



DRAFT Memorandum

SRF No. 16021

To: Adam Jessen, Project Manager
Scott County

From: Brent Clark, PE, Traffic Studies Lead
Ashley Sherry, EIT, Engineer I

Date: October 7, 2022

Subject: Moraine Development Traffic Study; Shakopee, Minnesota

Introduction

As requested, SRF has completed a traffic study for the proposed residential development located in the northwest quadrant of the County Highway 18 and County Highway 16 (North)/Eagle Creek Boulevard intersection in Shakopee, Minnesota (see Figure 1: Project Location). The main objectives of the study are to evaluate the existing operations within the study area, identify any transportation impacts associated with the proposed development, and recommend improvements to address any issues, if necessary. The following information provides the assumptions, analysis, and recommendations offered for consideration.

Existing Conditions

Existing conditions were reviewed to establish a baseline to identify any future impacts associated with the proposed development. The evaluation of existing conditions includes a review of traffic volumes, roadway characteristics, and intersection capacity, which are summarized in the following sections.

Traffic Volumes

Weekday a.m. and p.m. peak period vehicular turning movement and pedestrian/bicyclist counts were collected by Scott County during the week of August 1, 2022, at the following study intersections:

- County Highway 18 and County Highway 16 (North)/Eagle Creek Boulevard
- County Highway 18 and County Highway 16 (South)/134th Street
- County Highway 16 and Portage Lane E

Note that data collection efforts were performed during the summer and the nearby Eagle Creek Elementary School was not currently in session. Therefore, to account for elementary school trips, trip generation estimates were developed using the *ITE Trip Generation Manual, 11th Edition* and distributed to the roadway network. It should be noted that based on the elementary school district boundaries, less than ten (10) percent of elementary school trips are expected to utilize the County Highway (CH) 18 study intersections.



Project Location

Moraine Development Traffic Study
City of Shakopee

002216021
September 2022

Figure 1

The turning movement counts were compared to historical turn movement counts and average daily traffic (ADT) counts provided by the Minnesota Department of Transportation (MnDOT) to understand any travel pattern changes associated with the COVID-19 pandemic and/or ongoing TH 13 construction. Results of the comparison indicate that travel patterns are generally consistent with historical volumes for the area, therefore, no additional adjustments were made.

In addition, short-duration (i.e. 30-minute) counts were collected at the following internal neighborhood study intersections the week of August 22, 2022, during typical weekday peak hour conditions (i.e. a Tuesday, Wednesday, or Thursday). These short-duration counts were modified to reflect peak hour volumes based on the peak hour turning movement counts collected by Scott County at the external study intersections.

- Portage Lane E and Moraine Drive (west intersection)
- Portage Lane E and Moraine Drive (east intersection)

Roadway Characteristics

A field assessment was completed to identify various roadway characteristics within the transportation system study area, such as functional classification, general configuration, and posted speed limit. A summary of these roadway characteristics is shown in Table 1. Note that these are general characteristics and that there are some deviations within the area or segments of the roadways.

