

Attachment F

Traffic Memo



Memorandum

SRF No. 11925.00

To: Steve Lillehaug, PE, PTOE, Public Works Director/City Engineer
City of Shakopee

From: Brent Clark, PE, Senior Engineer
Matt Pacyna, PE, Principal

Date: December 20, 2019

Subject: Shakopee AUAR Transportation Analysis

Introduction

SRF has completed a transportation analysis for the Shakopee Alternative Urban Area-wide Review (AUAR). The study area focuses on development scenarios within Jackson Township, which is generally bounded by the Mn Highway 41 bridge to the west, County Road 78 to the south, County Road 79 to the east, and US 169 to the north. As the City of Shakopee moves forward with the southwestern orderly annexation area within Jackson Township, it is important to identify anticipated development and mitigate potential impacts associated with development. Therefore, the purpose of the transportation analysis component of the AUAR is to focus on potential development impacts to the transportation network. This analysis will collect updated traffic counts, identify land use projections in the development area, understand potential impacts to the transportation system, and recommend mitigation to provide safe and efficient operations. The following information provides the assumptions, analysis, and recommendations offered for consideration.

Project Background

Development and transportation within the project area has been discussed and evaluated over the past few years. Previous efforts have included the Scott County and City of Shakopee Comprehensive Plans, as well as other development related traffic studies, such as:

- 1) Hy-Vee Development Traffic Impact Analysis, Kimley-Horn and Associates, (June 2016)
- 2) US 169 at TH 41 Intersection Study – Existing Conditions and No Build, SEH (November 2016)
- 3) The Bluffs at Marystown/Windermere Traffic Study Update, Westwood (July 2018)

These efforts identified potential area land uses and transportation system improvements. In particular, the Scott County 2040 Comprehensive Plan identified County Road 78 (CR 78) as a future study need, as the roadway is identified as a potential functional classificational transfer to a principal arterial. However, none of these studies took a comprehensive review of the study area to understand how the overall transportation system is expected to function as area improvements and/or development occurs. Therefore, information from each of these studies were leveraged to assist with the Shakopee AUAR Transportation Analysis.

Existing Conditions

Existing conditions were reviewed to establish a baseline condition to compare and determine any future impacts associated with future AUAR scenarios. The evaluation of existing conditions includes various data collection efforts, field observations, and an intersection capacity analysis, which are summarized in the following sections.

Study Intersections

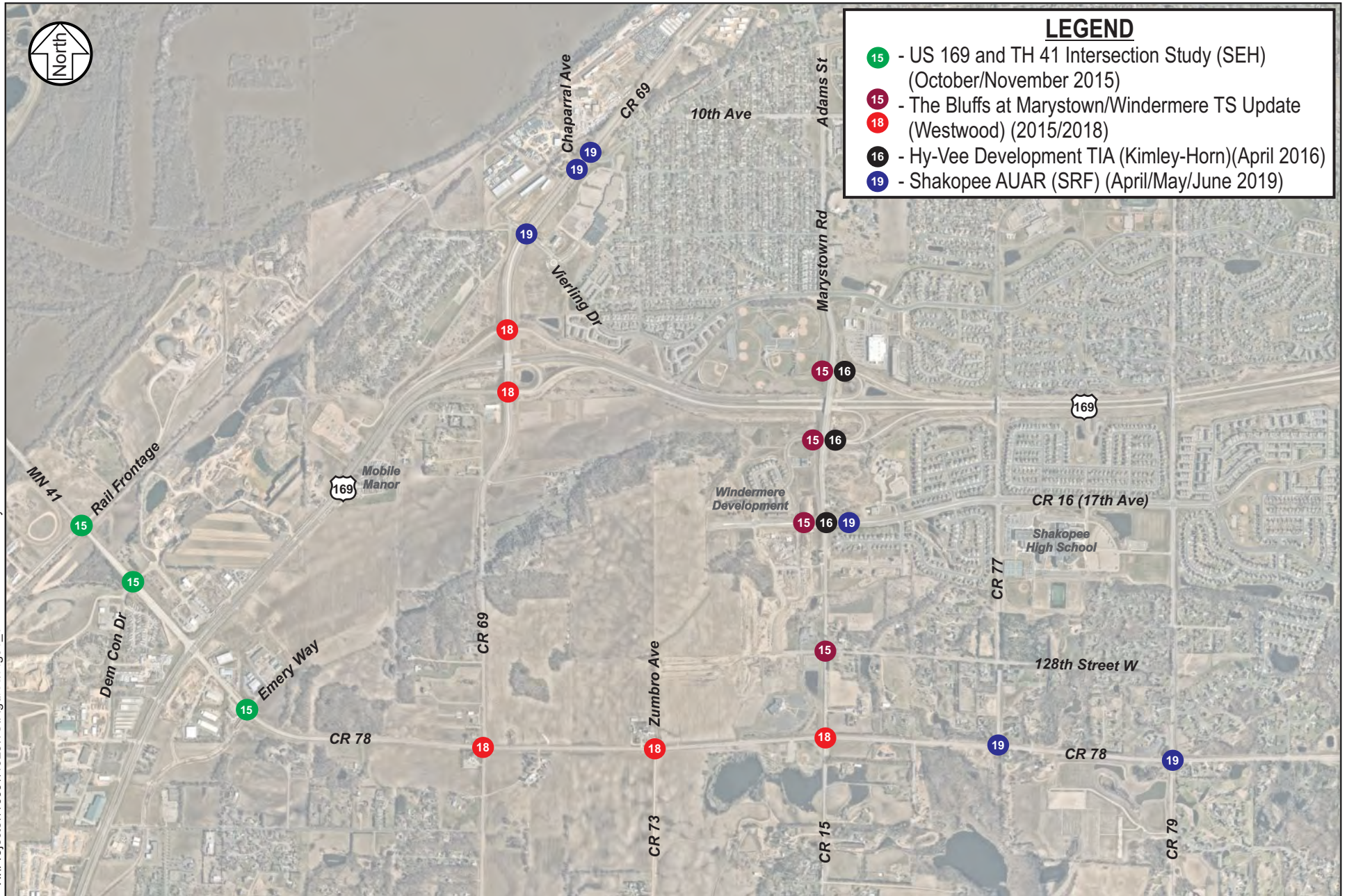
The following study intersections represent the primary focus areas of the AUAR. These intersections were identified through discussion with City and County staff as they relate to potential development impacts, as well as future area infrastructure needs.

- Mn Highway 41/Rail Frontage
- Mn Highway 41/Dem Con Drive
- County Road 78/Emery Way
- County Road 78/County Road 69
- County Road 78/County Road 73
- County Road 78/County Road 15
- County Road 78/County Road 77
- County Road 78/County Road 79
- County Road 69/10th Avenue W
- County Road 69/Chaparral Avenue
- County Road 69/Vierling Drive
- County Road 69/US 169 North Ramp
- County Road 69/US 169 South Ramp
- Marystown Road/US 169 North Ramp
- Marystown Road/US 169 South Ramp
- County Road 15/County Road 16
- County Road 15/128th Street W

Specific development access locations were included as part of the future operations analysis to help identify area infrastructure and traffic control needs. This included two (2) locations along County Road 69, as all other development access was assumed to be located at existing intersections.

Data Collection

Intersection turning movement counts from previous studies completed within the area since 2015 were reviewed. Previous area data included weekday a.m. and p.m. peak hour counts during various months of the year, which were used to help identify how area traffic volumes and travel patterns change within the study area. This data was supplemented with new intersection turning movement counts collected by SRF the week of April 29th, 2019, at several locations to ensure data within the study area is current. It should be noted that the CR 69/Chaparral Avenue and CR 69/10th Avenue intersections were collected by SRF in June 2019. A summary of the traffic data collected within the study area since year 2015 is illustrated in Figure 1.



Traffic data collected previously (prior to 2019) was modified to reflect current conditions based on the recent counts collected in April/May 2019. Additional adjustments were made to the existing turning movement counts to account for the following intersection conditions:

- **County Road 69/US 169 South Ramp:** In the Summer of 2018, as part of the initiative to transition US 169 from an expressway to a freeway, the Mobile Manor mobile home facility access along US 169 was closed and a Frontage Road was provided to access the mobile home facility via the CR 69/US 169 South Ramp intersection. Traffic counts occurred after the Frontage Road was constructed, although the US 169 access had not been closed. Intersection turning movement counts were adjusted to account for the direct access closure to US 169.
- **Marystown Road/US 169 South Ramp:** The west approach to the intersection was constructed by year 2018 to provide an additional access to the Windermere development in the southwest quadrant of the intersection. To date, approximately 60 single-family homes and a daycare center has been built in the Windemere development. Intersection turning movement counts were adjusted to account for this development.
- **Marystown Road/US 169 Ramps:** The Hy-Vee development, which included a grocery store, gas station, bank with drive-through, and multi-family residential, in the northeast quadrant of the Marystown Road/US 169 North Ramp was completed in 2017. Although the Marystown Road mainline movements were captured in the most recent traffic counts at the CR 15/CR 16 intersection, the US 169 ramp turning movements associated with the development were not. Therefore, expected trips to/from the development, as assumed in the *Hy-Vee Development Traffic Impact Analysis*, were utilized to adjust the intersection turning movements to account for the Hy-Vee Development.

