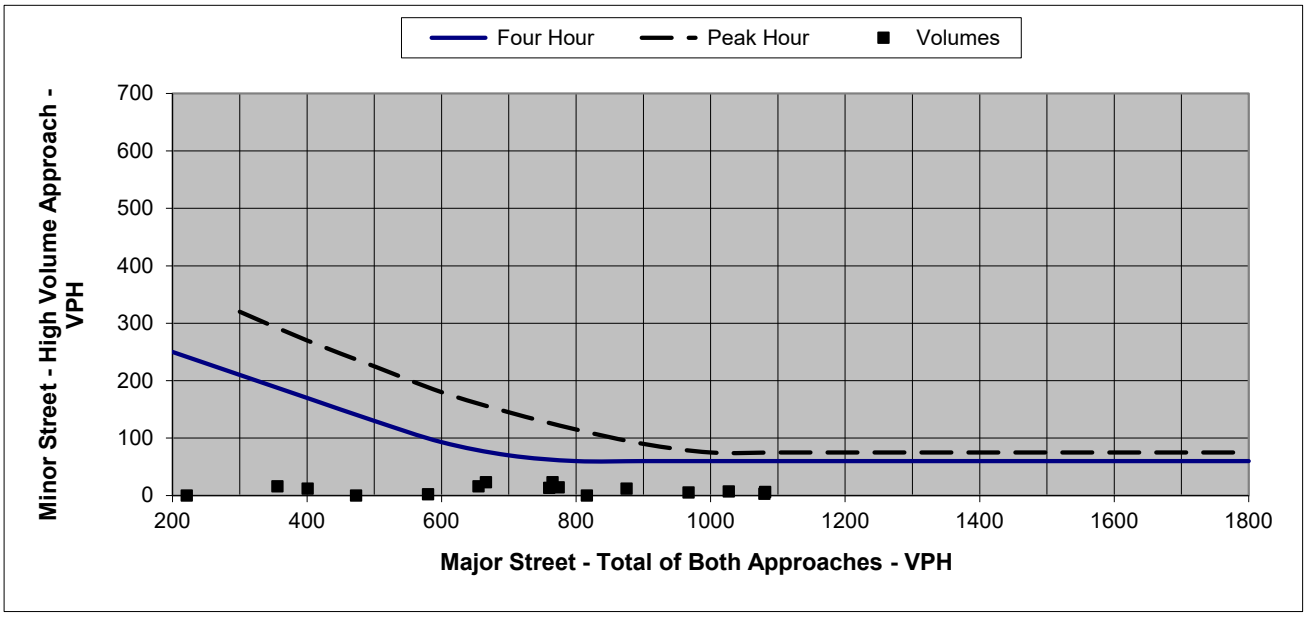


Figure 1. Four Hour and Peak Hour Warrant Analysis

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	250	
300	210	320
400	170	270
500	130	225
600	93	180
700	70	145
800	60	115
900	60	90
1000	60	75
1100	60	75
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: Warrant 2	Warrant 3
HOUR	Sum Major App.	Max Minor App.	Four Hour	Peak Hour
0:00 - 1:00	24	0	NO	NO
1:00 - 2:00	15	0	NO	NO
2:00 - 3:00	65	0	NO	NO
3:00 - 4:00	32	0	NO	NO
4:00 - 5:00	79	2	NO	NO
5:00 - 6:00	221	0	NO	NO
6:00 - 7:00	473	0	NO	NO
7:00 - 8:00	1080	3	NO	NO
8:00 - 9:00	875	12	NO	NO
9:00 - 10:00	655	16	NO	NO
10:00 - 11:00	666	23	NO	NO
11:00 - 12:00	774	14	NO	NO
12:00 - 13:00	765	23	NO	NO
13:00 - 14:00	760	13	NO	NO
14:00 - 15:00	816	0	NO	NO
15:00 - 16:00	1027	7	NO	NO
16:00 - 17:00	1081	6	NO	NO
17:00 - 18:00	967	5	NO	NO
18:00 - 19:00	580	2	NO	NO
19:00 - 20:00	401	12	NO	NO
20:00 - 21:00	356	16	NO	NO
21:00 - 22:00	188	8	NO	NO
22:00 - 23:00	108	0	NO	NO
23:00 - 24:00	65	0	NO	NO

