Attachment 9: Traffic Impact Study and Addendums

The traffic study and addendums are included in the following order:

This attachment includes the following technical reports and addenda prepared by SFR Consulting Group, Inc.:

1. Merriam Junction Sands Facilities Louisville Township, Scott County Traffic Impact Study May 26, 2016
2. Addendum 1: May 26, 2016 Merriam Junction Sands Facilities Traffic Study Addendum Potential Cumulative Effects Analysis
3. Addendum 2: April 24, 2019 Merriam Junction Sands Facilities – Traffic Impact Study In response to March 13,2018 technical review comments.

In addition, incorporated by reference is the traffic impact study that was included as an attachment to the Environmental Assessment Worksheet prepared for the US169/TH41/CSAH78/CSAH114 interchange project for which Scott County was the proposer and MnDOT was the RGU, and the June 9, 2017 Negative declaration regarding the need for an Environmental Impact Statement and Findings of Fact and Conclusions, which are both incorporated by reference. The EAW includes a statement of need, traffic forecasting, existing conditions and no build conditions and build alternatives, including an evaluation of the chosen alternative which update and supplement the attached Traffic Impact Study and addendums.

1. Merriam Junction Sands Facilities Traffic Impact Study

Merriam Junction Sands Facilities

Louisville Township, Scott County

Traffic Impact Study

Prepared for

Merriam Junction Sands, Inc.

SRF Consulting Group, Inc. | Engineers Planners Designers

May 26, 2016

SRF No. 0157741.01

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Introduction

This Traffic Impact Study (TIS) was prepared for the existing and proposed Merriam Junction Sands mining and processing facility located generally south of TH 41 and west of TH 169 in in Louisville Township, Scott County (see Figure 1). This TIS documents the impacts to the area transportation system associated with the proposed Merriam Junction Sands Facility development.

Project Description

Merriam Junction Sands, Inc. (MJS) proposes to develop approximately 682 acres of land for nonmetallic mineral mining and processing operations. Mining and processing operations include: stripping, blasting, dewatering, extraction, washing, drying, screening, truck and rail loadout and phased reclamation.

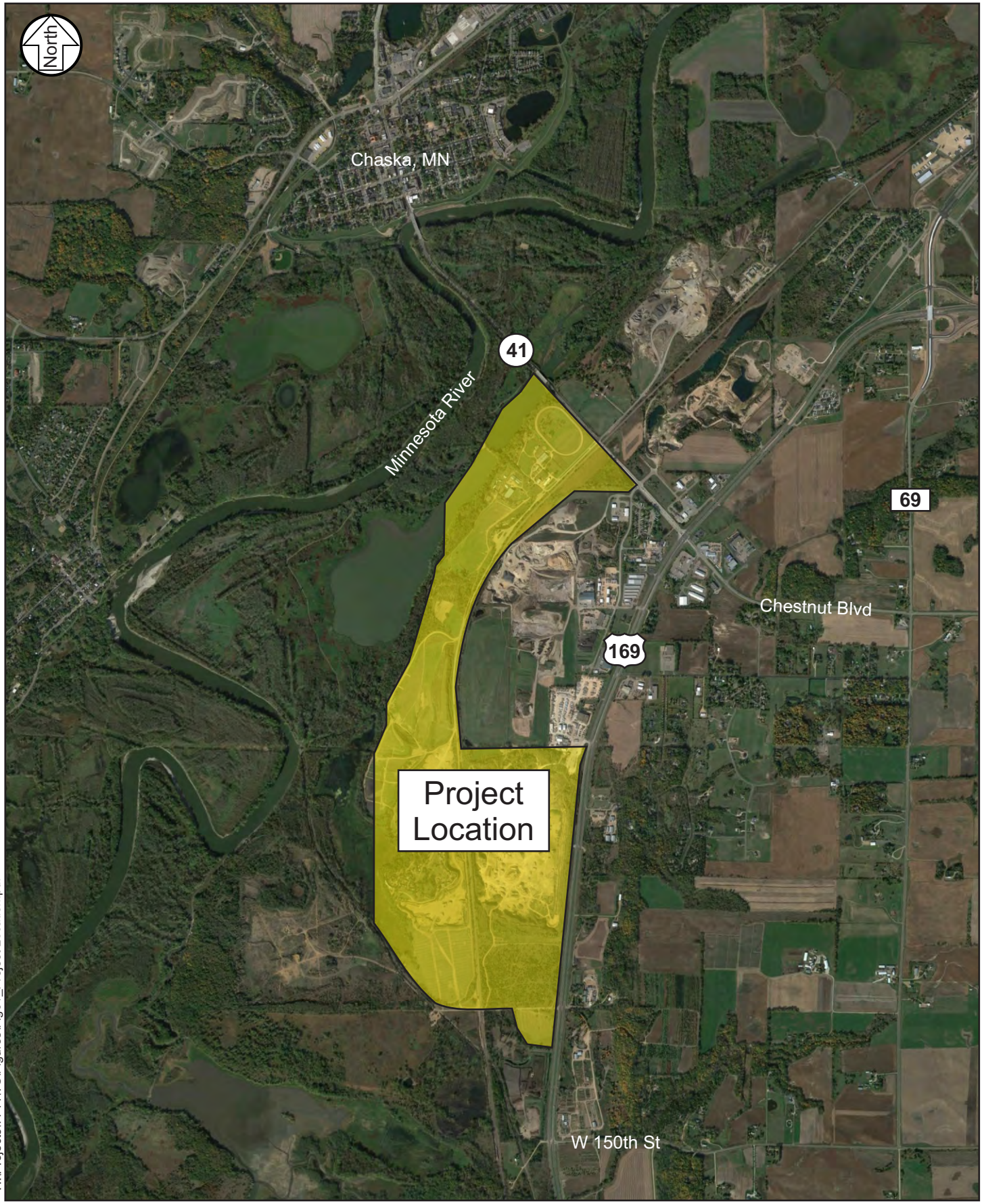
MJS (Proposer) is seeking to continue existing sand, gravel and limestone mining and processing and establish new sandstone/silica sand mining of the Jordan Sandstone, and associated processing facilities (Project) on several adjacent parcels of land located in Louisville Township, Scott County (Site). Some of the parcels have been mined in the past, some are currently mined and some have not been mined. Several of the parcels have current non-mining uses. The Project includes mining, processing, loading and site reclamation. The following information in Table 1 provides a summary description of the Site and Project related existing and proposed activities. It should be noted that the proposed increase in limestone and sand and gravel production is simply to accommodate projected market demand. It does not represent an expansion of the existing use. Past limestone production has exceeded 1.5 million tons per year from these properties. Existing Conditions are a reflection of the current market conditions.

Table 1: Project Elements Summary

Type of Use	Existing Conditions	Proposed Conditions
Limestone Mining, Processing and Transport	1.0 million tons/year	1.5 million tons/year
Sand and Gravel Mining, Processing and Transport	150,000 tons/year	450,000 tons/year
Sandstone Mining, Processing and Transport	---	2.4 million tons/year

Mining on the Project parcels in the past has included the production of sand, gravel and limestone/dolomite. The Project involves the continuation of the production of construction aggregates from the sand and gravel and limestone deposits as well as mining silica sand[1] associated with the Jordan Sandstone, which underlies the sand and gravel and limestone deposits. The TIS will evaluate the potential impacts of truck transport of processed silica sand from the Site and include an evaluation of potential impacts to the existing roadways, access points and present potential mitigation measures.

[1] Sand and gravel mined, processed and sold as construction aggregates is referred to as "sand and gravel" throughout. Sand from mining sandstone that is processed and sold as fracturing sand, or other uses such as foundry or glass manufacturing is referred to as "sand" or "silica sand" throughout.



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Project Location

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Figure 1

The TIS will take into consideration the existing truck transport as well as vehicles related to Renaissance Festival. The TIS will include specific evaluations of each of the proposed access points, timing proposed for each as well as maximum truck numbers anticipated at each point of the Project.

Sand, gravel and limestone materials are currently transported from the Malkerson Sales property (see Figures 2 and 3) to TH 41 on a paved internal haul road. A scale and scale house are located in the northern portion of the Malkerson Sales property. There is also a southern access to 145th Street that is used only occasionally for aggregate hauling, for example when there is a job to the south of the Site, empty trucks may enter the Site from 145th Street. The trucks are loaded and then exit over the scale and out to TH 41. (This access is used primarily to manage Renaissance Festival traffic.)

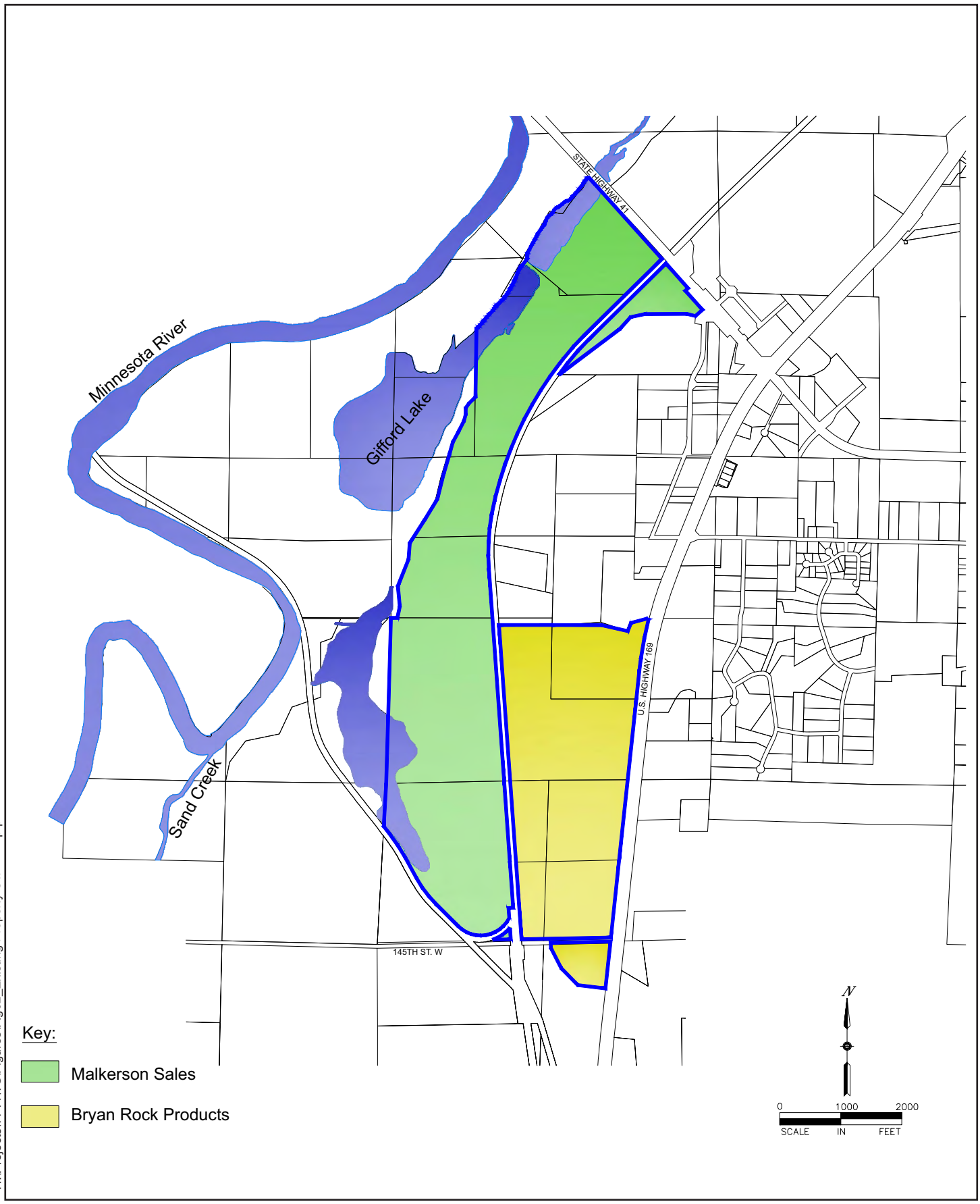
Limestone materials from the Bryan Rock property (see Figures 2 and 3) are transported by truck from the Site onto TH 169. There are a scale and scale house and Site access located on the northern end of the property. This access is shared with Anchor Block, the property owner to the north. Bryan Rock also has two points of access onto 145th Street. One access to the property is north of 145th Street West and is used occasionally to haul aggregates, in situations similar to the above description for the Malkerson Sales property. The other access to the property is south of 145th Street. Access locations are illustrated on Figure 2, Existing Site Features.