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. For example, both County Road 69 and County Road 15/Marystown Road transition from a 4-lane divided roadway into a 2-lane undivided roadway south of US 169; Mn Highway 41 transitions from a 4-lane divided roadway to a 2-lane undivided roadway northwest of the Dem Con Drive intersection.

In addition to the general roadway characteristics, there are varying types of traffic controls within the transportation system study area. The Mn Highway 41/Dem Con Drive intersection is signalized and the CR 78/CR 15 and CR 78/CR 79 intersections operate under all-way stop control. The remaining study intersections are unsignalized with side-street stop control. Existing geometrics, traffic controls, and volumes are shown in Figure 2.

Table 1. Existing Roadway Characteristics

Roadway	Functional Classification	General Configuration	Posted Speed Limit (mph)
Mn Highway 41	Principal Arterial	4-lane divided/2-lane undivided	55
County Road 78	A Minor Arterial ⁽¹⁾	2-lane undivided	55
County Road 69	A Minor Arterial	4-lane divided/2-lane undivided	50/55
Marystown Road/ County Road 15	A Minor Arterial	4-lane divided/2-lane undivided	55/45
County Road 73 ⁽²⁾	County Local	Gravel	N/A
County Road 77 ⁽²⁾	Collector	2-lane undivided	55
County Road 79	Collector	2-lane undivided	55
County Road 16	A Minor Arterial	4-lane divided	45
Vierling Drive	Collector	4-lane undivided	30
10th Avenue	Collector	4-lane undivided	30

(1) The 2040 Scott County Comprehensive plan identifies this roadway as a potential to convert to a Principal Arterial

(2) The 2040 Scott County Comprehensive plan identifies these roadways as potential transfers from County to City

Intersection Capacity Analysis

An intersection capacity analysis was conducted to determine how traffic is currently operating at the study intersections during typical weekday a.m. and p.m. peak hour conditions. All intersections were analyzed using Synchro/SimTraffic. 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 results from SimTraffic, which correspond to the delay threshold values shown in Table 2. LOS A indicates the best traffic operation and LOS F indicates an intersection where demand exceeds capacity. Overall intersection LOS A through D is generally considered acceptable by drivers in the Twin Cities Metropolitan Area.

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-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 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 (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 intersection capacity analysis, shown in Table 3, indicate that all study intersections currently operate at an acceptable overall LOS B or better during the weekday a.m. and p.m. peak hours. Although there are no significant issues in the study area from an overall intersection capacity perspective, the following information summarizes existing operational and/or queuing issues that warrant consideration as development occurs.

- **Mn Highway 41/Rail Frontage:** The Rail Frontage side-street stop approach currently operates at LOS E during both the a.m. and p.m. peak hours. This is a result of limited available gaps along Mn Highway 41, which makes left-turn movements difficult, especially for truck traffic.
- **Mn Highway 41/Dem Con Drive:** Due to the lane reduction northwest of the intersection, there is a poor lane utilization for vehicles traveling northwest, which results in less than efficient operations.
- **CR 69/Chaparral Avenue and CR 69/10th Avenue:** The *Scott County Comprehensive Plan* and *Shakopee Transportation Plan* were reviewed for access spacing guidelines and conformance. Based on this review, low-volume local streets on minor arterials should have access spacing at a minimum of 1/4-mile for full-access. The Chaparral Avenue and 10th Avenue intersections are currently spaced approximately 275 feet apart. Therefore, Chaparral Avenue does not meet access spacing guidelines for a full-access or partial-access (330 feet). Under future conditions, Chaparral Avenue should be considered for access closure or should be realigned with 10th Avenue to provide a 4-leg intersection.

Table 3. Existing Intersection Capacity Analysis

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
<i>MN 41</i>				
MN 41/Rail Frontage ⁽¹⁾	A/E	36 sec.	A/E	42 sec.
MN 41/Dem Con Drive	B	19 sec.	B	16 sec.
<i>CR 78</i>				
CR 78/Emery Way ⁽¹⁾	A/A	1 sec.	A/A	4 sec.
CR 78/CR 69 ⁽¹⁾	A/A	9 sec.	A/B	11 sec.
CR 78/CR 73 ⁽¹⁾	A/A	2 sec.	A/A	1 sec.
CR 78/CR 15 ⁽²⁾	A	10 sec.	B	11 sec.
CR 78/CR 77 ⁽¹⁾	A/A	4 sec.	A/A	6 sec.
CR 78/CR 79 ⁽²⁾	B	11 sec.	B	12 sec.
<i>CR 69</i>				
CR 69/10th Avenue W ⁽¹⁾	A/A	6 sec.	A/A	8 sec.
CR 69/Chaparral Avenue ⁽¹⁾	A/A	4 sec.	A/A	5 sec.
CR 69/Vierling Drive ⁽¹⁾	A/A	9 sec.	A/A	10 sec.
CR 69/US 169 North Ramp ⁽¹⁾	A/A	5 sec.	A/A	5 sec.
CR 69/US 169 South Ramp ⁽¹⁾	A/A	5 sec.	A/A	8 sec.
CR 69/Driveways ⁽¹⁾	A/A	4 sec.	A/A	5 sec.
<i>Marystown Road/CR 15</i>				
Marystown Road/US 169 North Ramp ⁽¹⁾	A/A	7 sec.	A/B	12 sec.
Marystown Road/US 169 South Ramp ⁽¹⁾	A/B	14 sec.	A/B	14 sec.
CR 15/CR 16 ⁽¹⁾	A/B	11 sec.	A/A	8 sec.
CR 15/128th Street W ⁽¹⁾	A/A	6 sec.	A/A	5 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 all-way stop control intersection.

Planned Transportation Improvements

The Minnesota Department of Transportation (MnDOT) is in the process of constructing a new diverging diamond interchange (DDI) at the US 169/Mn Highway 41/CR 78 intersection in Jackson and Louisville townships in Scott County. The project will also include an overpass at the CR 14/US 169 intersection and associated frontage road (known as Louisville Road) along the east side of US 169. Interchange construction began in Fall 2018 and is anticipated to be completed in Fall 2020. The project is anticipated to improve safety and mobility in the area by removing direct access to US 169, which is consistent with the long-term vision of converting this segment of US 169 from an expressway to a freeway. The project limits are along Mn Highway 41/CR 78 from Dem Con Drive to approximately 1,100 feet west of CR 69.

Scott County has partial funding allocated to extend CR 16 from CR 15 to connect with CR 69 as part of their *2018-2022 Capital Improvement Plan*. The extension of this roadway is developer driven as it provides access to development in the area, but also a more direct and continuous facility. This roadway would be completed under City initiative in partnership with Scott County. A portion of this roadway was built in 2018 to facilitate the Windermere development. CR 16 is a 4-lane divided roadway west of CR 15, that transitions into a two-lane divided roadway.

AUAR Scenarios and Assumptions

As part of the AUAR process, two future scenarios were reviewed. The first scenario reviewed, referred to as the “2040 Comp Plan”, includes land use and staging assumptions consistent with both the approved *Scott County 2040 Comprehensive Plan* and the *draft City of Shakopee 2040 Comprehensive Plan*. It should be mentioned that the *Scott County 2040 Comprehensive Plan* was adopted on June 18, 2019, while the *draft City of Shakopee 2040 Comprehensive Plan* is still in the review process, with adoption anticipated for late fall 2019. Since the comprehensive plans are consistent with each other, the *City of Shakopee 2040 Comprehensive Plan* is considered adopted and equivalent to the no-build alternative. The second scenario reviewed, referred to as the “Max Build” scenario, includes land uses consistent with the City of Shakopee’s full build out potential based feasible development.

The Scott County Regional Travel Demand Model was reviewed to understand how the Max Build land use assumptions compare to the previous socio-economic (SE) assumptions within the traffic analysis zones (TAZ’s) in the study area. For the Max Build scenario, household and employment data was estimated using the planned land use and developable acreages of the TAZ. The development subdistrict locations and access assumptions are shown in Figure 3, which was developed in conjunction with City staff. A graphic showing how the subdistricts overlap with the current TAZ’s is provided in the Appendix. A comparison of the AUAR scenarios household and employment data assumptions are shown in Table 4 and Figure 4.