Appendix D

Traffic Operations Analysis Results

HCS Two-Way Stop-Control Report

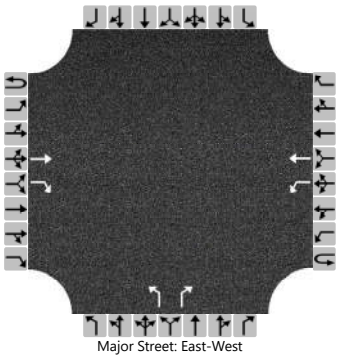
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2024
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			683	4		12	332			3		3				
Percent Heavy Vehicles (%)						0				67		67				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				7.07		6.87				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				4.10		3.90				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						13				3		3				
Capacity, c (veh/h)						858				161		318				
v/c Ratio						0.02				0.02		0.01				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.0				
Control Delay (s/veh)						9.3				27.8		16.4				
Level of Service (LOS)						A				D		C				
Approach Delay (s/veh)						0.3				22.1						
Approach LOS						A				C						

HCS Two-Way Stop-Control Report

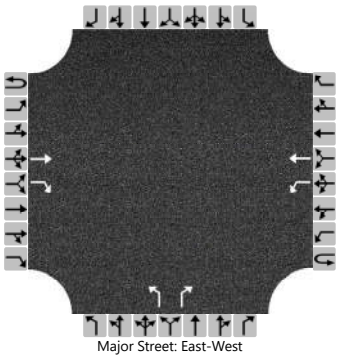
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2024
Time Analyzed	Midday Peak Hour
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			355	5		10	329			3		11				
Percent Heavy Vehicles (%)						10				0		27				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.20				6.40		6.47				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.29				3.50		3.54				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11				3		12				
Capacity, c (veh/h)						1133				379		617				
v/c Ratio						0.01				0.01		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.0		0.1				
Control Delay (s/veh)						8.2				14.6		10.9				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)						0.2				11.7						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

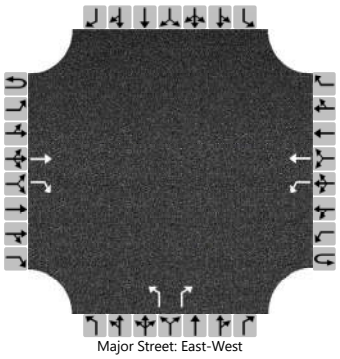
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2024
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			411	1		1	649			4		12				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1				4		13				
Capacity, c (veh/h)						1137				231		627				
v/c Ratio						0.00				0.02		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.1				
Control Delay (s/veh)						8.2				20.9		10.9				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.0				13.4						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

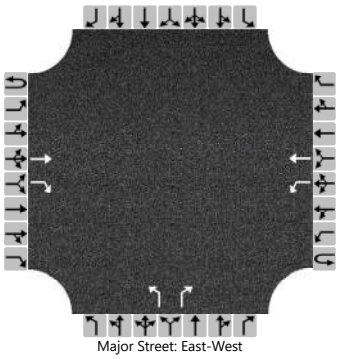
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2025
Time Analyzed	AM Peak Hour - No Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			686	4		12	334			3		3				
Percent Heavy Vehicles (%)						0				67		67				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				7.07		6.87				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				4.10		3.90				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						13				3		3				
Capacity, c (veh/h)						856				160		316				
v/c Ratio						0.02				0.02		0.01				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.0				
Control Delay (s/veh)						9.3				28.0		16.5				
Level of Service (LOS)						A				D		C				
Approach Delay (s/veh)						0.3				22.3						
Approach LOS						A				C						