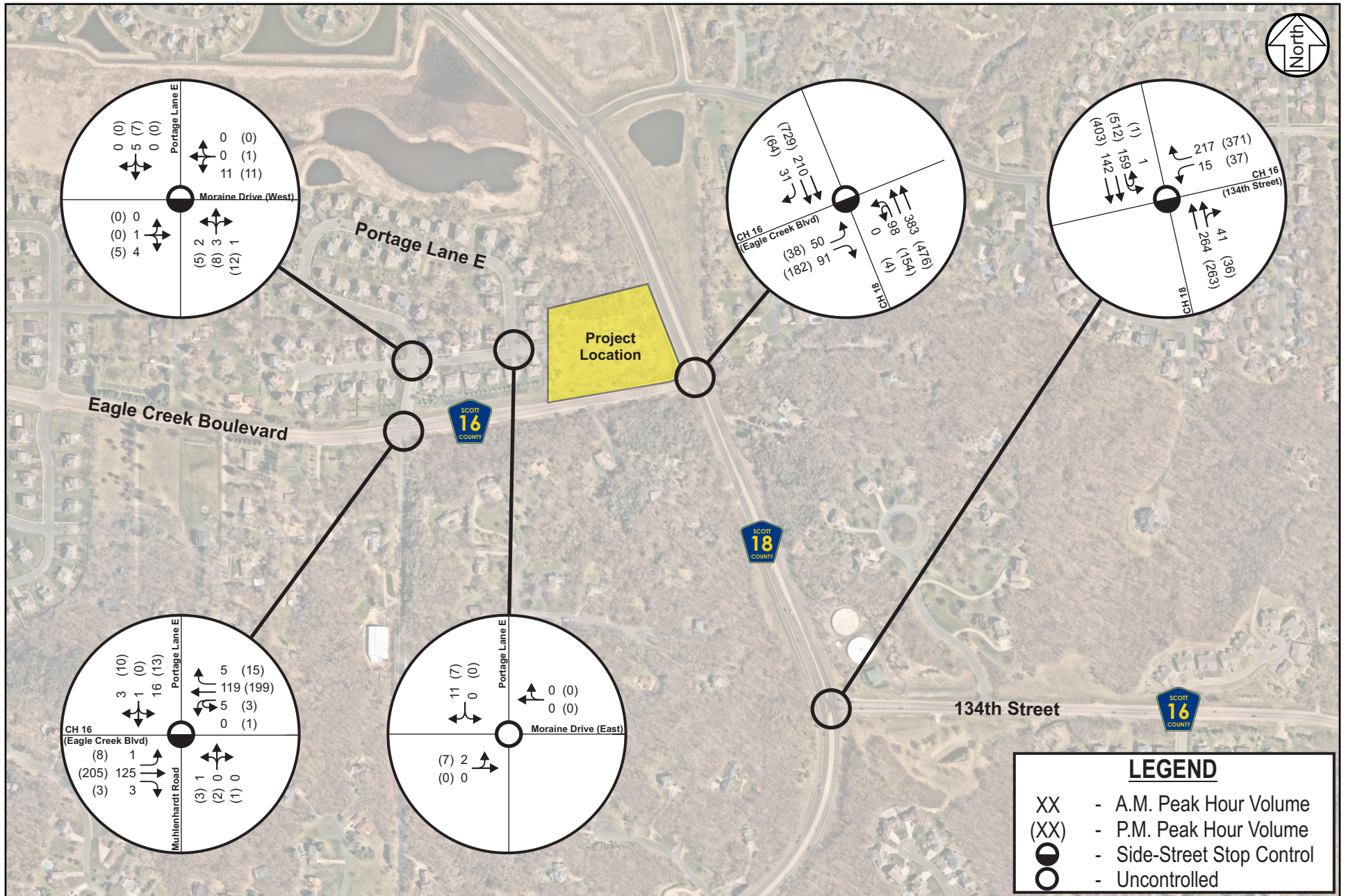
Table 1. Existing Roadway Characteristics

Roadway	Functional Classification ⁽¹⁾	General Configuration	Posted Speed Limit (mph)
County Highway 18	A Minor Arterial	4-Lane divided	50
County Highway 16	A Minor Arterial	2-lane undivided	50/55 ⁽²⁾
Portage Lane E	Local Roadway	2-lane undivided	30

(1) Functional Classification based on the *Scott County 2040 Comprehensive Plan*.

(2) The speed limit of County Highway 16 is 50-mph east of County Highway 18 (i.e. 134th Street) and 55-mph west of County Highway 18 (i.e. Eagle Creek Blvd)

From a traffic control perspective, one of the internal neighborhood intersections is uncontrolled, whereas the remaining study intersections are unsignalized, side-street stop controlled. Existing geometrics, traffic controls, and traffic volumes in the study area are shown in Figure 2. Note the existing traffic volumes include trips generated for the Elementary School to reflect non-summer conditions.



Intersection Capacity Analysis

An intersection capacity analysis was completed using Synchro/SimTraffic software to establish a baseline condition to which future traffic operations could be compared. Capacity analysis results identify a Level of Service (LOS) which indicates how well an intersection is operating. Intersections are graded from LOS A through LOS F. The LOS results are based on average delay per vehicle, which correspond to the delay threshold values shown in Table 2. LOS A indicates the best traffic operation, while LOS F indicates an intersection where demand exceeds capacity. Overall intersection LOS A through LOS D is generally considered acceptable based on MnDOT guidelines.

Table 2. Level of Service Criteria for Signalized and Unsignalized Intersections

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

For side-street stop/yield-controlled intersections, special emphasis is given to providing an estimate for the level of service of the side-street approach. Traffic operations at an unsignalized intersection with side-street stop/yield control can be described in two ways. First, consideration is given to the overall intersection level of service. This takes into account the total number of vehicles entering the intersection and the capability of the intersection to support these volumes.

Second, it is important to consider the delay on the minor approach. Since the mainline does not have to stop, the majority of delay is attributed to the side-street approaches. It is typical of intersections with higher mainline traffic volumes to experience high-levels of delay (i.e. poor levels of service) on the side-street approaches, but an acceptable overall intersection level of service during peak hour conditions.

Results of the existing capacity analysis, shown in Table 3, indicate that all study intersections currently operate at an acceptable overall LOS A during the weekday a.m. and p.m. peak hours, with the existing geometric layout and traffic controls.