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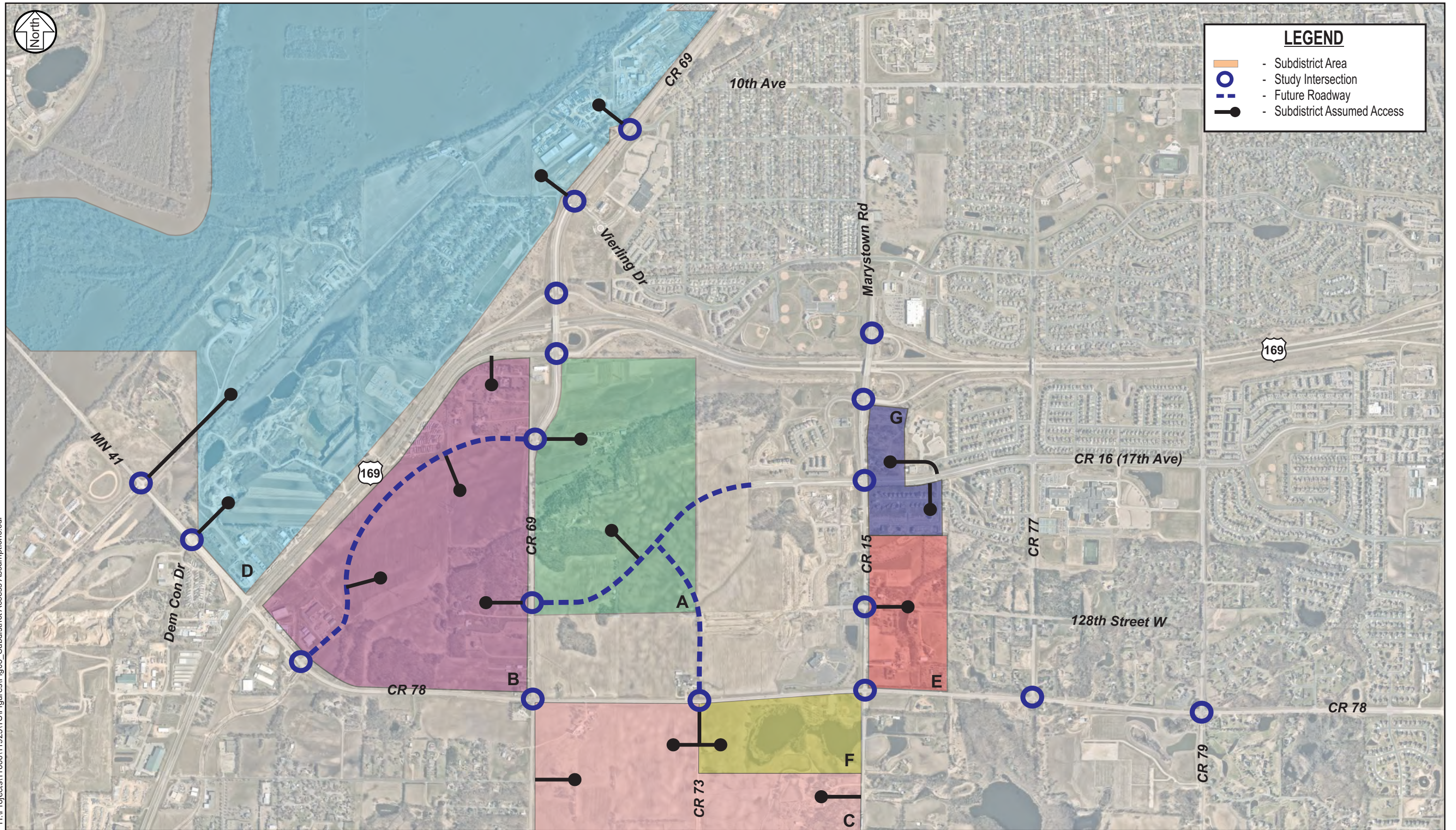
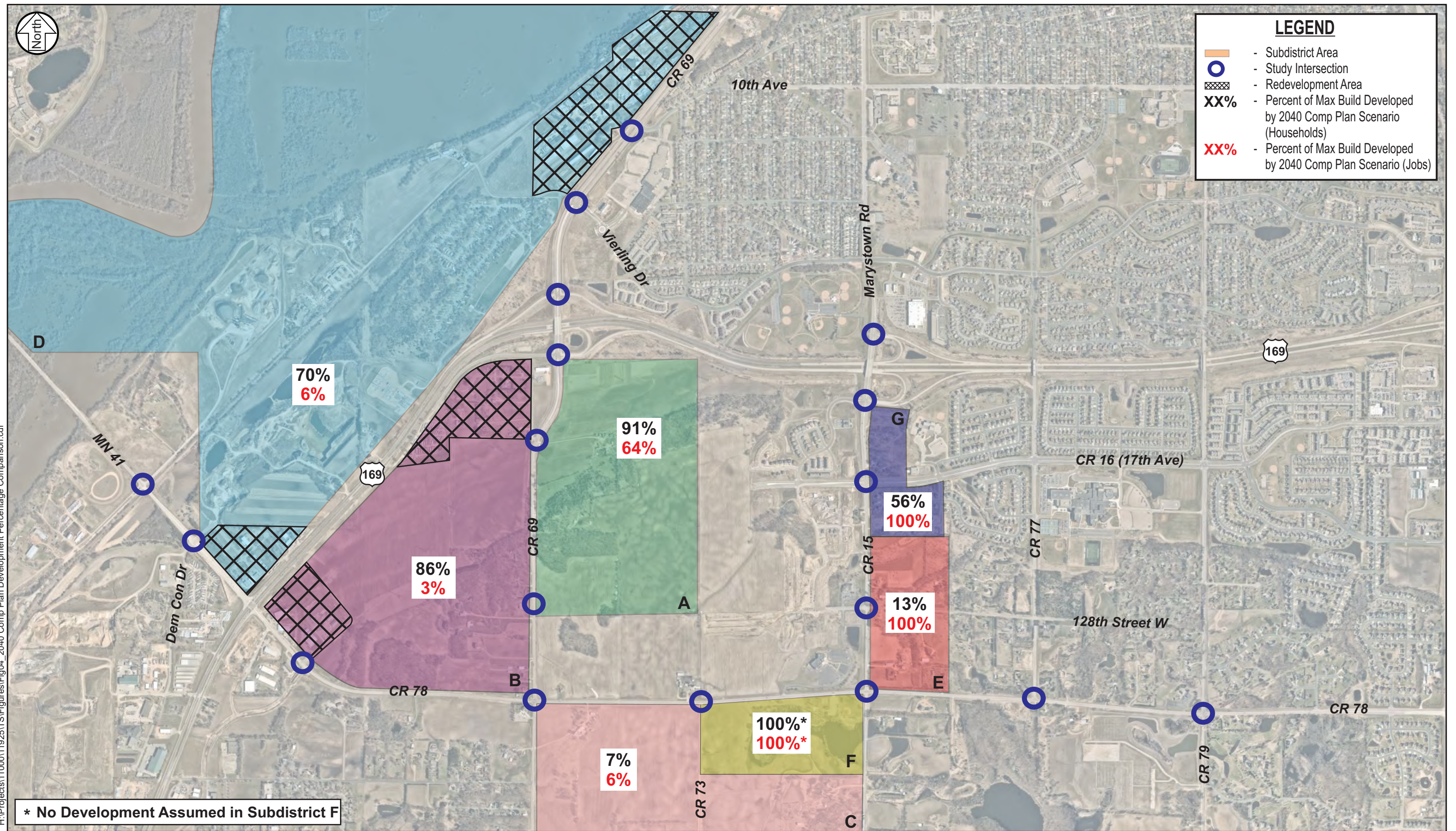


Table 4. Socio-Economic Data Comparison

Subdistrict	TAZ	2040 Comp Plan				Max Build			
		Pop.	House-Holds	Retail Employ.	Non-Retail Employ.	Pop.	House-Holds	Retail Employ.	Non-Retail Employ.
A	257	3	1	0	990	84	31	480	1,003
	260	824	303	0	0	824	303	59	0
	Total	827	304	0	990	908	334	539	1,003
B	259	199	72	0	130	554	203	539	3,917
	261	786	289	0	30	597	219	170	1,041
	Total	985	361	0	160	1,151	422	709	4,958
C	274	69	24	0	4	366	128	0	0
	275	17	6	0	0	922	322	63	0
	Total	86	30	0	4	1,288	450	63	0
D	3	21	8	0	19	131	50	26	1,102
	4	573	229	0	71	573	244	12	445
	5	2	1	34	27	90	45	150	797
	Total	596	238	34	117	794	339	188	2,344
E	255	43	15	7	7	319	113	11	0
F	274	18	6	0	1	0	0	0	0
G	252	3	1	100	87	441	156	100	87
	253	565	199	0	0	565	199	0	0
	Total	568	200	100	87	1,006	355	100	87
TOTAL		3,123	1,154	141	1,366	5,466	2,013	1,610	8,392

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Traffic Forecasts

Traffic forecasts were developed to help determine long-term transportation infrastructure needs within the study area. The forecasts were developed using the current Scott County Regional Travel Demand Model and checked for reasonableness against trip generation estimates based on proposed development. The following outlines the traffic forecast development process and assumptions.

Scott County Regional Travel Demand Model

A review of the Scott County Regional Travel Demand Model was completed. At the regional level, County and State roadway improvements within the model are consistent with *Scott County's 2040 Comprehensive Plan* and only include funded improvements identified in the *County's Transportation Improvement Program (TIP)* or in MnDOT's *State Transportation Improvement Program (STIP)*. Improvements near the proposed development within the model, as identified previously, include:

- DDI interchange at MN 41 and US 169 (currently under construction)
- East Frontage Road from CR 78 to CR 14 (currently under construction)
- CR 16 extension to CR 69 (developer driven and funded – only partial City/County funding)

In addition to area roadways, local access assumptions for the proposed development were reviewed and the model was refined to include accurate access points for each subdistrict.

Methodology

For the 2040 Comp Plan scenario, traffic forecasts were developed and approved as part of the *2040 Scott County Comprehensive Plan* update. These forecasts and model scenario served as a base for all traffic forecasts developed for this study.