It is anticipated that the majority of silica sand will be transported from the Site by rail. The UP railroad owns the mainline track that runs adjacent to and through the Site. Rail yard and rail load-out facilities will be constructed as part of the Project. Improvements will include construction of switches from the mainline and spur lines to accommodate unit trains up to 100 cars. The rail load-out facilities will allow the transport of up to 2.4 million tons of sand annually. However, due to the potential for market changes and final product destinations, sand may be hauled by truck to a barge or rail transloading facility or to the final market.

The TIS will include a worst case scenario (Scenario A) in which it will be assumed that all of the processed silica sand will be transported from the Site by truck. A second more likely scenario (Scenario B) will be included in which it will be assumed that 10 percent of the processed sand will be transported by truck and 90 percent by rail car in unit trains.

There are a total of six site configuration alternatives and a No Build alternative being studied in the EIS that evaluate different plant locations and capacities. The various site alternatives result in different traffic patterns depending upon which plant sites are developed. Three individual Site Access Options and the No Build alternative were identified to be studied in the TIS. These three Site Access Options and the No Build alternative simplify, yet adequately represent traffic impacts associated with the various alternatives. (See Future Conditions Section for further Site Access Option descriptions) The number of alternatives is necessary to provide flexibility as the Project moves forward and takes into consideration potential changes in the sand market. It is anticipated that the market will undergo a number of changes throughout the life of the Project. Today's end markets may be located in other areas of the country than the markets 20 years from now.

Silica sand mining operations that will be economically viable in the future must be able to adapt to evolving market conditions. The alternatives identified in this report reflect maximum plant capacity at full build out to capture worst-case analysis in the TIS.



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Existing Property Ownership

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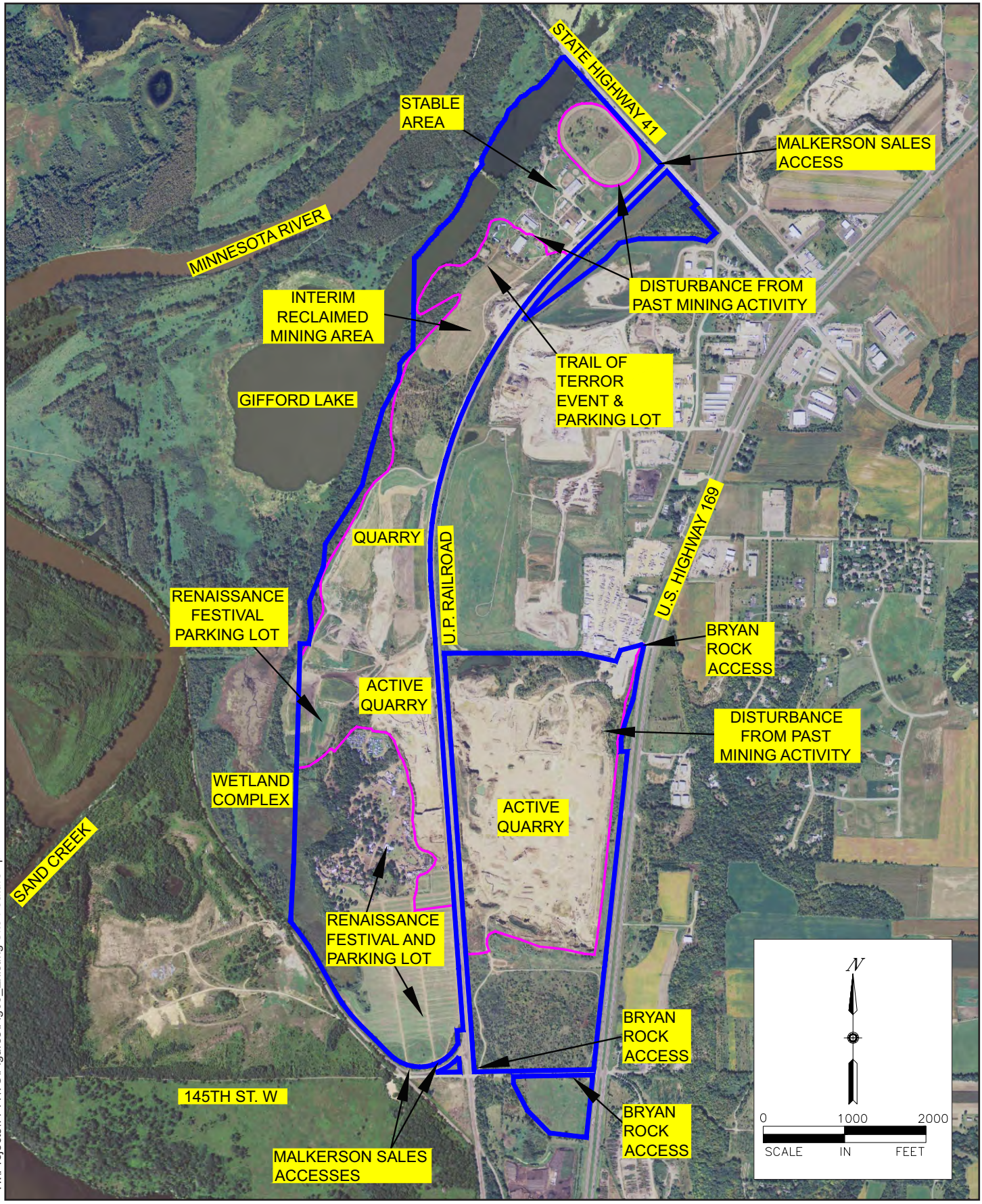
Figure 2



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Existing Site Features

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Figure 3

Disclosure of Transportation Impacts

This section of the TIS summarizes and describes the transportation impacts associated with the Project.

Traffic Operations

Existing Conditions

Data Collection

To determine the impact of the Project to the adjacent roadway network, existing operations were evaluated within the area. Vehicular a.m. and p.m. peak period counts were obtained from MnDOT and/or collected by SRF at the following intersections:

- TH 169/TH 41
- TH 169/Bryan Rock Site Access
- TH 41/Dem-Con Drive
- TH 169/130th Street
- TH 169/145th Street
- TH 41/Malkerson Sales Site Access

In addition to the intersection turning movement counts, observations were completed to identify roadway characteristics within the study area. The following information summarizes the observations.

TH 169 is a two-way four-lane divided north/south Principal Arterial. No parking is allowed on either side of the roadway within the study area. The year 2012 average daily traffic (ADT) volume was 29,500 vehicles per day (vpd) north of TH 41 and 28,000 vehicles per day (vpd) south of TH 41.

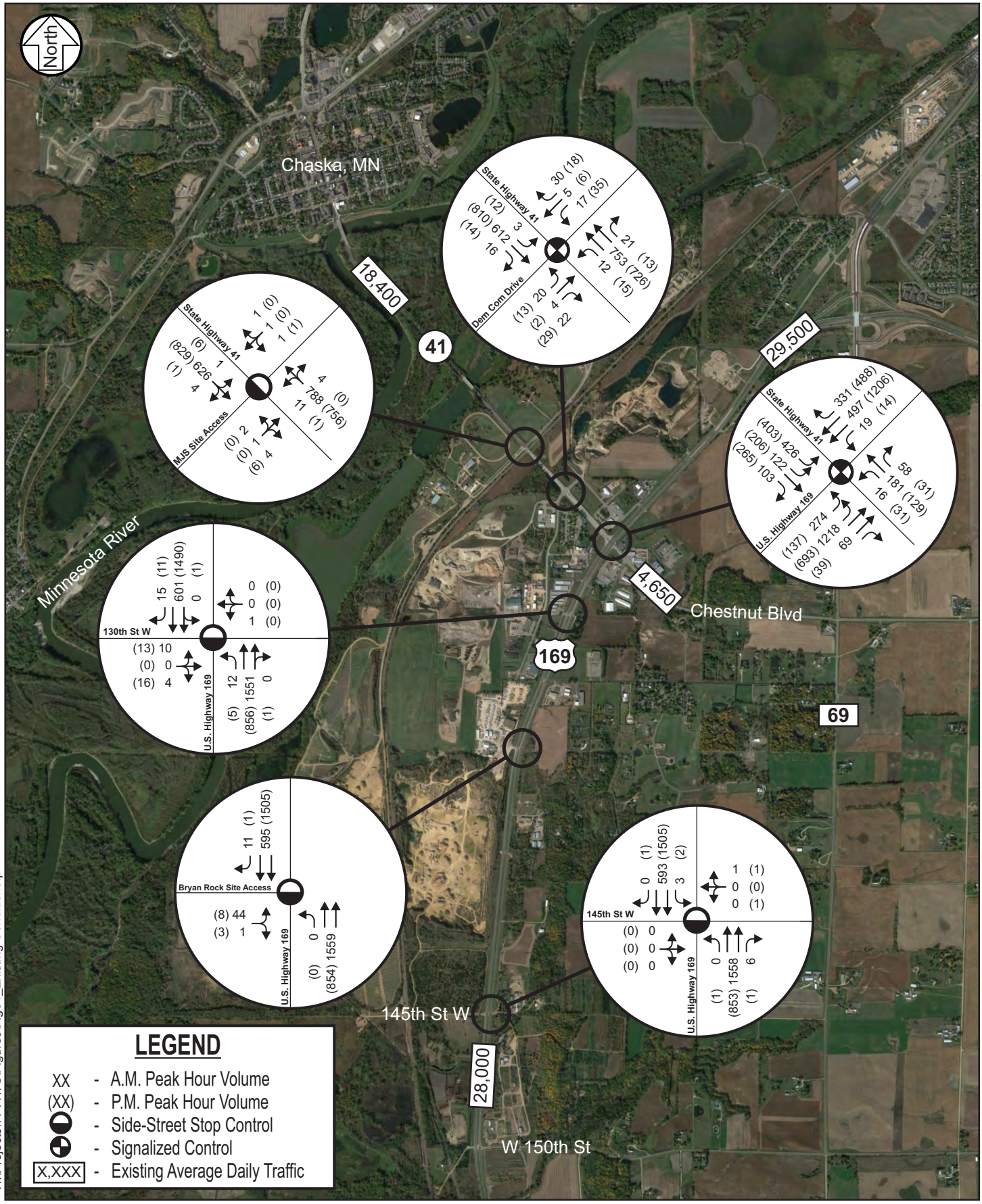
TH 41 is a two-way multi-lane divided "A" Minor Arterial roadway transitioning to a two-lane undivided "A" Minor Arterial roadway. No parking is allowed on either side of the roadway. The year 2012 ADT volume west of TH 169 was 18,400 vpd.