Table 3. Existing Intersection Capacity Analysis

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
County Highway 18 / County Highway 16 (North) ⁽¹⁾	A/A	5 sec.	A/B	18 sec.
County Highway 18 / County Highway 16 (South) ⁽¹⁾	A/A	4 sec.	A/A	10 sec.
County Highway 16 / Portage Lane E ⁽¹⁾	A/A	5 sec.	A/A	6 sec.
Portage Lane E / Moraine Drive (West) ⁽¹⁾	A/A	4 sec.	A/A	4 sec.
Portage Lane E / Moraine Drive (East) ⁽²⁾	A/A	3 sec.	A/A	1 sec.

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst side-street approach LOS. The delay shown represents the worst side-street approach delay.

(2) Indicates an uncontrolled intersection, where the overall LOS results are reported similar to an unsignalized intersection.

The following information summarizes the operational, queueing, and/or safety issues identified as part of the existing capacity analysis and field observations:

County Highway 18 / County Highway 16 (North)

- While the overall eastbound approach operates at LOS B, the eastbound left-turn movement operates at LOS F (66 seconds) during the p.m. peak hour. The movement was observed to be challenging and vehicles would often stop beyond the stop bar to compete for sight distance with the eastbound right-turn movement. However, no significant queueing or safety issues were observed at the intersection.
- Due to the difficulties of the eastbound left-turn movement, vehicles along CH 16 and within the neighborhood may be avoiding the movement/intersection and utilizing alternative signalized routes such as CH 21 or the CH 18/Crossings Boulevard intersection.
- The *Scott County CSAH 18/CSAH 16 Intersection Study*, completed by CH2M Hill in 2005, provided a long-term recommendation of converting the intersection to a three-quarter access.
- Scott County should continue to monitor the intersection and investigate potential long-term improvements for the study intersection and along the corridor.

County Highway 18 / County Highway 16 (South)

- There are over 500 southbound left-turn movements during the p.m. peak hour, which is significant for an unsignalized intersection. However, operations are acceptable for all movements and queues were never observed to extend beyond storage.

2025 No Build Conditions

To understand how general background growth is expected to impact the study intersections, year 2025 no build conditions were reviewed. The year 2025 represents one-year post construction of the full-build out of the proposed development.

Background Traffic Growth

To account for general background growth in the area, an annual growth rate of one (1) percent was applied to the existing peak hour traffic volumes to develop year 2025 background forecasts. This growth rate was developed using a combination of historical average daily traffic (ADT) volumes from surrounding roadways as published by MnDOT, traffic forecasts from the *Scott County 2040 Comprehensive Plan*, and engineering judgment.

Adjacent Development

In addition to the proposed development, there are known adjacent developments planned in the area. The Whispering Waters development, which is currently under construction, is generally located in the southwest quadrant of the CH 16 (Eagle Creek Boulevard)/Foothill Trail intersection. The development consists of approximately 134 residential lots. For the purpose of this study, the Whispering Waters development was assumed to be fully completed by 2025. Therefore, to account for the adjacent development, trip generation estimates were developed using the *ITE Trip Generation Manual, 11th Edition* and distributed to the roadway network.

Intersection Capacity Analysis

To determine how the adjacent roadway network will accommodate the year 2025 no build traffic forecasts, an intersection capacity analysis was completed using Synchro/SimTraffic software. Year 2025 no build traffic forecasts, which include general background growth and adjacent development, are shown in Figure 3. Note no intersection improvements were assumed within the analysis. Results of the analysis, summarized in Table 4, indicate that all study intersections are expected to continue to operate at an acceptable overall LOS A during the weekday peak hours. Side-street delays at the study intersections are expected to worsen as area development occurs (i.e., from background growth/adjacent development).