For the Max Build scenario, traffic forecasts were developed using a post-process application that scaled the 2040 Comp Plan scenario model results relative to the increased socio-economic development assumptions for the Max Build scenario. To begin this process, select zone analyses were completed using the *Scott County Regional Travel Demand Model* for each of the 13 TAZs impacted by the proposed development. A select zone analysis isolates a TAZ and records the traffic volumes and distribution on the entire regional roadway network for that TAZ. Recording where trips in the proposed development area traveled to and from under 2040 Comp Plan conditions provides a base condition that can be factored up to capture trips generated by the increased development under Max Build conditions.

To determine factors by which to scale up the select zone results, trip generation was gauged for both the 2040 Comp Plan and the Max Build socio-economic datasets. NCITE trip rates were applied to the household and employment assumptions for each dataset and a scaling factor calculated from the ratio of the two trip generation estimates. The factors were then used to scale-up the select zone traffic volumes to what the proposed development is expected to generate for each TAZ. This additional traffic volume was then added to the 2040 Comp Plan daily traffic forecasts and checked for reasonableness against the trip generation estimated for the proposed development.

For purposes of this study, the daily traffic forecasts were used to develop year 2040 Comp Plan and Max Build peak hour traffic volumes to understand traffic operations and infrastructure needs required for each scenario. The Max Build conditions include the traffic volumes generated under 2040 Comp Plan conditions, as well as trips generated under Max Build conditions. A summary of the peak hour traffic forecasts are provided, along with further discussion regarding area infrastructure phasing, later in this assessment.

Traffic Forecast Summary

Based on the traffic forecast methodology described within this assessment, peak hour and daily traffic volumes were developed for the year 2040 Comp Plan and Max Build scenarios. The Max Build scenario includes the traffic volumes generated from the regionally approved development expectations, as well as additional trips based on feasible development. A summary of the daily traffic volumes for existing, 2040 Comp Plan, and Max Build is provided in Figure 5. A summary of the peak hour turning movements for the 2040 Comp Plan and Max Build scenarios are provided in Figure 6 and Figure 7, respectively.

Future Capacity Analysis

To help determine impacts associated with the AUAR development scenarios, the 2040 Comp Plan and Max Build scenarios were reviewed. Both a planning-level and detailed intersection capacity analysis were completed to better understand the long-term infrastructure needs within the study area. The improvements identified are intended to provide acceptable operations during the typical weekday a.m. and p.m. peak hour conditions.

It should be noted that the future traffic evaluation is meant to be used as a planning tool to identify reasonable long-term transportation needs within the study area based on the development potential for the area. The improvements identified in this section are to be considered potential improvements for consideration if the development assumptions and traffic volumes materialize. The mitigation measures offered for consideration in this section should be re-evaluated if/when the AUAR is updated (i.e. approximately every five (5) years) to determine if the improvements identified in this study are valid and/or if any new improvements are needed. The following information summarizes the future condition analyses.

Planning-Level Capacity Analysis

A planning-level review was completed for the study area to help identify areas of congestion along a stretch of roadway and help determine where roadway improvements, access management, or demand management strategies may need to be implemented. It does not, however, provide a basis for determining the need for specific intersection improvements. Results of the planning-level capacity review indicates that there are four roadways within the study area that are expected to operate near or over capacity under future conditions. These roadways are summarized in Table 5, along with their expected future daily traffic volumes and estimated roadway capacities.

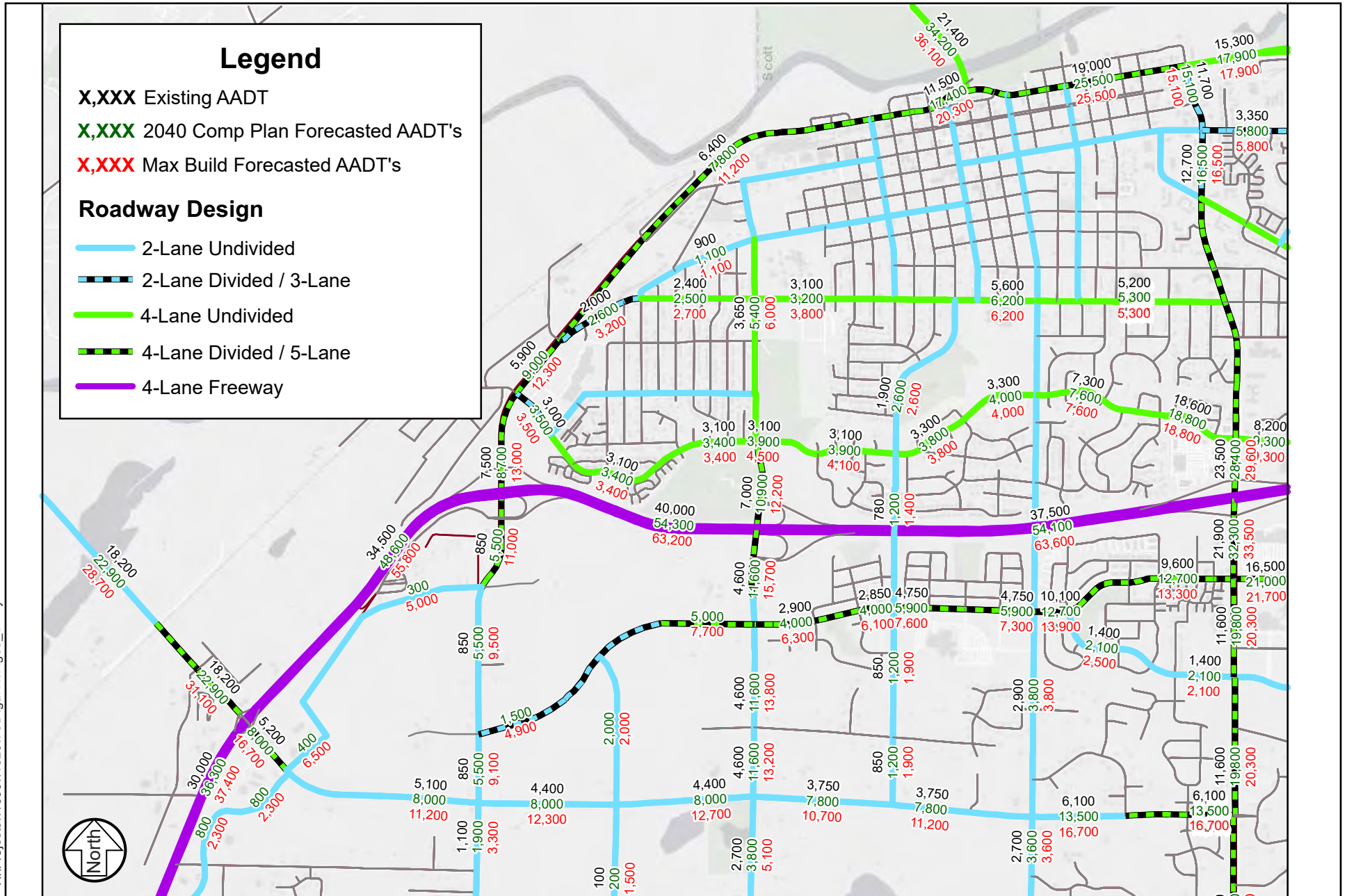


Table 5. Planning-Level Roadway Capacities

Roadway	Existing Roadway Type	Average Daily Traffic Volume (vehicles per day)			
		Existing	2040 Comp Plan AADT	Max Build AADT	Estimated Roadway Capacity
Mn Highway 41 (Northwest of railroad tracks)	2-Lane Undivided	18,200	22,900	28,700	14,000 – 15,000
County Road 78 (Between Emery Way to CR 77)	2-Lane Undivided	5,200	8,000	12,700	8,000 – 10,000
County Road 69 (Between US 169 and CR 78)	2-Lane Undivided	1,300	5,500	9,500	8,000 – 10,000
County Road 15 (Between CR 16 and CR 78)	2-Lane Undivided	4,600	11,600	13,800	8,000 – 10,000

With the anticipated development growth in the region, the increase in high-volume access points, and the conflicting volumes identified in the traffic forecasts, CR 78, CR 69, and CR 15 are anticipated to operate similarly to an urbanizing rural segment from a planning-level capacity perspective. Therefore, the capacity for these roadways is anticipated to be less than the Mn Highway 41 segment, which has limited- to no-access over the bridge. Mn Highway 41 is currently identified in the *Scott County Comprehensive Plan* as being over capacity with the existing roadway type and is expected to be significantly over capacity under both the 2040 Comp Plan and Max Build AUAR scenarios. The CR 78 and CR 15 corridors are anticipated to be near/at capacity as a 2-lane undivided roadway under the 2040 Comp Plan scenario, while CR 69 is only expected to be near/at capacity under the Max Build scenario. These findings are consistent with the land use assumptions, as less development is assumed in Subdistricts B and D under the 2040 Comp Plan scenario versus the Max Build scenario.

2040 Comp Plan Scenario Conditions

The 2040 Comp Plan scenario conditions were reviewed to understand how the transportation system study area would be expected to operate. The following information summarizes the 2040 Comp Plan scenario conditions.

Assumptions

The existing roadway network along with the following assumptions were included as part of the intersection capacity analysis:

- The US 169/Mn Highway 41/CR 78 interchange project was completed, including a four-lane divided roadway that extends beyond the Emery Way intersection.
- All new access locations are assumed to have a left-turn lane and a shared thru/right-turn lane configuration, including the Subdistrict A/B North and South Access (CR 16) and the westbound 128th Street approach at CR 15.