CSAH 78 is a two-way four-lane divided transitioning to a two-lane undivided "A" Minor Arterial roadway. No parking is allowed on either side of the roadway. The year 2012 ADT volume east of TH 169 was 4,650 vpd.

130th Street and 145th Street are two-way two-lane local roadways. Parking is not restricted on either side of either roadway. No published ADT volumes are available for these segments. The current ADT volume within the study area is estimated at 630 vpd on 130th Street west of TH 169 and 30 vpd on 145th Street west of TH 169.

Dem-Con Drive is a two-way multi-lane local roadway at TH 41 and transitions to a two-way two-lane local roadway north and south of the intersection area. No parking is allowed on either side of the roadway. No published ADT volumes are available for this segment. The current ADT volume within the study area is estimated at 1,920 vpd north of TH 41 and 1,480 south of TH 41.

The posted speed limit along TH 169, TH 41 and CSAH 78 within the study area is 55 miles per hour. Speed limits on 130th Street, 145th Street and Dem-Con Drive are not posted, but are assumed at the statutory 30 miles per hour (mph). Existing geometrics, traffic control, and peak hour volumes within the study area are shown in Figure 3.



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Existing Conditions

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Figure 4

Traffic Safety/Crash Analysis

Based on available crash data in the Minnesota Crash Mapping Analysis Tool (MnCMAT) for the three-year period from year 2012 through year 2014, there were a total of 87 reported crashes at the six study intersections. A summary of the crash data by location is as follows:

- TH 169/TH 41: 52 crashes reported; one involved serious injury, two involved minor injury, 11 involved possible injury and 38 involved property damage only.
- TH 169/130th Street: Nine crashes reported; one involved possible injury and eight involved property damage only.
- TH 169/Bryan Rock Site Access: No crashes reported.
- TH 169/145th Street: Four crashes reported; one involved minor injury, two involved possible injury and one involved property damage only.
- TH 41/Dem-Con Drive: 11 crashes reported; six involved possible injury and five involved property damage only.
- TH 41/Malkerson Sales Site Access: Four crashes reported; two involved possible injury and two involved property damage only.

The rates at which crashes are occurring at most of the study intersections are below critical crash rates for similar intersections. This indicates that roadway conditions at most of the study intersections are not likely factors contributing to the crashes. However, the rate at which crashes are occurring at the TH 169/TH 41 intersection is above the critical crash rate for similar intersections. Therefore, it is concluded that there is an existing traffic safety problem at the TH 169/TH 41 intersection. This traffic safety issue will be further discussed later in this report.

Existing Intersection Capacity Analysis

An existing intersection capacity analysis was completed to establish a baseline condition to which future traffic operations could be compared. The study intersections were analyzed using a combination of Synchro/SimTraffic software (V8.0) and the *Highway Capacity Manual* (HCM).

Capacity analysis results identify a Level of Service (LOS) that indicates how well an intersection is operating. Intersections are ranked 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 - LOS D is generally considered acceptable in urban areas.

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 (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 intersection capacity analysis shown in Table 3 indicate that all of the study intersections currently operate at an acceptable overall LOS D or better during the a.m. and p.m. peak hours. However, it should be noted that the TH 169/TH 41 intersection is approaching an unacceptable LOS E during the p.m. peak hour. This TH 169/TH 41 intersection operational condition will be further discussed later in this report.

Table 3: Existing Intersection Capacity Analysis

Intersection	Level of Service (LOS)	
	A.M. Peak Hour	P.M. Peak Hour
TH 169/TH 41(1)	D	D
TH 169/130th Street(2)	A/F	A/E
TH 169/Bryan Rock Products Site Access(2)	A/D	A/D
TH 169/145th Street(2)	A/C	A/C
TH 41/Dem-Con Drive(1)	B	B
TH 41/Malkerson Sales Site Access(2)	A/E	A/F

(1) A signalized intersection with the overall LOS shown.

(2) An unsignalized intersection with all-way or side-street stop control, the overall LOS is shown followed by the worst approach LOS.

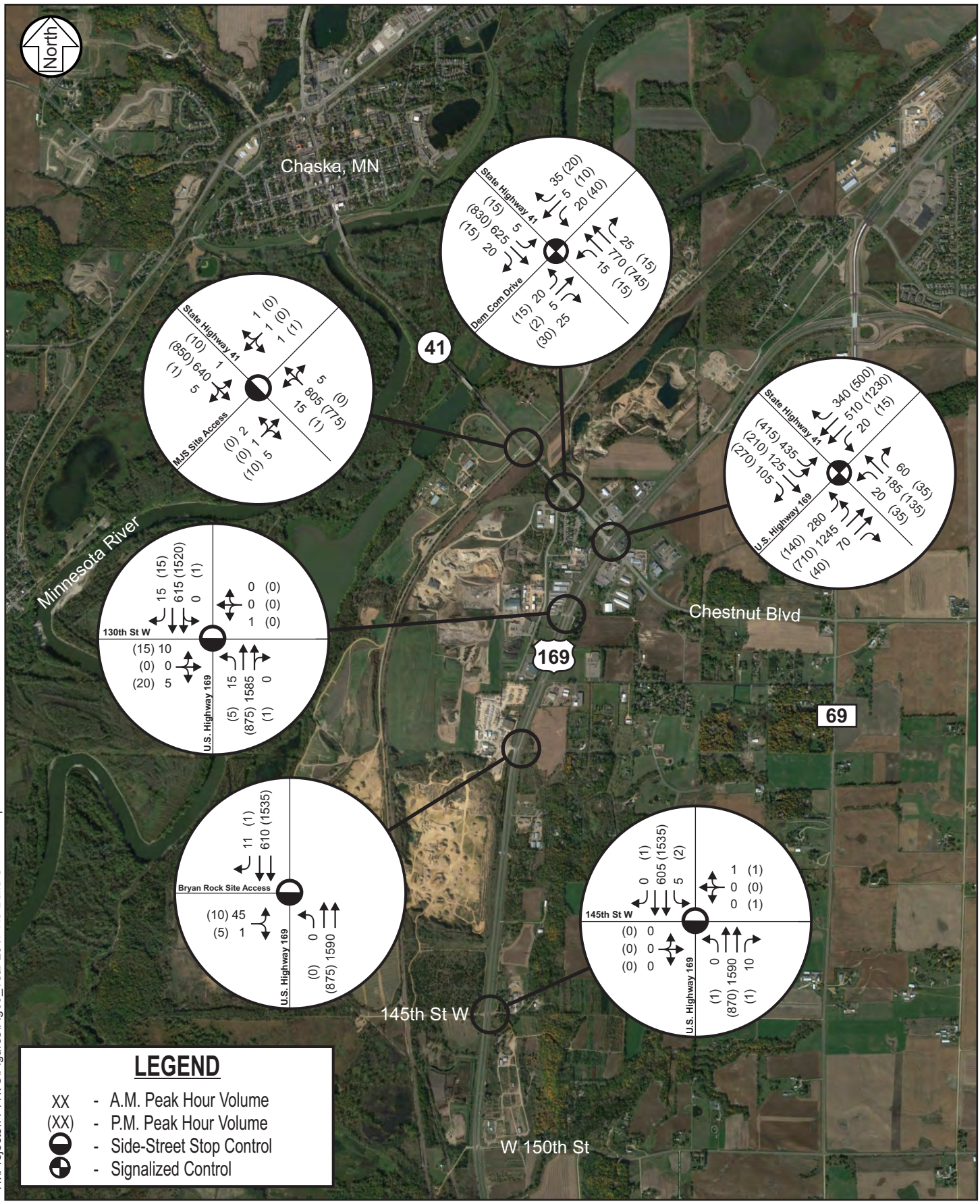
(3) Overall LOS D or minor approach LOS E-F (approaching capacity). Overall LOS E-F (over capacity).

Traffic Forecasts

Background Growth

The Project was conservatively assumed to be completed by the year 2017. Therefore, traffic forecasts were developed for year 2017 and year 2026 conditions (i.e., approximately one year and 10 years after opening). Based on existing area growth patterns, historical ADT volumes and recent forecasts for year 2040 daily traffic volumes (Scott County Travel Demand Model), an annual background traffic growth rate of one percent was applied to the existing peak hour volumes to develop year 2017 and year 2026 no build condition traffic forecasts. Year 2017 and year 2026 no build traffic volumes are shown in Figure 5 and Figure 6, respectively

It should be noted that the TIS traffic forecasts were only extended out to 10 years after opening due to uncertainty in market demand for the materials proposed to be mined and processed at the proposed Site and potential major improvements to the supporting transportation system (i.e., access management/potential new interchange at TH 169/TH 41 pending legislative action and funding).



LEGEND

XX - A.M. Peak Hour Volume
(XX) - P.M. Peak Hour Volume
- Side-Street Stop Control
- Signalized Control

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Year 2017 No-Build Conditions