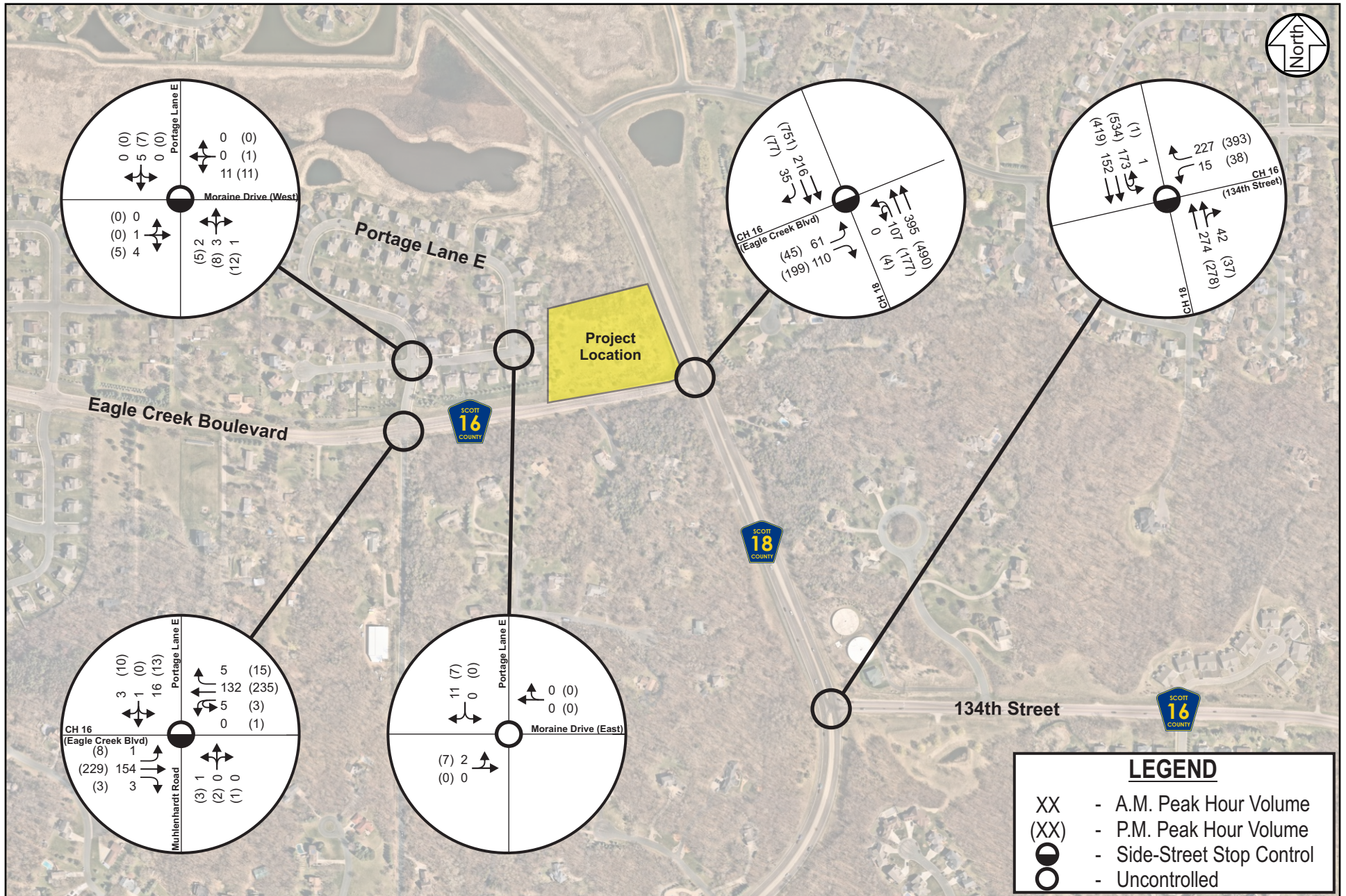


Table 4. 2025 No Build Intersection Capacity Analysis

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
County Highway 18 / County Highway 16 (North) ⁽¹⁾	A/A	5 sec.	A/C	23 sec.
County Highway 18 / County Highway 16 (South) ⁽¹⁾	A/A	5 sec.	A/B	11 sec.
County Highway 16 / Portage Lane E ⁽¹⁾	A/A	5 sec.	A/A	7 sec.
Portage Lane E / Moraine Drive (West) ⁽¹⁾	A/A	4 sec.	A/A	5 sec.
Portage Lane E / Moraine Drive (East) ⁽²⁾	A/A	3 sec.	A/A	1 sec.

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst side-street approach LOS. The delay shown represents the worst side-street approach delay.

(2) Indicates an uncontrolled intersection, where the overall LOS is shown followed by the worst side-street approach LOS. The delay shown represents the worst side-street approach delay.

Proposed Development

The proposed residential development is located in the northwest quadrant of the County Highway 18 and County Highway 16 (North)/Eagle Creek Boulevard intersection. The development, which is anticipated to be constructed by 2024, consists of a total of 10 single-family residential units. It should be noted that the development originally planned to have 15 single-family units, however, the units have been reduced. A preliminary site plan for the proposed development is illustrated in Figure 4, which was used as the basis for the traffic analysis. Moraine Drive is expected to be extended to provide access to the development. Note there is an existing off-street trail that currently connects Moraine Drive to Eagle Creek Blvd, and is utilized as an emergency fire access, if needed. Converting this off-street trail to an alternative access for the neighborhood was identified for consideration. While not assumed within the analysis, this potential alternative access is discussed later in this document.