HCS Two-Way Stop-Control Report

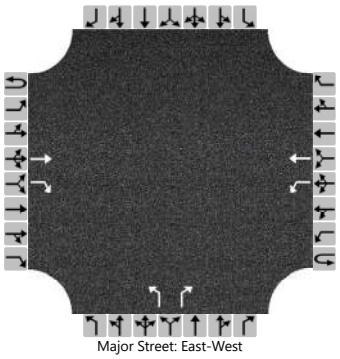
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2025
Time Analyzed	MD Peak Hour - No Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			357	5		10	331			3		11				
Percent Heavy Vehicles (%)						10				0		27				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.20				6.40		6.47				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.29				3.50		3.54				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11				3		12				
Capacity, c (veh/h)						1131				377		615				
v/c Ratio						0.01				0.01		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.0		0.1				
Control Delay (s/veh)						8.2				14.6		11.0				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)						0.2				11.8						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

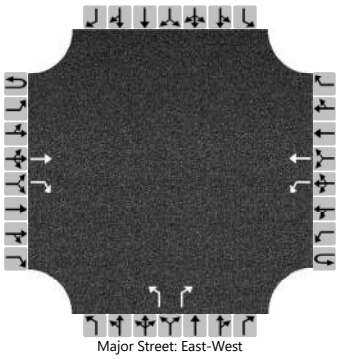
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2025
Time Analyzed	PM Peak Hour - No Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			413	1		1	652			4		12				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1				4		13				
Capacity, c (veh/h)						1135				229		626				
v/c Ratio						0.00				0.02		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.1				
Control Delay (s/veh)						8.2				21.0		10.9				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.0				13.4						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

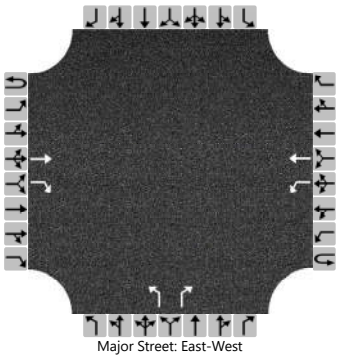
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2025
Time Analyzed	AM Peak Hour - Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			686	18		55	334			11		28				
Percent Heavy Vehicles (%)						2				18		7				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.58		6.27				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.66		3.36				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						61				12		31				
Capacity, c (veh/h)						836				163		397				
v/c Ratio						0.07				0.08		0.08				
95% Queue Length, Q_{95} (veh)						0.2				0.2		0.3				
Control Delay (s/veh)						9.6				28.9		14.8				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)						1.4				18.8						
Approach LOS						A				C						

HCS Two-Way Stop-Control Report

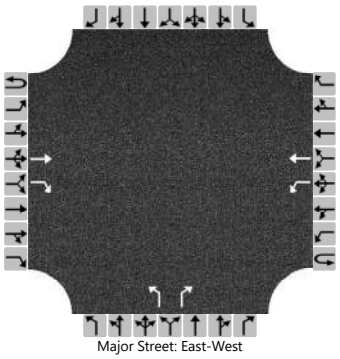
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2025
Time Analyzed	MD Peak Hour - Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			357	13		36	331			17		55				
Percent Heavy Vehicles (%)						3				0		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.40		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.50		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						38				18		59				
Capacity, c (veh/h)						1160				341		661				
v/c Ratio						0.03				0.05		0.09				
95% Queue Length, Q_{95} (veh)						0.1				0.2		0.3				
Control Delay (s/veh)						8.2				16.1		11.0				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.8				12.2						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

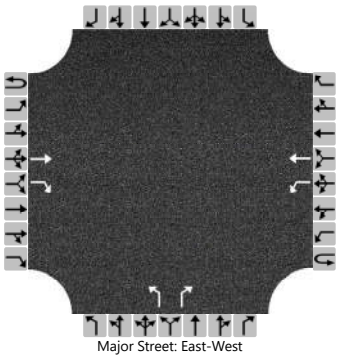
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2025
Time Analyzed	PM Peak Hour - Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			413	1		3	652			6		20				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						3				6		21				
Capacity, c (veh/h)						1135				228		626				
v/c Ratio						0.00				0.03		0.03				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.1				
Control Delay (s/veh)						8.2				21.3		11.0				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.0				13.3						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