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Figure 5

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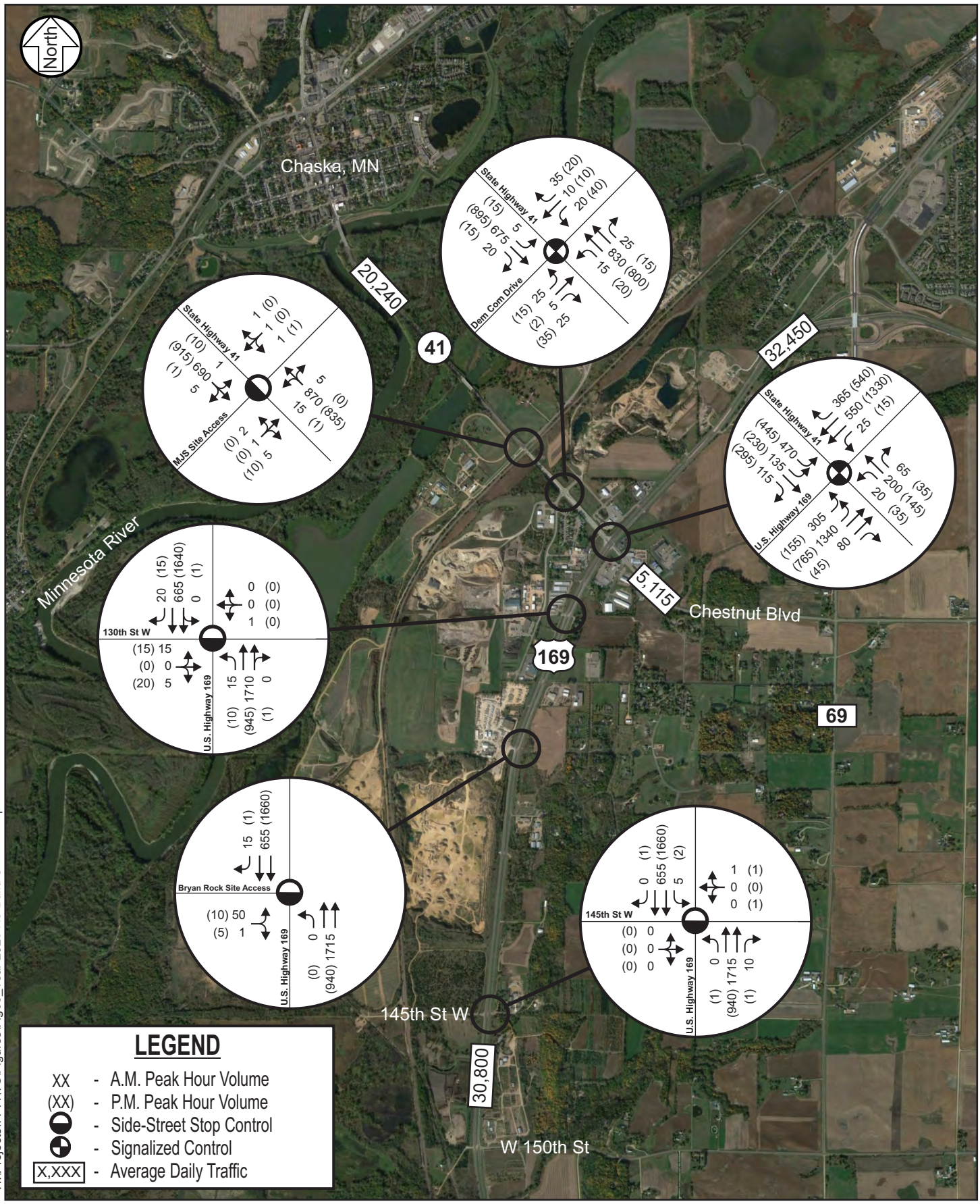

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Year 2026 No-Build Conditions

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Figure 6

Trip Generation

Truck trip generation estimates for the weekday a.m. and p.m. peak hour and daily trips were calculated for the Project based on assumptions made for the mining, processing and transport of materials associated with the proposed Merriam Junction Sands Facilities (see Appendix A). Employee trip generation estimates for the weekday a.m. and p.m. peak hour and daily trips for the new employees of the Project were based on the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition* (see Appendix A).

It should be noted that the TIS includes a worst case scenario (Scenario A) in which it was assumed that all of the processed silica sand will be transported from the Site by truck. Silica sand trucks account for between 64 to 91 percent of the site-generated trips in this worst case scenario. A second more likely scenario (Scenario B) was also included in which it was assumed that 10 percent of the processed sand will be transported from the Site by truck and 90 percent by rail car in unit trains.

Results of the trip generation estimate shown in Table 4 indicate that the Project is expected to generate a total of: 181 a.m. peak hours, 151 p.m. peak hours, and 1,674 daily trips in Scenario A, and 92 a.m. peak hours, 79 p.m. peak hours, and 768 daily trips in Scenario B.

Table 4: Trip Generation Summary

Vehicle Trip Type	A.M. Peak Hour Trips				P.M. Peak Hour Trips				Daily Trips	
	Scenario A(1)		Scenario B(2)		Scenario A		Scenario B		Scenario A	Scenario B
	In	Out	In	Out	In	Out	In	Out		
Trucks	70	70	24	24	56	56	20	20	1,396	490
Employees	34	7	34	7	8	31	8	31	278	278
Totals	104	77	58	34	64	87	28	51	1,674	768
	181		92		151		79			

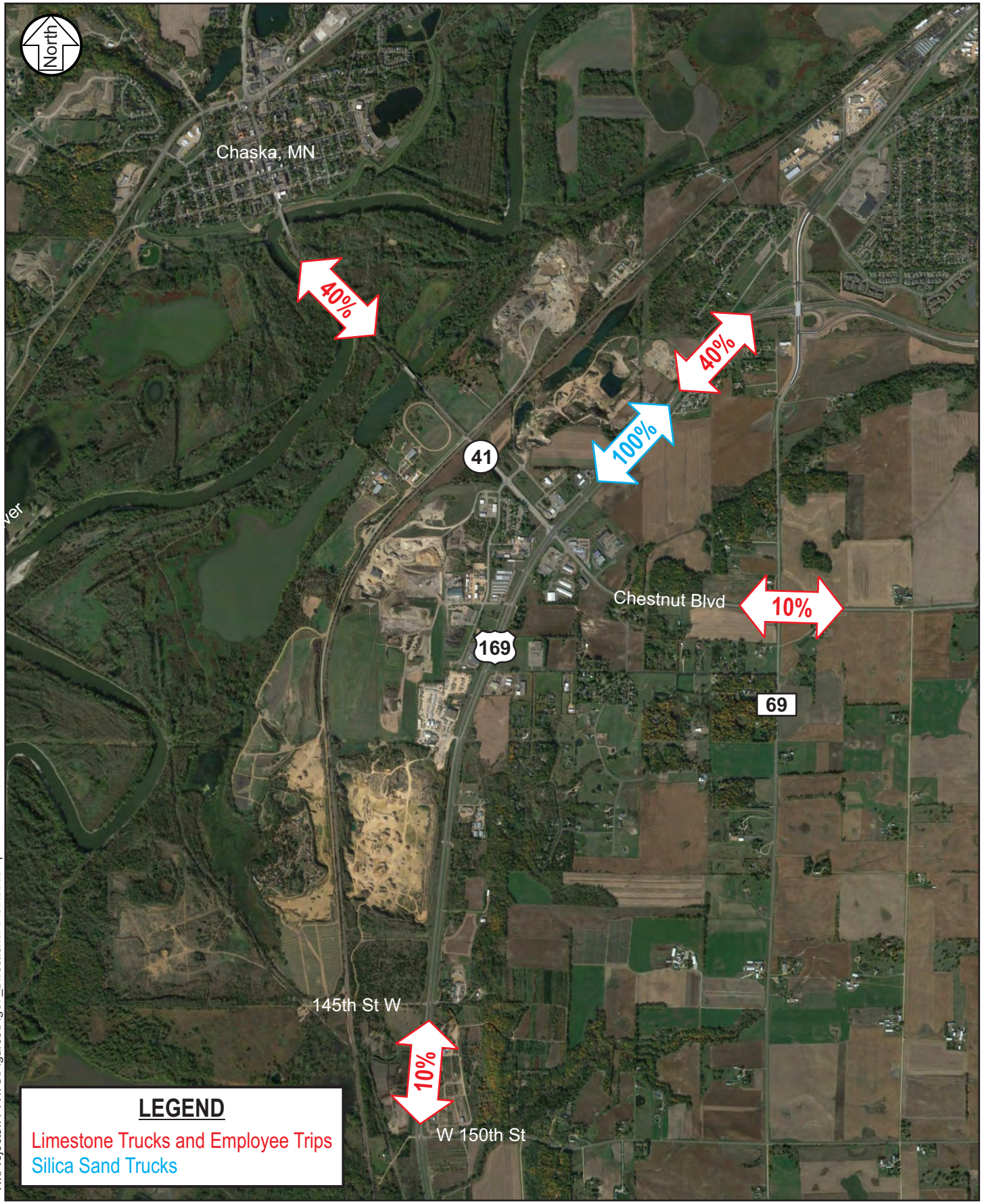
(1) Scenario A represents a worst case scenario in which 100 percent of the processed silica sand will be transported by truck.

(2) Scenario B represents a more likely scenario in which 10 percent of the processed silica sand will be transported from the Site by truck and 90 percent by rail car in unit trains.

It should be noted that ITE typically uses 100 peak hour trips as a threshold to determine the need for a detailed traffic operations analysis. Below this threshold traffic impacts are typically negligible. Since Scenario B generates less than 100 peak hour trips, no significant traffic-related impacts are anticipated due to the Project. Therefore, Scenario B was precluded from the detailed future traffic operations analysis presented in the following section. It should also be noted that the trips generated by the existing Site operations are already accounted for in the background traffic volumes counted at the study intersections and are therefore, not included in Table 4.

Traffic Assignment

The directional trip distribution for both employee and truck trips (assumed to be the same) generated by the Project, shown in Figure 7, was developed based on existing travel patterns in the area, information provided by the Proposer, and engineering judgment. The Site-generated trips for each of a number of Site Configuration Alternatives/Site Access Options were then assigned to the supporting roadway system based on this directional trip distribution.



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Directional Distribution

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Figure 7

Future Conditions

Site Configuration Alternatives

There are a total of six site configuration alternatives (see Appendix B) studied in the TIS. In addition to the No Build Alternative, six site configuration alternatives evaluated different plant locations and capacities. The number of alternatives is necessary to provide flexibility as the Project moves forward and takes into consideration potential changes in the silica sand market. With each alternative, plant production may begin at a lower production rate, increasing to maximum capacity as market conditions warrant.

Alternative 1: Two 1.2 million ton (MT)/year silica sand processing plants. "Processing plants" refers to both a wet plant and a dry plant throughout this document. One plant to be located on the Bryan Rock plant site and one plant located on the Malkerson Sales northern plant site. Alternative 1 includes two separate loadout facilities.

Alternative 2: Two 1.2 MT/year silica sand processing plants. One plant to be located on the Bryan Rock plant site and one plant located on the Malkerson Sales southern plant site. Alternative 2 includes two separate rail yards and loadout facilities.

Alternative 3: One 2.4 MT/year silica sand processing plant located on the Bryan Rock plant site. Alternative 3 includes one rail yard and loadout facility.

Alternative 4: One 2.4 MT/year silica sand processing plant located on the Malkerson Sales northern plant site. Alternative 4 includes one rail yard and loadout facility.

Alternative 5: One 2.4 MT/year silica sand processing plant located on the Malkerson Sales southern plant site. Alternative 5 includes one rail yard and loadout facility.

Alternative 6: One 2.4 MT/year silica sand processing plant located on the Bryan Rock plant site. Alternative 6 includes one rail yard loadout facility.

No Build Alternative: This alternative considers continued limestone quarry, sand and gravel mining and processing operations. No silica sand mining, processing and loadout are associated with this alternative.