2025 Build Conditions

To identify potential impacts associated with the proposed development, traffic forecasts for year 2025 (i.e., one-year after opening) conditions were developed. The year 2025 traffic forecasts take into account general area background growth, adjacent development, and traffic generated by the proposed development. The following sections outline the proposed development trip generation and intersection capacity analysis.

Proposed Development Trip Generation

To account for traffic impacts associated with the proposed development, trip generation estimates for the proposed land uses were developed for the a.m. and p.m. peak hours and a daily basis. These estimates, shown in Table 5, were developed using the *ITE Trip Generation Manual, 11th Edition*. Note that no multi-use or pass-by reductions were applied due to the residential nature of the development.



Table 5. Proposed Development Trip Generation Estimate

Land Use Type (ITE Code)	Size	A.M. Peak Hour		P.M. Peak Hour		Daily Trips
		In	Out	In	Out	
Single-Family Housing (210)	10 DU	2	5	6	3	94

Results of the trip generation estimate indicate that the proposed development is expected to generate approximately 7 a.m. peak hour, 9 p.m. peak hour, and 94 daily trips. The trips generated were distributed throughout the area based on the directional distribution shown in Figure 5, which was developed based on existing travel patterns and engineering judgement. The proposed development site trips are shown in Figure 6 and the resultant year 2025 build traffic forecasts, which included general background growth, adjacent development trips, and trips generated by the proposed development, are shown in Figure 7. Note that the development is only contributing one (1) to three (3) peak hour trips per movement at the CH 18 study intersections.