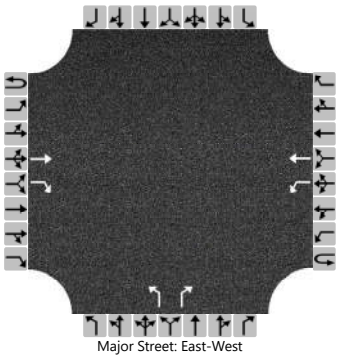
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	AM Peak Hour - No Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			703	4		12	342			3		3				
Percent Heavy Vehicles (%)						0				67		67				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				7.07		6.87				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				4.10		3.90				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						13				3		3				
Capacity, c (veh/h)						842				153		308				
v/c Ratio						0.02				0.02		0.01				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.0				
Control Delay (s/veh)						9.3				29.1		16.8				
Level of Service (LOS)						A				D		C				
Approach Delay (s/veh)						0.3				22.9						
Approach LOS						A				C						

HCS Two-Way Stop-Control Report

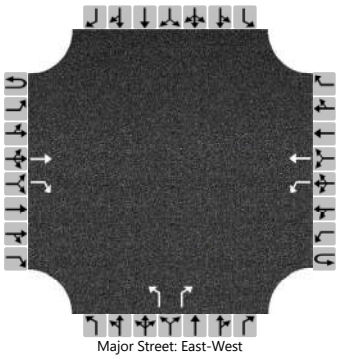
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	MD Peak Hour - No Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			366	5		10	339			3		11				
Percent Heavy Vehicles (%)						10				0		27				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.20				6.40		6.47				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.29				3.50		3.54				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11				3		12				
Capacity, c (veh/h)						1122				368		608				
v/c Ratio						0.01				0.01		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.0		0.1				
Control Delay (s/veh)						8.2				14.9		11.0				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)						0.2				11.9						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

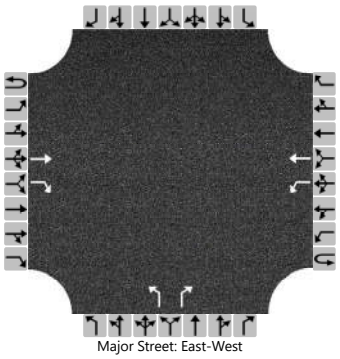
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	PM Peak Hour - No Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			423	1		1	668			4		12				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1				4		13				
Capacity, c (veh/h)						1125				221		617				
v/c Ratio						0.00				0.02		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.1				
Control Delay (s/veh)						8.2				21.6		11.0				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.0				13.6						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

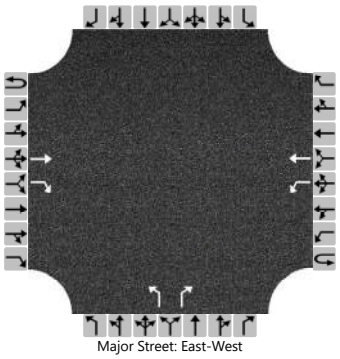
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	AM Peak Hour - Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			703	18		55	342			11		28				
Percent Heavy Vehicles (%)						2				18		7				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.58		6.27				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.66		3.36				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						61				12		31				
Capacity, c (veh/h)						822				156		387				
v/c Ratio						0.07				0.08		0.08				
95% Queue Length, Q_{95} (veh)						0.2				0.3		0.3				
Control Delay (s/veh)						9.7				30.0		15.1				
Level of Service (LOS)						A				D		C				
Approach Delay (s/veh)						1.3				19.3						
Approach LOS						A				C						

HCS Two-Way Stop-Control Report

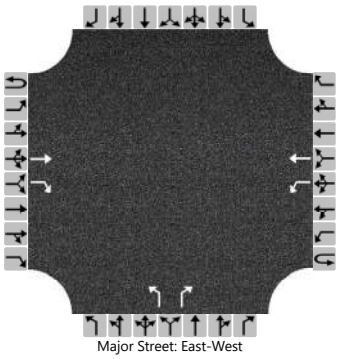
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	MD Peak Hour - Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			366	13		36	339			17		55				
Percent Heavy Vehicles (%)						3				0		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.40		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.50		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						38				18		59				
Capacity, c (veh/h)						1150				333		652				
v/c Ratio						0.03				0.05		0.09				
95% Queue Length, Q_{95} (veh)						0.1				0.2		0.3				
Control Delay (s/veh)						8.2				16.4		11.1				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.8				12.3						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