Intersection Capacity Analysis

Results of the 2040 Comp Plan scenario intersection capacity analysis, shown in Table 6, indicates that several study intersections are expected to operate at overall LOS E or LOS F during the weekday a.m. and p.m. peak hours based on the assumptions identified. The issues and mitigation for the 2040 Comp Plan scenario are summarized in Table 7. Note that the mitigation identified represents the minimum mitigation needed to provide acceptable operations; additional improvements would be expected to further improve operations. An illustrative summary of the 2040 Comp Plan scenario peak hour operations before mitigation is shown in Figure 8, while an illustrative mitigation summary is presented in Figure 9.

Table 6. 2040 Comp Plan Scenario - Intersection Capacity Analysis

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
MN 41				
MN 41/Rail Frontage ⁽¹⁾	C/F	>3 min	F/F	>3 min
MN 41/Dem Con Drive	E	67 sec.	E	67 sec.
CR 78				
CR 78/Emery Way ⁽¹⁾	A/C	16 sec.	A/B	13 sec.
CR 78/CR 69 ⁽¹⁾	A/C	19 sec.	B/E	42 sec.
CR 78/CR 73 ⁽¹⁾	A/A	9 sec.	A/A	9 sec.
CR 78/CR 15 ⁽²⁾	C	17 sec.	F	63 sec.
CR 78/CR 77 ⁽¹⁾	A/A	8 sec.	A/A	8 sec.
CR 78/CR 79 ⁽²⁾	F	63 sec.	F	83 sec.
CR 69				
CR 69/10th Avenue W ⁽¹⁾	A/B	12 sec.	A/C	21 sec.
CR 69/Chaparral Avenue ⁽¹⁾	A/A	6 sec.	A/A	7 sec.
CR 69/Vierling Drive ⁽¹⁾	A/B	12 sec.	A/C	23 sec.
CR 69/US 169 North Ramp ⁽¹⁾	A/A	10 sec.	A/B	14 sec.
CR 69/US 169 South Ramp ⁽¹⁾	A/A	9 sec.	A/C	18 sec.
CR 69/Subdistrict A/B North Access ⁽¹⁾	A/A	9 sec.	A/A	8 sec.
CR 69/CR 16/Subdistrict A/B South Access ⁽¹⁾	A/A	7 sec.	A/A	9 sec.
Marystown Rd/CR 15				
Marystown Rd/US 169 North Ramp ⁽¹⁾	C/F	51 sec.	F/F	>3 min
Marystown Rd/US 169 South Ramp ⁽¹⁾	F/F	>3 min	F/F	>3 min
CR 15/CR 16 ⁽¹⁾	F/F	>3 min	E/F	~2.5 min
CR 15/128th Street W ⁽¹⁾	A/A	8 sec.	A/C	17 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 all-way stop control intersection.

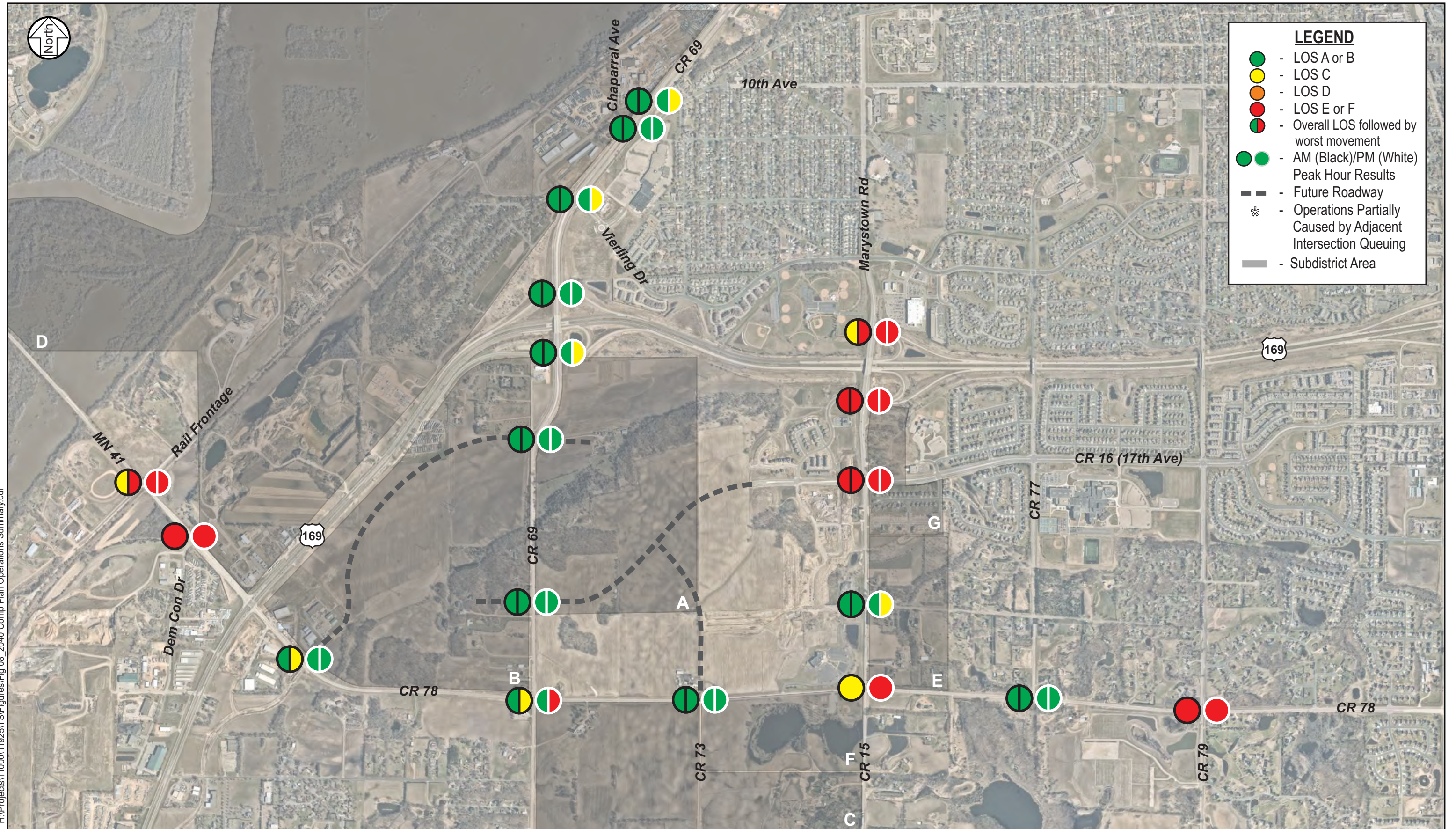
Table 7. 2040 Comp Plan Scenario - Issue and Mitigation Summary