Site Access Options

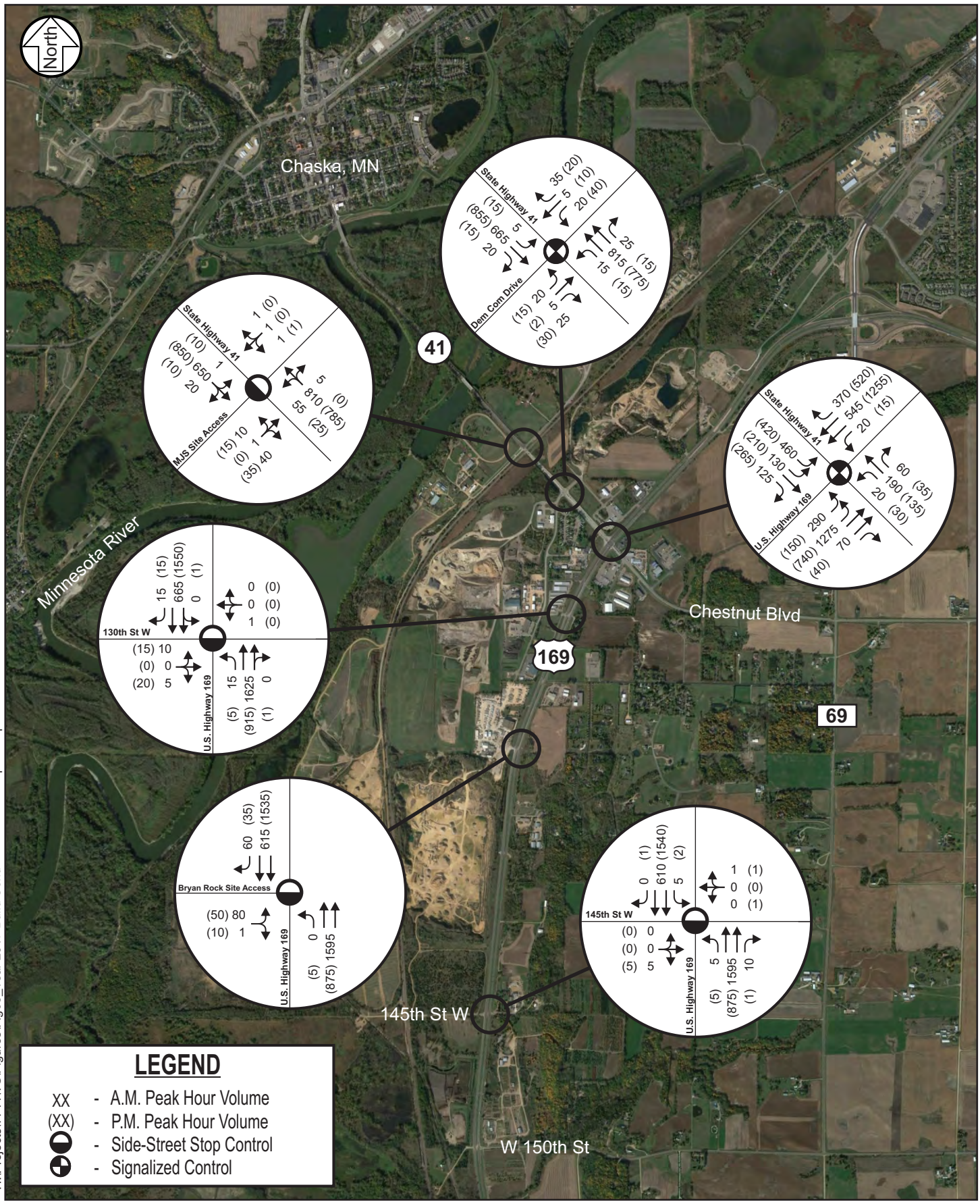
Because the various site configuration alternatives will result in different traffic patterns depending upon which plant sites are developed, three individual Site Access Options were identified to simplify yet adequately represent traffic impacts associated with the various alternatives including:

Site Access Option A: Site Alternatives 1 and 2 (these two alternatives will generate similar traffic volume and patterns with silica sand transported from both Bryan Rock and Malkerson Sales Properties).

Site Access Option B: Site Alternatives 3 and 6, silica sand transported from the Bryan Rock Property only.

Site Access Option C: Site Alternatives 4 and 5, (these alternatives will generate similar traffic volumes and patterns with silica sand transported from the Malkerson Sales property only).

The combination of background traffic and proposed Site-generated trips for year 2017 and year 2026 build conditions for each Site Access Option are shown in Figure 8 through Figure 13, respectively.



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Year 2017 Build Conditions - Access Option A

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Figure 8

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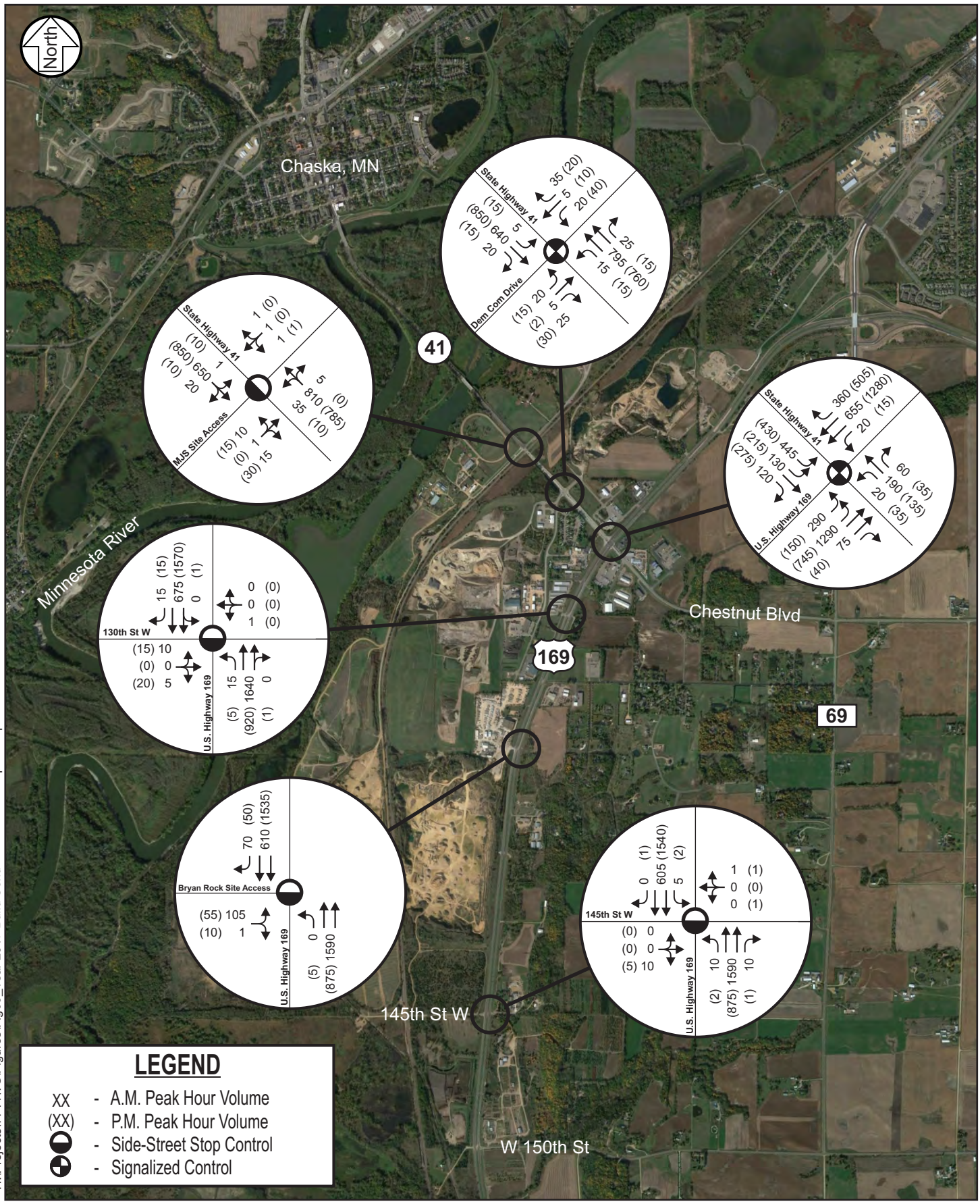

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Year 2017 Build Conditions - Access Option B

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Figure 9

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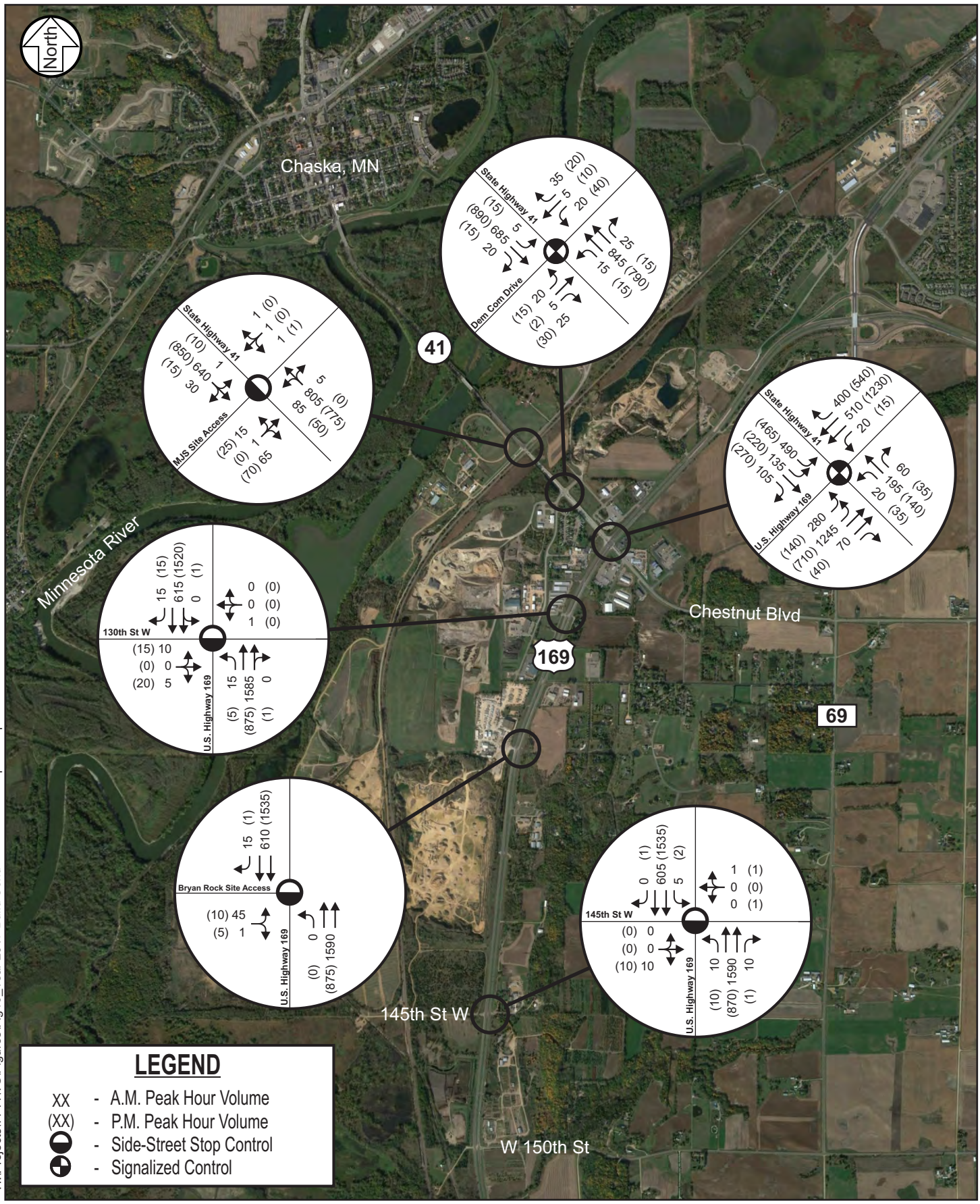