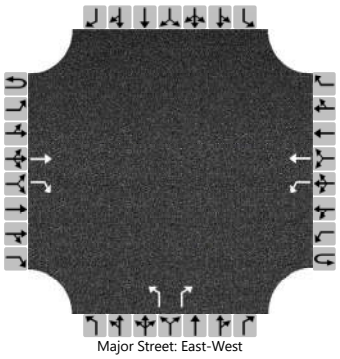
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	PM Peak Hour - Build
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			423	1		3	668			6		20				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						3				6		21				
Capacity, c (veh/h)						1125				219		617				
v/c Ratio						0.00				0.03		0.03				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.1				
Control Delay (s/veh)						8.2				21.9		11.0				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.0				13.5						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

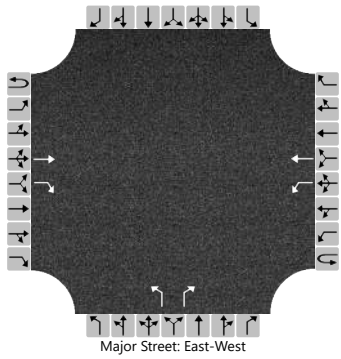
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	AM - Build w/ Expansion
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			703	23		72	342			14		38				
Percent Heavy Vehicles (%)						1				14		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.54		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.63		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						80				16		42				
Capacity, c (veh/h)						823				147		390				
v/c Ratio						0.10				0.11		0.11				
95% Queue Length, Q_{95} (veh)						0.3				0.3		0.4				
Control Delay (s/veh)						9.8				32.4		15.3				
Level of Service (LOS)						A				D		C				
Approach Delay (s/veh)						1.7				19.9						
Approach LOS						A				C						

HCS Two-Way Stop-Control Report

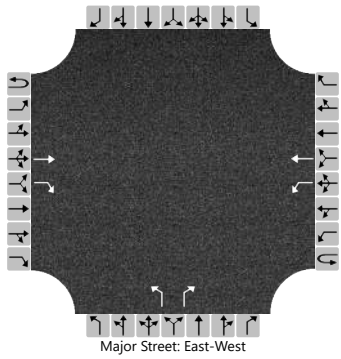
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	MD - Build w/ Expansion
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			366	17		44	339			23		73				
Percent Heavy Vehicles (%)						2				0		4				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.40		6.24				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.50		3.34				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						47				24		78				
Capacity, c (veh/h)						1151				323		655				
v/c Ratio						0.04				0.08		0.12				
95% Queue Length, Q_{95} (veh)						0.1				0.2		0.4				
Control Delay (s/veh)						8.3				17.1		11.2				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.9				12.6						
Approach LOS						A				B						

HCS Two-Way Stop-Control Report

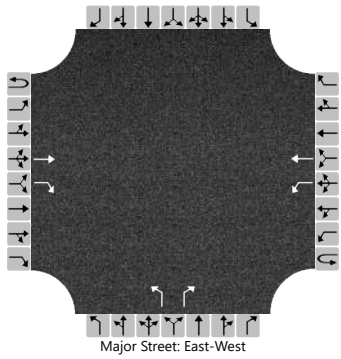
General Information

Analyst	Justin Anibas, PE, PTOE
Agency/Co.	SEH
Date Performed	4/15/2024
Analysis Year	2030
Time Analyzed	PM - Build w/ Expansion
Intersection Orientation	East-West
Project Description	Timberwood Dr TIS

Site Information

Intersection	TH 210 at Timberwood Dr
Jurisdiction	Baxter, MN
East/West Street	TH 210
North/South Street	Timberwood Dr
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			423	1		3	668			8		22				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						3				8		23				
Capacity, c (veh/h)						1125				219		617				
v/c Ratio						0.00				0.04		0.04				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.1				
Control Delay (s/veh)						8.2				22.1		11.1				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.0				14.0						
Approach LOS						A				B						

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