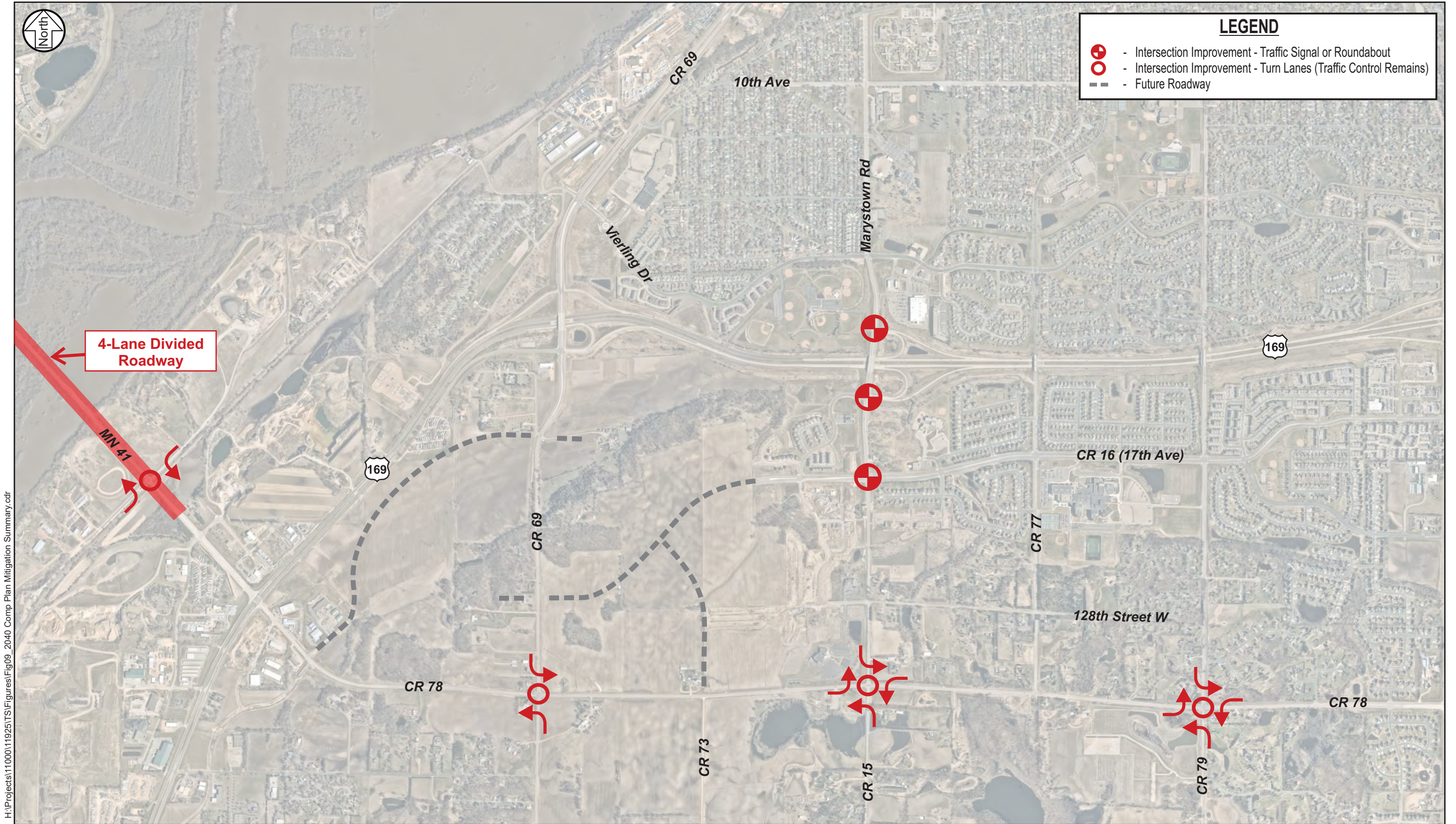
Issue	Mitigation
MN 41/Rail Frontage	
- As mentioned previously in the Planning-Level Review, this segment is over capacity for a two-lane undivided roadway - As mentioned under existing conditions, the lane reduction northwest of Dem Con Drive causes poor lane utilization at the intersection; as volumes increase, this lane imbalance causes issues at the Dem Con Drive signalized intersection - Side-street delays at the MN 41/Rail Frontage intersection are expected to be greater than three (3) minutes	- Construct a 4-Lane Divided Roadway with turn lanes along Mn Highway 41 - Construct left-turn lanes at the side-street approaches, with potential for future signalization - Monitor and consider signalization when development occurs/signal warrants are met
CR 78/CR 69	
Southbound approach is expected to operate at LOS E during the p.m. peak hour with 95th percentile queues of 350 feet	Construct left-turn lanes at the side-street approaches, with potential for future signalization or roundabout
CR 78/CR 15 and CR 78/79	
Intersections are expected to operate as LOS F during the p.m. peak hour	Construct left-turn lanes on all approaches
Marystown Road/US 169 Ramps and CR 15/CR 16	
All intersection side-streets are expected to operate as an overall LOS F during the a.m. and/or p.m. peak hour, with delays greater than three (3) minutes	- Construct traffic signal or roundabout ⁽¹⁾ - For signalization, consider converting the shared thru/left and right-turn lane configuration at the US 169 Ramps to a left- and shared thru/right-turn lane configuration

(1) Roundabout configuration is identified as a potential future project in the City of Shakopee's *Capital Improvement Plan 2019-2023* for the Marystown Road/US 169 Ramp intersections, however, no funding has been identified. These intersections are being further evaluated as part of the *Marystown Road Corridor Study*. Further discussion with area stakeholders will occur as part of the study to determine the appropriate future traffic control.

Based on the mitigation identified, the 2040 Comp Plan scenario intersection capacity results with mitigation are shown in Table 8, while detailed analysis results are shown in the Appendix. Note that while the MN 41/Rail Frontage intersection operates as an overall LOS A, the side-street delays are up to one (1) minute, which is common in the metro area for low-volume side-streets. It is recommended to continue to monitor the intersection queues/delays and as development occurs to identify if traffic signal warrants are met and construct a traffic signal when necessary. The CR 78/CR 79 intersection is anticipated to operate at an acceptable overall LOS D during both the a.m. and p.m. peak hours with an all-way stop control. While, the 95th percentile queues are expected to be approximately 500 feet for the westbound movement in the a.m. peak hour and 600 feet for the eastbound movement in the p.m. peak hour, the average queues of these movements are expected to be approximately 250 feet or less. The intersection queues and delays should continue to be monitored to determine if/when a traffic signal or roundabout should be installed.

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Table 8. 2040 Comp Plan Scenario Intersection Capacity Analysis – With Mitigation

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
MN 41				
MN 41/Rail Frontage ⁽¹⁾	A/E	37 sec.	A/F	63 sec.
MN 41/Dem Con Drive	B	16 sec.	B	15 sec.
CR 78				
CR 78/Emery Way ⁽¹⁾	A/C	16 sec.	A/B	13 sec.
CR 78/CR 69 ⁽¹⁾	A/C	16 sec.	A/C	17 sec.
CR 78/CR 73 ⁽¹⁾	A/A	9 sec.	A/A	10 sec.
CR 78/CR 15 ⁽²⁾	B	15 sec.	C	17 sec.
CR 78/CR 77 ⁽¹⁾	A/A	7 sec.	A/A	9 sec.
CR 78/CR 79 ⁽²⁾	D	27 sec.	D	32 sec.
CR 69				
CR 69/10th Avenue W ⁽¹⁾	A/B	12 sec.	A/C	22 sec.
CR 69/Chaparral Avenue ⁽¹⁾	A/A	4 sec.	A/A	8 sec.
CR 69/Vierling Drive ⁽¹⁾	A/B	13 sec.	A/D	26 sec.
CR 69/US 169 North Ramp ⁽¹⁾	A/A	10 sec.	A/B	14 sec.
CR 69/US 169 South Ramp ⁽¹⁾	A/A	9 sec.	A/B	15 sec.
CR 69/Subdistrict A/B North Access ⁽¹⁾	A/A	9 sec.	A/A	9 sec.
CR 69/CR 16/Subdistrict A/B South Access ⁽¹⁾	A/A	6 sec.	A/A	8 sec.
Marystown Rd/CR 15				
Marystown Rd/US 169 North Ramp ⁽³⁾	A	6 sec.	A	8 sec.
Marystown Rd/US 169 South Ramp ⁽³⁾	A	7 sec.	A	8 sec.
CR 15/CR 16 ⁽³⁾	A	8 sec.	A	9 sec.
CR 15/128th Street W ⁽¹⁾	A/A	9 sec.	A/B	14 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 all-way stop control intersection.

(3) Indicates an Intersection with roundabout control and was analyzed using HCS 7.

CR 78 4-Lane Divided Sensitivity Test

The *Scott County 2040 Comprehensive Plan* identifies CR 78 as a potential roadway functional classification switch to a Principal Arterial. If the roadway is classified as a Principal Arterial, the roadway is likely to be planned to be reconstructed to a 3-lane or 4-lane divided roadway, to fit more in line with the functional classification. As mentioned previously, the mitigations identified in this study identify the minimum mitigation needed. The high-level planning review and intersection capacity analysis mitigation identified a need for left-turn lanes along CR 78 at both the CR 15 and CR 79 intersections. This essentially identifies a need for a 3-lane divided roadway within this segment of CR 78.

To understand the intersection needs if a 4-lane CR 78 facility were implemented, a sensitivity test was performed. The sensitivity test reviewed CR 78 as a 4-lane divided roadway with turn lanes; the all-way stop control at the CR 78/CR 15 and CR 78/CR 79 intersections were switched to north/south side-street stop for analysis purposes. The results of this sensitivity test, shown in Table 9, indicates that with a 4-lane divided section, traffic signals or roundabouts⁽²⁾ would likely need to be included to accommodate p.m. peak hour operations along the CR 78 corridor.

Table 9. CR 78 Sensitivity Test (4-lane divided roadway)

CR 78 Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
CR 69 ⁽¹⁾	A/C	18 sec.	C/E	48 sec.
CR 15 ⁽¹⁾	B/E	36 sec.	D/F	78 sec.
CR 79 ⁽¹⁾	A/B	14 sec.	C/F	63 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; delay shown represents the worst side-street approach.

(2) CR 78 is designated as a future principal arterial roadway in the 2040 Scott County Comprehensive Plan, which states that roundabouts are not appropriate for urban principal arterial roadways. However, roundabouts may be feasible and/or desirable in these locations and further discussion with area stakeholders should occur to determine the appropriate traffic control.

Max Build Scenario Conditions

The Max Build scenario was reviewed to understand how the transportation system study area would be expected to operate if the study area TAZ's were to fully develop based on the land use and zoning potential from the City of Shakopee. It should be noted that the Max Build evaluation is meant to be a planning tool and the improvements identified in this section are to be considered potential improvements if current development plans and traffic volumes materialize. The following information summarizes the Max Build scenario.

Assumptions

The following assumptions were included as part of the intersection capacity analysis:

- The US 169/Mn Highway 41/CR 78 interchange project was completed, including a four-lane divided roadway that extends beyond the Emery Way intersection.
- All new access locations are assumed to have left-turn and shared thru/right-turn lane configurations, including the Subdistrict A/B North and South Access (CR 16) and the westbound 128th Street approach at CR 15.
- All of Mn Highway 41 is a four-lane divided roadway with turn lanes, and left turn lanes are provided on the Rail Frontage side-street approaches.
- Hybrid roundabouts at the Marystown Road/US 169 Ramp intersections and the CR 15/CR 16 intersection. ⁽¹⁾
- Left-turn lanes on all approaches at the CR 78/CR 69, CR 78/CR 15, and CR 78/CR 79 intersections.