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Year 2017 Build Conditions - Access Option C

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Figure 10

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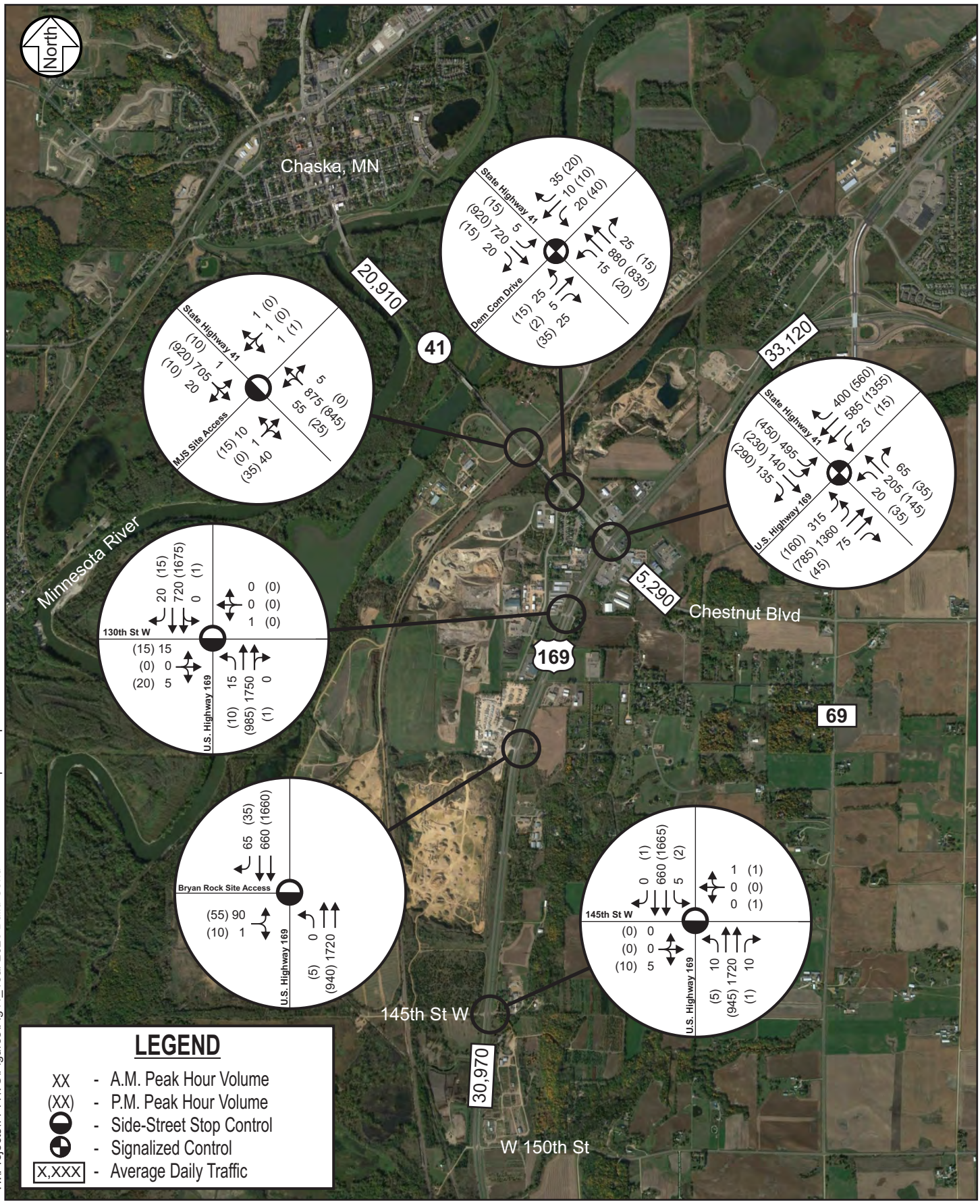

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Year 2026 Build Conditions - Access Option A

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Figure 11

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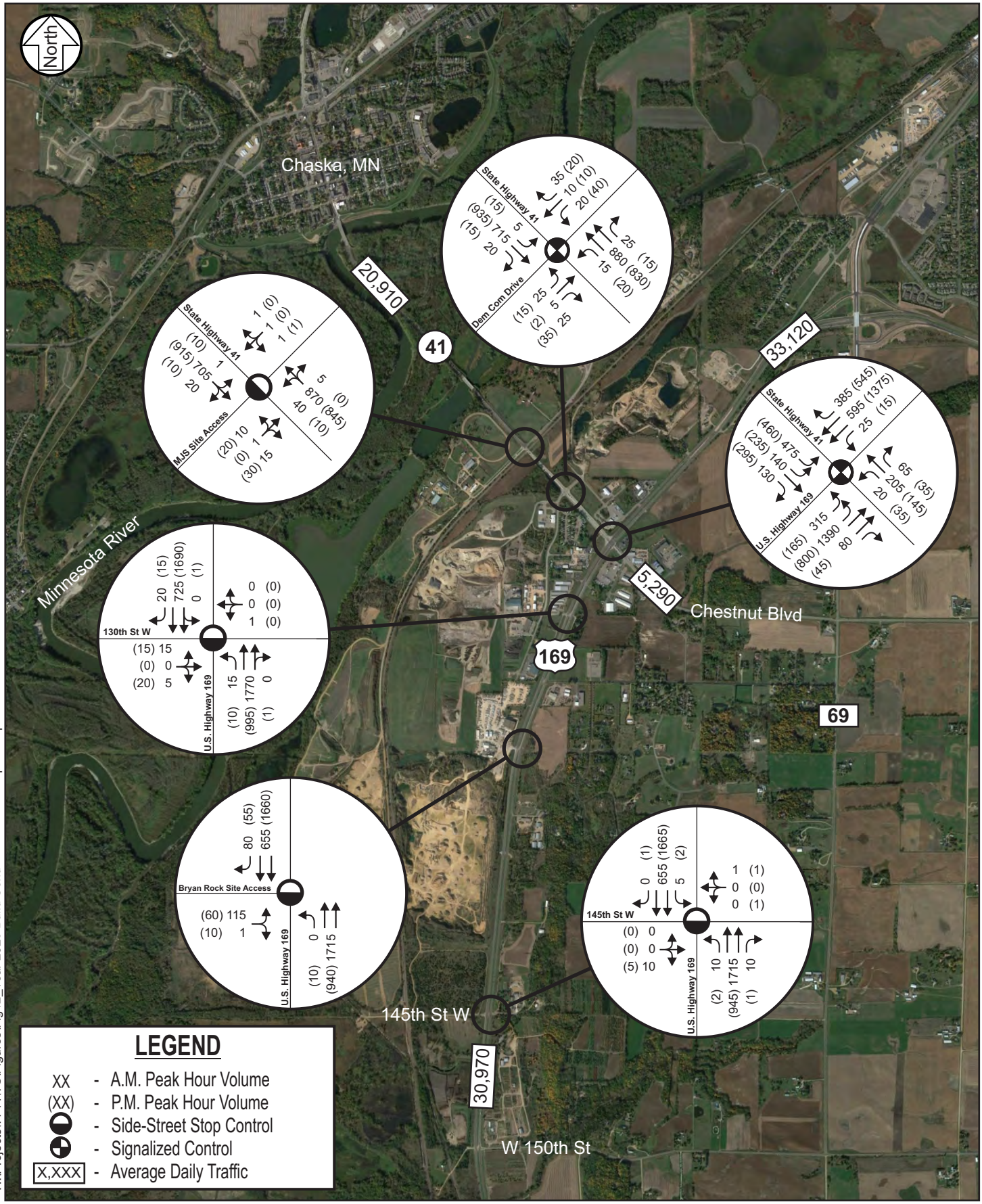

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Year 2026 Build Conditions - Access Option B

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Figure 12

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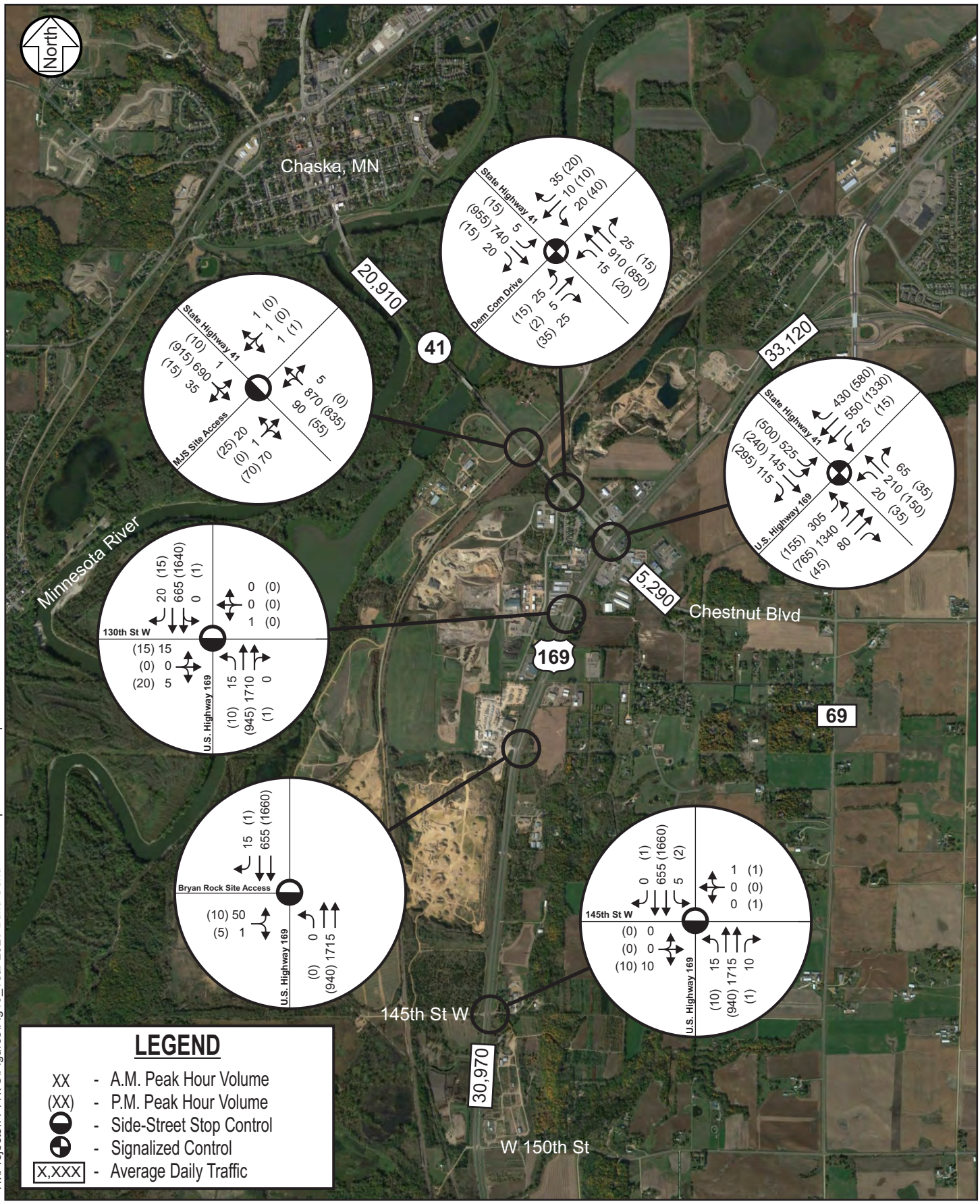

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Year 2026 Build Conditions - Access Option C

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Figure 13

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To determine how the existing roadway network will operate under future year 2017 and year 2026 no build and build conditions for Scenario A (worst case scenario where all processed silica sand would be transported from the Site by trucks) and Site Access Options A, B and C, an operations analysis was completed for the a.m. and p.m. peak hours. Results of the intersection capacity analysis shown in Table 5 indicate that all study intersections are expected to continue operating at acceptable overall LOS D or better under year 2017 no build and build peak hour conditions.