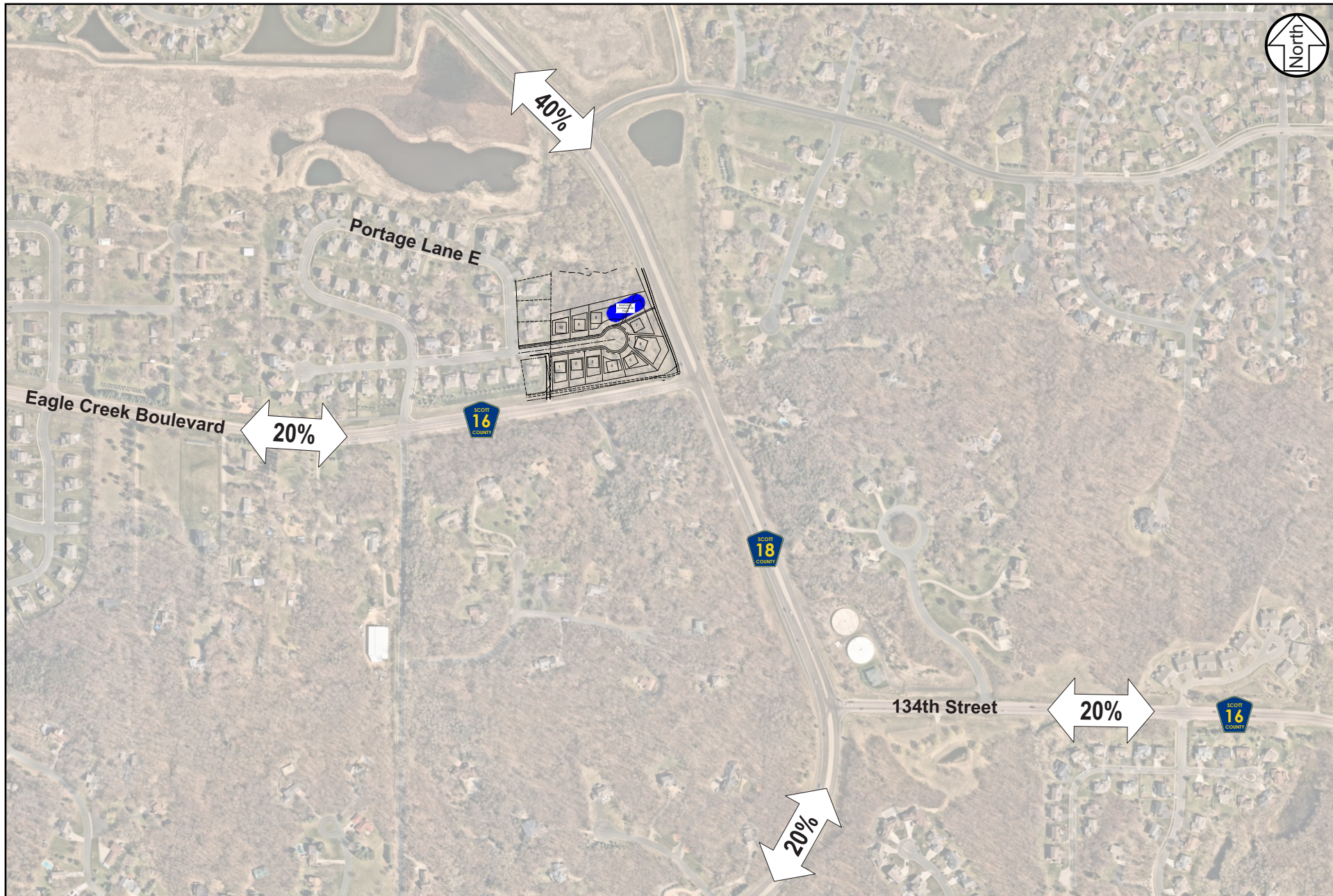
Intersection Capacity Analysis

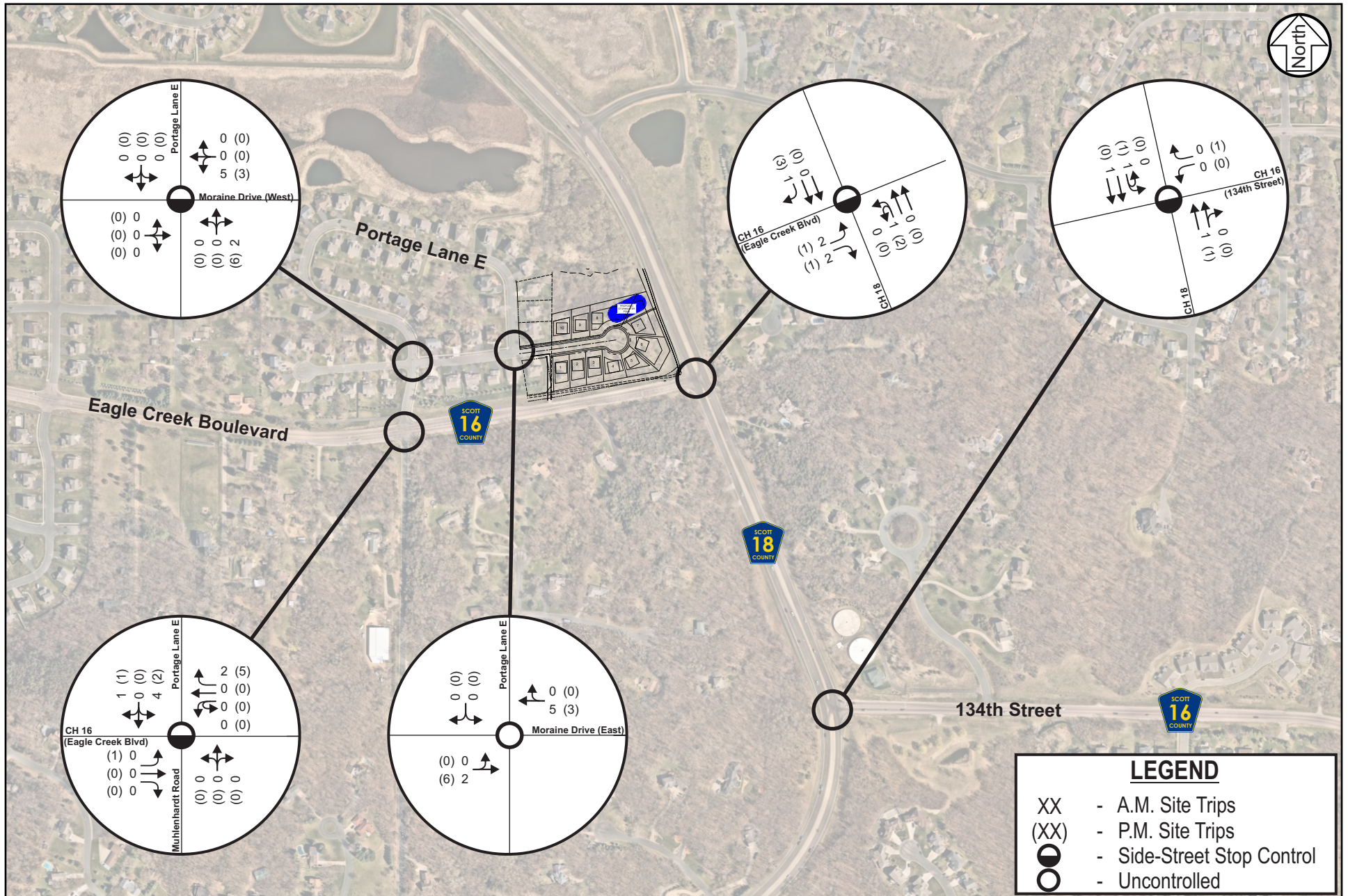
To determine how the study intersections will operate under year 2025 conditions, an intersection capacity analysis was completed using Synchro/SimTraffic software. Results of the analysis, summarized in Table 6, indicate that all study intersections are expected to continue to operate at an acceptable overall LOS A during the weekday a.m. and p.m. peak hours. Note the 2025 no build results are included in the table for comparison purposes. The proposed development is expected to have minimal impact on the traffic operations within the study area. As mentioned previously, Scott County should continue to monitor the CH 18/CH 16 intersection and investigate potential long-term improvements for the intersection and along the corridor.