(1) The Marystown Road Corridor Study is evaluating these intersections to determine the appropriate traffic control. For the purpose of this study, roundabouts were assumed for these intersections.

Intersection Capacity Analysis

Results of the Max Build scenario intersection capacity analysis, shown in Table 10, indicates that several study intersections are expected to operate at an overall LOS E or LOS F during the weekday a.m. and p.m. peak hours based on the assumptions identified. The issues and mitigation for the Max Build scenario are summarized in Table 11. An illustrative summary of the Max Build scenario peak hour operations before mitigation is shown in Figure 10, while an illustrative mitigation summary is presented in Figure 11. The Max Build scenario intersection capacity results, including with mitigation, are shown in Table 12, while detailed analysis results are shown in the Appendix. It should be noted that the Max Build evaluation is meant to be a planning tool and the improvements identified in this section are to be considered potential improvements if current development plans and traffic volumes materialize.

Table 10. Max Build Scenario - Intersection Capacity Analysis

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
MN 41				
MN 41/Rail Frontage ⁽¹⁾	E/F	>3 min	F/F	>3 min
MN 41/Dem Con Drive	C	31 sec.	C	27 sec.
CR 78				
CR 78/Emery Way ⁽¹⁾	F/F	>3 min	F/F	> 3 min
CR 78/CR 69 ⁽¹⁾	F/F	>3 min	F/F	> 3 min
CR 78/CR 73 ⁽¹⁾	A/C	18 sec.	A/C	20 sec.
CR 78/CR 15 ⁽²⁾	F	64 sec.	F	~ 3 min
CR 78/CR 77 ⁽¹⁾	A/A	9 sec.	F/F ⁽⁴⁾	>3 min
CR 78/CR 79 ⁽²⁾	F	~2.5 min	F	>3 min
CR 69				
CR 69/10th Avenue W ⁽¹⁾	A/D	34 sec.	E/F	>3 min
CR 69/Chaparral Avenue ⁽¹⁾	A/B	11 sec.	A/D	26 sec.
CR 69/Vierling Drive ⁽¹⁾	B/E	39 sec.	F/F	>3 min
CR 69/US 169 North Ramp ⁽¹⁾	E/F	>3 min	E/F	~3 min
CR 69/US 169 South Ramp ⁽¹⁾	A/D	30 sec.	F/F	>3 min
CR 69/Subdistrict A/B North Access ⁽¹⁾	C/F	55 sec.	F/F	>3 min
CR 69/CR 16/Subdistrict A/B South Access ⁽¹⁾	A/C	17 sec.	F/F ⁽⁴⁾	>3 min
Marystown Road/CR 15				
Marystown Road/US 169 North Ramp ⁽³⁾	A	6 sec.	A	10 sec.
Marystown Road/US 169 South Ramp ⁽³⁾	A	9 sec.	A	10 sec.
CR 15/CR 16 ⁽³⁾	B	11 sec.	B	14 sec.
CR 15/128th Street W ⁽¹⁾	A/B	13 sec.	E/F ⁽⁴⁾	~2.5 min

(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 all-way stop control intersection.

(3) Indicates an intersection with roundabout control and was analyzed using HCS 7.

(4) Intersection operations are partially caused by adjacent intersection queueing

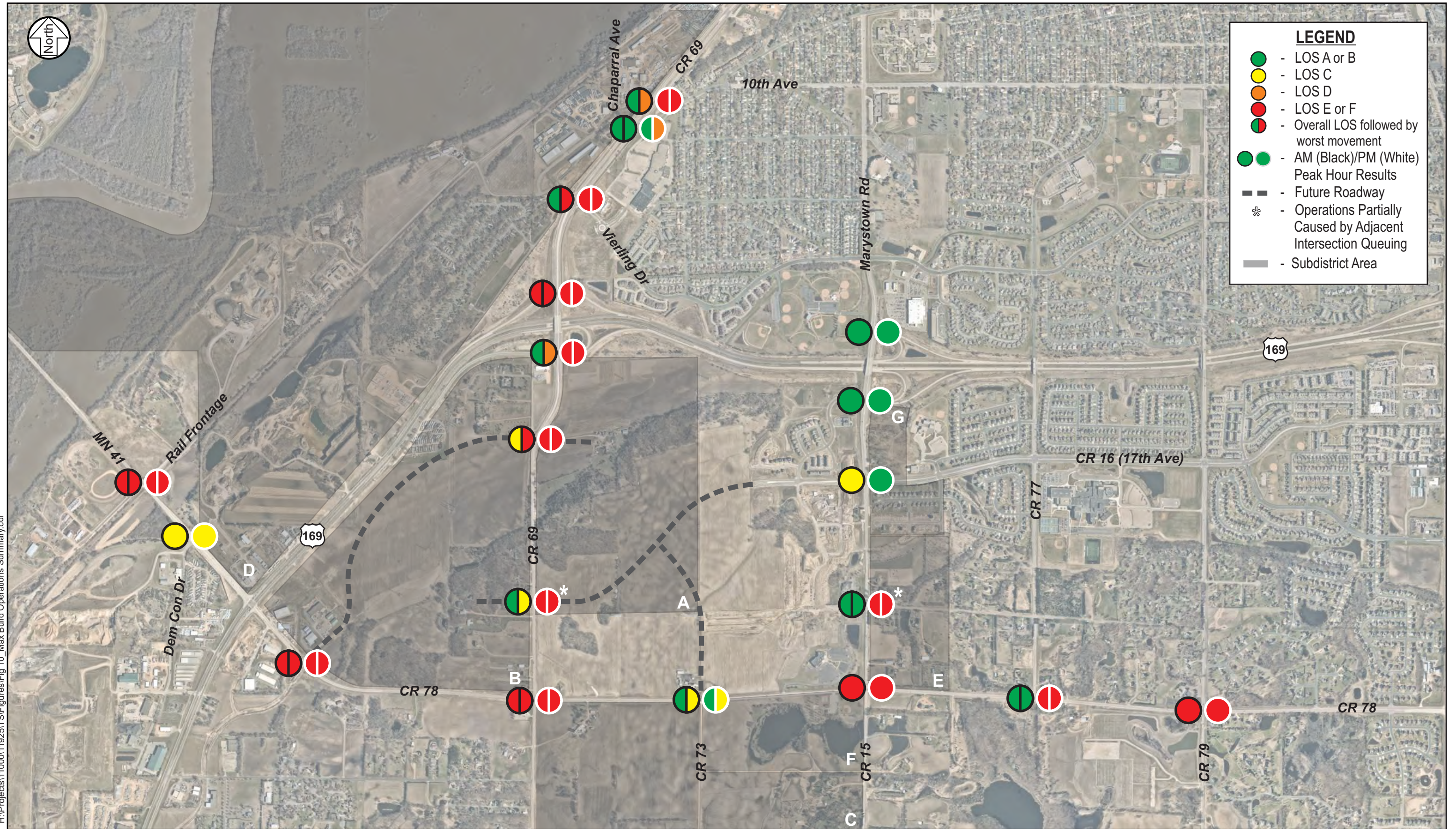
Table 11. Max Build Scenario - Issues and Mitigation Summary