And although all of the study intersections are expected to continue to operate at overall acceptable levels of service (LOS) D or better under year 2017 no build and build conditions, many of the study intersections are already approaching capacity and will continue to degrade as traffic growth and development occur within the study area. This is particularly the case for left-turning heavy commercial trucks on the side-street approaches to both TH 169 and TH 41 that will continue to experience long delays and queuing spillback conditions. Under year 2026 no build and build p.m. peak hour conditions, the LOS at the TH 169/TH 41 intersection will be degraded to unacceptable levels indicating the need for longer range improvements.

Table 5: Future Intersection Capacity Analysis

Study Intersection	Level of Service (LOS)							
	Year 2017				Year 2026			
	No Build	Build - Site Access Option			No Build	Build - Site Access Option		
		A	B	C		A	B	C
A.M. Peak Hour								
TH 169/TH 41(1)	D	D	D	D	D	D	D	D
TH 169/130th Street(2)	A/F	A/F	A/F	A/F	A/F	A/F	A/F	A/F
TH 169/Bryan Rock Site Access(2)	A/D	A/E	A/F	A/D	A/E	A/F	A/F	A/E
TH 169/145th Street(2)	A/C	A/C	A/C	A/C	A/C	A/C	A/C	A/C
TH 41/Dem-Con Drive(1)	B	B	B	B	B	B	B	B
TH 41/Malkerson Site Access(2)	A/E	A/F	A/F	C/F	A/E	A/F	A/F	E/F
P.M. Peak Hour								
TH 169/TH 41(1)	D	D	D	D	E	F	F	F
TH 169/130th Street(2)	A/E	A/F	A/E	A/E	A/E	A/F	A/F	A/E
TH 169/Bryan Rock Site Access(2)	A/D	A/F	A/F	A/D	A/E	A/F	A/F	A/E
TH 169/145th Street(2)	A/C	A/D	A/D	A/D	A/C	A/D	A/D	A/D
TH 41/Dem-Con Drive(1)	B	B	B	B	B	B	B	B
TH 41/Malkerson Site Access(2)	A/F	A/F	A/F	B/F	A/F	A/F	A/F	C/F

(1) A signalized intersection with the overall LOS shown.

(2) An unsignalized intersection with all-way or side-street stop control, the overall LOS is shown followed by the worst approach LOS.

(3) Overall LOS D or minor approach LOS E-F (approaching capacity). Overall LOS E-F (over capacity).

Based on a comparison of the detailed traffic operations analysis between the no-build and build conditions, it is concluded that the Project generated trips are expected to have minimal impact to the study area roadway system. The worst case scenario development generated daily trips represent less than a two percent increase in total study area future year 2026 daily traffic volumes. However, long range roadway system improvements will be necessary to improve the operation and reduce delay to Site-generated traffic attempting to enter the TH 169 and TH 41 supporting highways. These improvements may include internal Site connections to the TH 41/Dem-Con Drive traffic signal controlled intersection from a frontage/service road west of TH 169 in the very northern portion of the Project area that connects the current Anchor Block/Bryan Rock 169 access to the Dem-Con Drive and/or a frontage/ service road west of TH 169 in the very southern portion of the Project area that connects 145th Street to the new interchange at County Road 14.

Other Future Considerations

TH 169/TH 41 Intersection/Interchange

As previously discussed, under existing conditions the TH 169/TH 41 intersection is operating at levels approaching capacity. The rate at which crashes are occurring at the TH 169/TH 41 intersection is above the critical crash rate for similar intersections. Therefore, it is concluded that there is an existing traffic safety problem at the TH 169/TH 41 intersection. Under year 2026 no build and build p.m. peak hour conditions, the LOS at the TH 169/TH 41 intersection will be degraded to unacceptable levels. All of these issues indicate the need for longer range improvements. In fact, TH 169/TH 41 intersection currently ranks number one in the 2014 Regional Solicitation Grants listing of Principal Arterial roadway expansion projects being considered for future funding.

A Scott County initiative, in cooperation with MnDOT, has identified possible funding sources and strategies to complete preliminary engineering design and other steps in the process to position this junction to be eligible for funding as early as 2019 for reconstruction to a full interchange. Details of the design and configuration of this future full interchange are not known at this time. However, it should be expected that a full interchange at the junction of TH 169/TH 41 will require closing/relocation of direct site access and local public street intersections within the study area as well as completion of adjacent frontage/service road systems.

TH 169/CSAH 14 Intersection/Interchange

Another Scott County initiative, in corporation with MnDOT, has also identified possible funding sources and strategies to complete preliminary engineering design and other steps in the process to position this TH 169/CSAH 14 junction south of the study area, to be eligible for funding to construct a full interchange or possibly an overpass with local access intersections to connect to a frontage/service road system. Details of the design and configuration of this future full interchange/overpass are not known. However, it should be expected that a full interchange at the junction of TH 169/CSAH 14 will require closing/relocation of direct site access and local public street intersections within the study area as well as completion of frontage/service road systems.

Access Management

With TH 169 as a current principal arterial, and TH 41 as a future principal arterial, it should be expected that the elimination/reduction of direct site access and public street intersections not

conforming to the planned access spacing guidelines, will continue to be a priority whenever new development/redevelopment is considered. And with interchanges being considered at the TH 169/TH 41 intersection and TH 169/CSAH 14 intersection, it is likely that closing/relocation of direct site access and local public street intersections within the study area as well as completion of adjacent frontage/service road systems will be considered as part of those potential future projects.

TH 41/Malkerson Sales Site Access Intersection

A previous study and analysis of issues related to additional heavy truck/rail activity at the TH 41/Malkerson Sales Site Access intersection was completed in April 2012 and is included in this TIS as Appendix C. Generally, it was concluded that there are and will continue to be limited acceptable gaps available for left-turning heavy trucks at this TH 41/Malkerson Sales Site Access intersection. Recommendations included: reducing the demand to have heavy trucks make this left-turn movement and/or alternative access improvement should be considered. It should be noted that the limestone and sand/gravel resources associated with the Malkerson Sales Site are expected to be depleted by 2022, resulting in significantly reduced demand to make left-turns from this access.

Dem-Con Drive Connection and Study Area Access/Internal Frontage/Service Road System

As traffic volumes on TH 169 and TH 41 continue to grow, the long delays and queuing spillback, particularly for left-turning heavy trucks on the side-street approaches to TH 169 at 130th Street, Bryan Rock Products Site Access, 145th Street and the TH 41/Malkerson Sales Site Access intersection, will only worsen. With potential future interchanges being considered at the TH 169/TH 41 and TH 169/CSAH 14 intersections, it is likely that direct site access and local public street intersections on TH 169 and TH 41 within the study area will be closed. Additional heavy truck traffic generated by the proposed Project will only further the need to consider alternative study area access.

Since the TH 41/Dem-Con Drive intersection is the only study area intersection that has and will continue to have significant reserve capacity available, the connection of the internal study area access and frontage/service road system to that intersection should be strongly considered. It should be noted that there are property/parcel ownership issues that will need to be resolved in order to accomplish this connection.

Minnesota Renaissance Festival/Trail of Terror

The Minnesota Renaissance Festival is a short term, seasonal, outdoor entertainment event with annual attendance of approximately 300,000 that takes place from mid- to late-August through early October each year from 9 a.m. to 7 p.m. This event is held primarily only on weekends on land that is part of the Project. Primarily access is provided from TH 169 and 145th Street with secondary access to TH 41 at the Malkerson Sales Site access. Smaller events such as weddings held in one of the Renaissance Festival buildings are occasionally conducted during spring, summer and fall.

The Minnesota Renaissance Festival which has been an active local attraction for over 40 years is located on the Malkerson Sales Property on the southern part of the Malkerson portion of the Project. With or without the Project, the Renaissance Festival will eventually be relocated from the Site due to either continued limestone mining on the Malkerson Sales Property, or the limestone and sandstone mining associated with the Project. The proposed Project would preclude the long-term continuation of the Renaissance Festival.

The Renaissance Festival generates only seasonal traffic. The festival is held during weekends in the late summer and fall occasionally generating high volumes of traffic during daylight hours on Saturday, Sunday and Labor Day Monday. As shown in Appendix D, over the last ten year period, Weeks 5, 6 and 7 generate a significantly greater attendance than the earlier weeks. Note that attendance has also generally fallen since 2007. One-way traffic control is established during the Festival where patrons enter from 145th Street and exit to State Highway 41. The mining operators have the ability to limit truck operations during the Renaissance Festival hours of operation and currently do so on the high attendance weekends (Weeks 5, 6 and 7).

The Trail of Terror is another short term seasonal outdoor entertainment event with annual attendance significantly less than the Minnesota Renaissance Festival that takes place on select Fridays - Sundays, mid- to late-October through early November on land that is part of the Project. Hours of operation are Fridays and Saturdays, 7 p.m. to 12:30 a.m. and Sundays from 7 p.m. to 11 p.m. The box office and attractions close at 10 p.m. and the operations close at 11 p.m. The Trail of Terror traffic utilizes the State Highway 41 access as well.

The Minnesota Renaissance Festival/Trail of Terror events and other smaller events taking place on the proposed Site, are short term, seasonal, weekend, outdoor entertainment events. The focus of this TIS is the typical weekday commuter peak hours. Therefore, these events were precluded from the detailed future traffic operations analysis presented in the preceding section.

Highway/Railroad At-Grade Crossings

The following is information was provided for the at-grade rail crossings on TH 41 and 145th Street by the Project rail yard design firm. These are for MJS site-generated trains under the Sand Product Transport Scenario B (10 percent trucks/90 percent rail car/unit trains). It should be noted that other, non-Site-generated trains routinely run through the Site and at-grade crossings on TH 41 and 145th Street and those non-Site-generated crossing events are not included in this analysis.

- The speed through Shakopee is dictated by the city at 10 mph.
- The rail speed is set at 30 mph to 49 mph generally through the other areas.
- The maximum velocity through a turnout is 10 mph.
- Acceleration and deceleration are the same. These times are assumed for loaded cars.
- Crossing signal/gate arms are activated 30 seconds before the train enters the intersection.
- Crossing signal/gate arms open 15 seconds after the train clears the intersection.
- Assumed train acceleration of 0.1 foot per second squared.