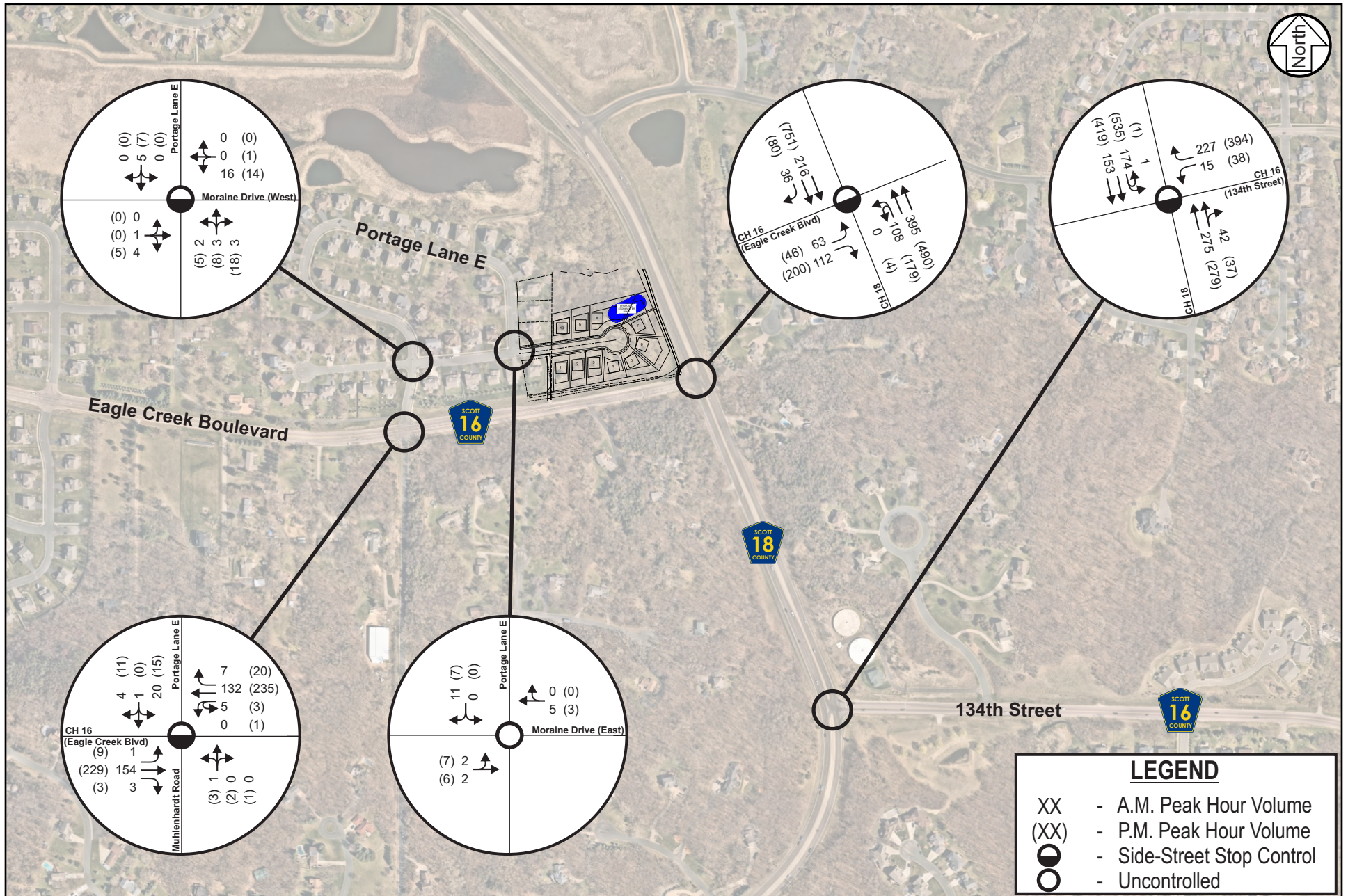
Table 6. Year 2025 Intersection Capacity Analysis