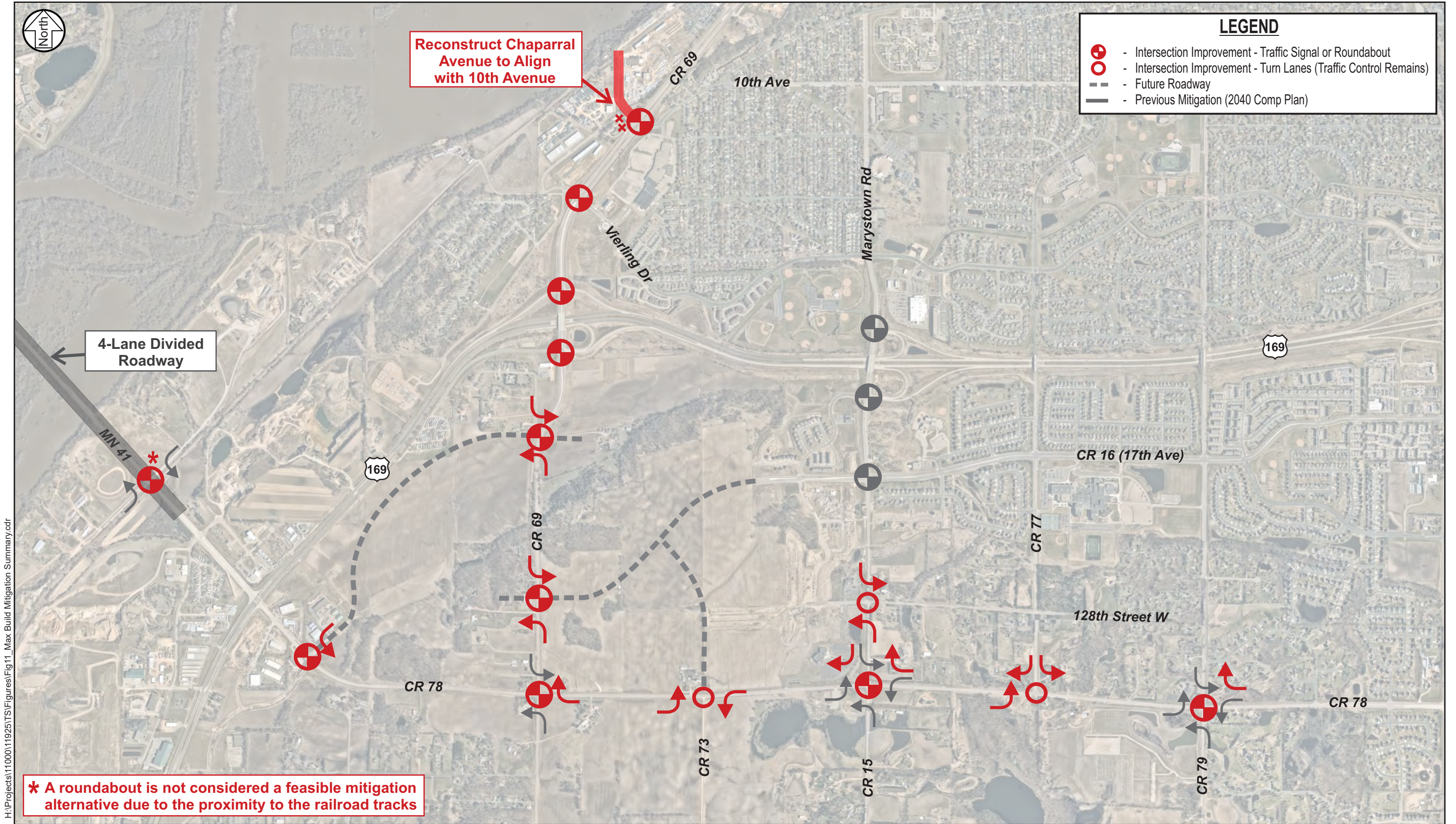
Issue	Mitigation
MN 41/Rail Frontage and CR 78/Emery Way	
Intersections are expected to operate at an overall LOS F during both the a.m. and p.m. peak hours, with side-street delays of greater than three (3) minutes	- Construct a traffic signal or roundabout - Construct a southbound left-turn lane at the Emery Way intersection - Roundabout not considered at rail frontage due to close proximity to railroad tracks
CR 78/CR 69 and CR 78/79	
- Intersections are expected to operate at an overall LOS F during both the a.m. and p.m. peak hours, with delays expected to be 2.5 minutes or greater - Intersection queues at the CR 78/CR 69 intersection are expected to extend into the CR 69/Subdistrict A/B South Access (CR 16), causing operational issues - Intersection queues at the CR 78/79 intersection are expected to extend into the CR 78/CR 77 intersection, causing operational issues	- Construct a traffic signal or roundabout ⁽¹⁾ - Construct a westbound right-turn lane to accommodate to the heavy westbound movement
CR 78/CR 15	
- Intersection is expected to operate at an overall LOS F during the a.m. and p.m. peak hours - Intersection queues are expected to extend into the CR 69/128th Street intersection, causing operational issues	- Construct a traffic signal or roundabout ⁽¹⁾ - Construct a southbound right-turn lane and a westbound right-turn lane
CR 78/CR 73	
- As identified in the high-level planning analysis, the CR 78 corridor is anticipated to be near capacity and a 3-lane section should be considered - Although not needed from an operation perspective, left-turn lanes should be provided from a safety perspective	Construct eastbound and westbound left-turn lanes
CR 78/CR 77	
- As identified in the high-level planning analysis, the CR 78 corridor is anticipated to be near capacity and a 3-lane section should be considered - Side-street approach is expected to operate as a LOS F during the p.m. peak hour	Construct a southbound right-turn lane and eastbound left-turn lane

(1) CR 78 is designated as a future principal arterial roadway in the 2040 Scott County Comprehensive Plan, which states that roundabouts are not appropriate for urban principal arterial roadways. However, roundabouts may be feasible and/or desirable in this location and further discussion with area stakeholders should occur to determine the appropriate future traffic control.

Issue	Mitigation
CR 69/10th Avenue and CR 69/Chaparral Avenue	
- As identified in the existing conditions, the following intersections do not meet access spacing guidelines - The CR 69/10th Avenue intersection is expected to operate at a LOS E during the p.m. peak hour, with side-street delays of three (3) minutes or greater	- Reconstruct Chaparral Avenue to align with 10th Avenue to create a 4-leg intersection - Construct a Traffic Signal or roundabout
CR 69/Vierling Drive and CR 69/US 169 North Ramp	
Intersections are expected to operate at an overall LOS E/LOS F during the a.m. and/or p.m. peak hours, with side-street delays of three (3) minutes or greater	Construct a traffic signal or roundabout
CR 69/US 169 South Ramp	
Intersection is expected to operate at an overall LOS F during the p.m. peak hour, with side-street delays of three (3) minutes or greater	- Construct traffic signal or roundabout. - If signalized, consider converting the shared thru/left-turn lane and right-turn lane configuration on the westbound approach to a left-turn lane and shared thru/right-turn lane configuration and provide a left-turn lane on the eastbound approach.
CR 69/Subdistrict A/B North Access & CR 69/Subdistrict A/B South Access (CR 16)	
- As identified in the high-level planning analysis, the CR 69 corridor is anticipated to be near capacity and a 3-lane section should be considered - Side-street operations are expected to operate at a LOS F during the p.m. peak hour, with side-street delays of three (3) minutes or greater	- Construct a northbound and southbound left-turn lane on CR 69 - Construct a traffic signal or roundabout
CR 15/128th Street	
- As identified in the high-level planning analysis, the CR 15 corridor is anticipated to be near capacity and a 3-lane section should be considered - Side-street approach is expected to operate as a LOS F during the p.m. peak hour	Construct a northbound and southbound left-turn lane on CR 15

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Table 12. Max Build Scenario Intersection Capacity Analysis – With Mitigation

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
<i>MN 41</i>				
MN 41/Rail Frontage	B	16 sec.	B	15 sec.
MN 41/Dem Con Drive	C	27 sec.	C	23 sec.
<i>CR 78</i>				
CR 78/Emery Way	B	16 sec.	B	13 sec.
CR 78/CR 69	B	20 sec.	C	30 sec.
CR 78/CR 73 ⁽¹⁾	A/C	24 sec.	A/D	26 sec.
CR 78/CR 15	C	23 sec.	C	25 sec.
CR 78/CR 77 ⁽¹⁾	A/B	11 sec.	B/D	29 sec.
CR 78/CR 79	B	14 sec.	C	24 sec.
<i>CR 69</i>				
CR 69/10th Avenue W/Chaparral Avenue	A	6 sec.	A	10 sec.
CR 69/Vierling Drive	A	9 sec.	B	12 sec.
CR 69/US 169 North Ramp	A	9 sec.	B	11 sec.
CR 69/US 169 South Ramp	A	8 sec.	B	13 sec.
CR 69/Subdistrict A/B North Access	B	14 sec.	B	15 sec.
CR 69/CR 16/Subdistrict A/B South Access	B	12 sec.	B	15 sec.
<i>Marystown Road/CR 15</i>				
Marystown Road/US 169 North Ramp ⁽³⁾	A	6 sec.	A	10 sec.
Marystown Road/US 169 South Ramp ⁽³⁾	A	9 sec.	A	10 sec.
CR 15/CR 16	C	22 sec.	B	20 sec.
CR 15/128th Street W ⁽¹⁾	A/B	13 sec.	A/C	23 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 all-way stop control intersection.

(3) Indicates an intersection with roundabout control and was analyzed using HCS 7.

Proposed Interchange Planning Level Review

Although not a study intersection, it is important to understand if the current proposed US 169 and MN 41/CH 78 interchange configuration can accommodate the forecasted traffic volumes. Therefore, a planning-level review was conducted for the proposed Diverging Diamond Interchange (DDI) using a combination of Synchro/SimTraffic and Cap-X. Results of the analysis indicated that the DDI is expected to operate under capacity with the future Max Build traffic volumes. No operational issues are anticipated, and the current interchange design is reasonable.

Summary

The following information provides a summary of the analysis performed as part of the Shakopee AUAR Transportation Analysis:

- Seventeen (17) study intersections were identified in the study area and analyzed utilizing Synchro/SimTraffic to establish a baseline condition.
- The following AUAR scenarios were identified for future operations analysis:
 - The “2040 Comp Plan”, which includes land use and staging assumptions consistent with both the *Scott County 2040 Comprehensive Plan* and the *City of Shakopee 2040 Comprehensive Plan*. This scenario is considered equivalent to the no-build alternative.
 - The “Max Build” scenario, which includes land uses consistent with the City of Shakopee’s full build out potential based on feasible development.
- Traffic forecasts from the 2040 Scott County Comprehensive Plan were used for the 2040 Comp Plan scenario. The Scott County Regional Travel Demand Model and socio-economic data was utilized to develop the Max Build Scenario forecasts.
- All future forecasts and traffic analysis included the following planned improvements:
 - DDI interchange at MN 41 and US 169 (currently under construction)
 - East Frontage Road from CR 78 to CR 14 (currently under construction)
 - CR 16 extension to CR 69 (developer driven and funded – only partial City/County funding)
- Detailed intersection capacity analysis was completed for the 2040 Comp Plan and Max Build scenarios using Synchro/SimTraffic and mitigation was developed for each scenario.
- Based on the findings within this study, the area transportation network is expected to be able to support the potential development with the implementation of the mitigation identified for the respective AUAR scenarios.