Intersection	2025 No Build		2025 Build	
	LOS	Delay	LOS	Delay
A.M. Peak Hour				
County Highway 18 / County Highway 16 (North) ⁽¹⁾	A/A	5 sec.	A/A	5 sec.
County Highway 18 / County Highway 16 (South) ⁽¹⁾	A/A	5 sec.	A/A	5 sec.
County Highway 16 / Portage Lane E ⁽¹⁾	A/A	5 sec.	A/A	5 sec.
Portage Lane E / Moraine Drive (West) ⁽¹⁾	A/A	4 sec.	A/A	4 sec.
Portage Lane E / Moraine Drive (East) ⁽²⁾	A/A	3 sec.	A/A	3 sec.
P.M. Peak Hour				
County Highway 18 / County Highway 16 (North) ⁽¹⁾	A/C	23 sec.	A/C	23 sec.
County Highway 18 / County Highway 16 (South) ⁽¹⁾	A/B	11 sec.	A/B	11 sec.
County Highway 16 / Portage Lane E ⁽¹⁾	A/A	7 sec.	A/A	7 sec.
Portage Lane E / Moraine Drive (West) ⁽¹⁾	A/A	5 sec.	A/A	5 sec.
Portage Lane E / Moraine Drive (East) ⁽²⁾	A/A	1 sec.	A/A	4 sec.

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst side-street approach LOS. The delay shown represents the worst side-street approach delay.







Site Plan/Access Review

A review of the proposed site plan was completed to identify any issues and recommend potential improvements with regard to access, sight distance, and circulation. The following information provides an overview of the site plan/access review:

Alternative Access:

An alternative vehicular access to the proposed development/neighborhood was identified for consideration and could be accomplished by repurposing/reconstructing the existing off-street trail/emergency fire access.

- The off-street trail/fire access along Eagle Creek Boulevard is currently spaced approximately 625 feet between Portage Lane and CH 18. Based on Scott County Access Spacing Guidance, a right-in/right-out on an A Minor Arterial should have access spacing of 1/8-mile or 660 feet. Therefore, the existing access location does not meet access spacing guidelines.
- The CH 16/Portage Lane intersection operates at LOS A/A during peak hours under year 2025 build conditions without the additional access, therefore, the access is not needed from an operational perspective.
- Adding access to Eagle Creek Boulevard would introduce more conflict points to the roadway, thus having a negative impact on safety.
- **Recommendation:** The additional vehicular access location does not meet access spacing guidance and is not needed from an operational or safety perspective, therefore, the access is recommended to remain an off-street trail/emergency fire access.

Other Considerations:

- Given the extension of Moraine Drive to the residential development, consider incorporating traffic controls consistent with the *Manual on Uniform Traffic Control Devices (MUTCD)* at the Moraine Drive/Portage Lane East intersection.

Summary and Conclusions

The following study conclusions and recommendations are offered for consideration:

- 1) All study intersections currently operate at an acceptable overall LOS A during the weekday a.m. and p.m. peak hours, with the existing geometric layout and traffic control.
 - While the overall eastbound approach operates at LOS B, the eastbound left-turn movement at County Highway 18/County Highway 16 (North) operates at LOS F (66 seconds) during the p.m. peak hour. The movement was observed to be challenging and vehicles would often stop beyond the stop bar, however, no significant queuing or safety issues were observed.

- Due to the difficulties of the eastbound left-turn movement, vehicles along CH 16 and within the neighborhood may be avoiding the movement/intersection and utilizing alternative signalized routes such as CH 21 and the CH 18/Crossings Boulevard intersection.
 - **Scott County should continue to monitor the CH 18/CH 16 intersection and investigate potential long-term improvements for the study intersection and along the corridor.**
- 2) Results of the year 2025 no build capacity analysis indicate that all study intersections are expected to continue to operate at an overall LOS A or better during the a.m. and p.m. peak hours. Side-street delays are expected to worsen as area development occurs (i.e., from background growth and adjacent developments).
 - 3) The proposed development consists of 10 single-family residential units. Moraine Drive is expected to be extended to provide access to the development. Converting an existing off-street trail/emergency fire access to an additional vehicular access for the neighborhood was identified for consideration as part of the study.
 - 4) The proposed development is expected to generate approximately 7 a.m. peak hour, 9 p.m. peak hour, and 94 daily trips.
 - 5) Results of the year 2025 build capacity analysis indicate that all study intersections are expected to continue to operate at an overall LOS A or better during the a.m. and p.m. peak hours. **The proposed development is expected to have minimal impact on the traffic operations within the study area.**
 - 6) A review of the proposed site plan was completed to identify any issues and recommend potential improvements with regard to access, sight distance, and circulation. The following is recommended:
 - **An additional vehicular access location does not meet access spacing guidance and is not needed from an operational or safety perspective, therefore, the access is recommended to remain an off-street trail/emergency fire access.**
 - Given the extension of Moraine Drive to the residential development, consider incorporating traffic controls consistent with the *Manual on Uniform Traffic Control Devices (MUTCD)* at the Moraine Drive/Portage Lane East intersection.