With the above assumptions, the crossing blocking time estimates are as follows:

- The 145th Street crossing would be blocked for approximately 3.03 minutes.
- The TH 41 crossing would be blocked for 5.60 minutes.

Based on a review of this information, these are reasonable crossing blocking time estimates. From statistical data available, it is estimated that a railroad crossing blockage of this nature may occur during either the a.m. or p.m. commuter peak hours approximately once per month. These Site-generated

crossing blocking time estimates are less than the lawful maximum blocking time of 10 minutes[2] and are not considered to represent a regularly occurring traffic delay. It should be noted that the above calculations are based on 100 car unit trains. Changes in the rail industry that may result in longer or shorter train lengths may result in somewhat different intersection blocking times, however, the lawful crossing blocking time must always be met.

Summary of Findings and Conclusions

Based on the Merriam Junction Sands Facilities Traffic Impact Study (TIS), the following findings and conclusions are offered for consideration:

Existing Conditions

1. Based on available crash data for the three-year period from year 2012 through year 2014, there were a total of 87 reported crashes at the six study intersections. The rate at which crashes are occurring at the TH 169/TH 41 intersection is above the critical crash rate for similar intersections. Therefore, it is concluded that there is an existing traffic safety problem at the TH 169/TH 41 intersection. The rates at which crashes are occurring at the remaining study intersections are below critical crash rates for similar intersections. This indicates that roadway conditions at the remaining study intersections are not likely factors contributing to the crashes.

2. Results of the existing intersection capacity analysis indicate that all of the study intersections currently operate at an acceptable overall LOS D or better during the a.m. and p.m. peak hours. However, it should be noted that the TH 169/TH 41 intersection is approaching an unacceptable overall LOS E during the p.m. peak hour. Also, many of the study intersections side-street approaches are already at or are approaching capacity. This is particularly the case for left-turning heavy commercial trucks on the side-street approaches to both TH 169 and TH 41 that will continue to experience long delays and queuing spillback conditions.

Future No Build Conditions

1. The Project was conservatively assumed to be completed in the year 2016. Therefore, traffic forecasts were developed for year 2017 and year 2026 conditions (i.e., approximately one year and 10 years after opening). Based on existing area growth patterns, historical ADT volumes and

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Minnesota State Statute: 219.383 SAFE OPERATION OF TRAIN OVER ROAD; PENALTY. Subdivision. 3. Not to block public road or street. No railway corporation shall permit a public road or street crossing a railroad track to be closed for traffic by a standing car, train, engine, or other railroad equipment, or by a switching movement which continuously blocks a crossing for longer than 10 minutes. Subdivision. 4. Penalty. A railway corporation violating this section is guilty of a petty misdemeanor. A corporation that commits a second or subsequent violation of this section is guilty of a misdemeanor.

recent forecasts for year 2040 daily traffic volumes (Scott County Travel Demand Model), an annual background traffic growth rate of one percent was applied to the existing peak hour volumes to develop year 2017 and year 2026 no build traffic forecasts. Traffic generated from on-going limestone and sand and gravel production is included in the no build traffic forecasts.

2. The TIS traffic forecasts were only extended out to 10 years after opening due to uncertainty in market demand for the materials proposed to be mined and processed at the proposed Site and potential major improvements to the supporting transportation system (i.e., access management and a potential new interchange at TH 169/TH 41 pending legislative action and funding).

3. All of the study intersections are expected to continue to operate at overall acceptable levels of service (LOS) D or better under year 2017 no build a.m. and p.m. peak hour conditions. However, many of the study intersections side-street approaches will be at or approaching capacity and will continue to degrade as traffic growth and development occur within the study area. This is particularly the case for left-turning heavy commercial trucks on the side-street approaches to both TH 169 and TH 41 that will experience long delays and queuing spillback.

4. Under year 2026 no build p.m. peak hour conditions, the LOS at the TH 169/TH 41 intersection will be degraded to unacceptable levels indicating the need for longer range improvements. Combined with the existing traffic safety problem at the TH 169/TH 41 intersection, the need for longer range improvements has resulted in this intersection currently being ranked number one in the 2014 Regional Solicitation Grants listing of Principal Arterial roadway expansion projects being considered for future funding.

Future Build Conditions

1. Truck trip generation estimates for the weekday a.m. and p.m. peak hours and daily trips were calculated for the Project based on assumptions made for the mining, processing and transport of silica sand associated with the various access options developed for the Project (see Appendix A). Employee trip generation estimates for the weekday a.m. and p.m. peak hours and daily trips for the new employees of the Project were based on the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition*.

2. The TIS includes a worst case Scenario A in which it was assumed that all of the processed silica sand will be transported from the Site by truck. Trucks account for between 64 to 91 percent of the Site-generated trips in this worst case scenario. A second more likely Scenario B was also included in which it was assumed that 10 percent of the processed silica sand will be transported from the Site by truck and 90 percent by rail car in unit trains.

3. Results of the trip generation estimate indicate that the Project is expected to generate a total of: 181 a.m. peak hours, 151 p.m. peak hours, and 1,674 daily trips in Scenario A, and 92 a.m. peak hours, 79 p.m. peak hours, and 768 daily trips in Scenario B.

4. It should be noted that ITE typically uses 100 peak hour trips as a threshold to determine the need for a detailed traffic operations analysis. Below this threshold traffic impacts are typically negligible. Since Scenario B generates less than 100 peak hour trips, no significant traffic-related impacts are anticipated due to the Project. Therefore, Scenario B was precluded from the detailed future traffic operations analysis. It should also be noted that the trips generated by existing Site

operations are assumed to be already accounted for in the background traffic volumes counted at the study intersections.

5. All of the study intersections are expected to continue to operate at overall acceptable levels of service (LOS) D or better under year 2017 build conditions. However, many of the study intersections side-street approaches will be at or approaching capacity and will continue to degrade as traffic growth and development occur within the study area. This is particularly the case for left-turning heavy commercial trucks on the side-street approaches to both TH 169 and TH 41 that will experience long delays and queuing spillback. Under year 2026 build p.m. peak hour conditions, the LOS at the TH 169/TH 41 intersection will be degraded to unacceptable levels indicating the need for longer range improvements.

6. Based on a comparison of the detailed traffic operations analysis between the no-build and build conditions, it is concluded that the Project generated trips are expected to have minimal impact to the study area roadway system. The worst case Scenario A development generated daily trips represent less than a two percent increase in total study area future year 2026 daily traffic volumes. However, long range roadway system improvements such as the internal Site connections to the TH 41/Dem-Con Drive traffic signal controlled intersection and a frontage/service road west of TH 169 will be necessary to improve the operation and reduce delay to Site-generated traffic attempting to enter the TH 169 and TH 41 supporting highways.

7. With interchanges being considered at the TH 169/TH 41 and TH 169/CSAH 14 intersections, it is likely that closing/relocation of direct site access and local public street intersections within the study area as well as completion of adjacent frontage/service road systems will be considered as part of those potential future projects.

8. There will continue to be limited acceptable gaps available for left-turning heavy trucks at the TH 41/Malkerson Sales Site Access intersection. Recommendations to address this condition include: reducing the demand to have heavy trucks make this left-turn movement and/or alternative access improvements be considered as part of any future projects. A review of conditions at this intersection indicates that it would be difficult to justify traffic signal installation due to the traffic volume patterns and the close proximity of the at-grade rail crossing on TH 41. Note that the limestone and sand/gravel resources associated with the Malkerson Sales Site are expected to be depleted by 2022, resulting in significantly reduced demand to make left-turns from this access.

9. Since the TH 41/Dem-Con Drive intersection is the only study area intersection that has and will continue to have significant reserve capacity available, the connection of the internal study area access and frontage/service road system, to that intersection, should be strongly considered. It should be noted that there are property/parcel ownership issues that will need to be resolved in order to accomplish this connection.

10. The Minnesota Renaissance Festival and Trail of Terror events plus other smaller events taking place on the proposed Site, are short term, seasonal, weekend, outdoor entertainment events. The focus of this TIS is the typical weekday commuter peak hours. Additionally, the mining operators have the ability to limit truck operations during the Renaissance Festival hours of operation and currently do so on the high attendance weekends (Weeks 5, 6 and 7). Therefore, these events were precluded from the detailed future traffic operations analysis.

11. Based on a review of information provided for the at-grade rail crossings on TH 41 and 145th Street by the Project rail yard design firm, the crossing blocking time estimates are as follows:

    - The 145th Street crossing would be blocked for approximately 3.03 minutes.
    - The TH 41 crossing would be blocked for 5.60 minutes.

    These at-grade rail crossing blocking time estimates are for MJS Site-generated trains under the silica sand product transport Scenario B (10 percent trucks/90 percent rail car/unit trains). A detailed review indicates that these are reasonable at-grade rail crossing blocking time estimates. From statistical data available it is estimated that a railroad crossing blockage of this nature may occur during either the a.m. or p.m. commuter peak hours approximately once per month. These Site-generated crossing blocking time estimates are less than the lawful maximum blocking time of 10 minutes and are not considered to represent a significant regularly occurring traffic delay.

Recommended Mitigation Measures For 90% Silica Sand Shipped by Truck

Based on the study findings and conclusions, the following actions and measures to mitigate Project generated study area traffic impacts are recommended for consideration:

1. With interchanges being considered, possibly within the near future at the TH 169/TH 41 intersection (as early as 2019) and the TH 169/CSAH 14 intersection, it is likely that closing of direct site access and local public street intersections within the study area will require roadway system improvements in order to serve the existing and future site-generated traffic not related to the sandstone products. These improvements should include internal Site connections to the TH 41/Dem-Con Drive traffic signal controlled intersection, the only study area intersection that will continue to have significant reserve capacity available. This improvement would require extension of internal Site access roadways and a frontage/service road west of TH 169 in the very northern portion of the Project area to connect the current Anchor Block/Bryan Rock 169 access to the Dem-Con Drive and geometric and traffic control improvements at the TH 41/Dem-Con Drive intersection.

2. Short-term improvements to be considered until the internal Site connections to the TH 41/Dem-Con Drive traffic signal controlled intersection are made include:

    a. Installation of intersection/street lighting at the TH 169/Bryan Rock Site Access intersection and the TH 41/Malkerson Sales Site Access intersection to facilitate the peak demand day/peak period traffic operations.

    b. Encourage drivers of the Site-generated heavy commercial trucks to consider alternate routes that minimize or eliminate the need to make left-turns from the site during peak periods.

Appendix A: Merriam Junction Sands Facilities Site Trip Generation Estimates for Additional Trips Entering and Exiting

Scenario A **Sandstone - 100% By Truck**				Peak Demand Season Tons (Q3 = 36%)	Peak Demand Day Tons (Q3 = 78 work days)	Truck Capcity (Tons)	Trucks per Design Day		Peak Hour Design Day Trucks			
	Annual Production (Tons)								A.M. Peak Hour (@ 10% of Daily)		P.M. Peak Hour (@ 8% of Daily)	
Material	Existing	Proposed	Additional				In (Empty)	Out (Full)	In (Empty)	Out (Full)	In (Empty)	Out (Full)
Limestone	1,000,000	1,500,000	500,000	180,000	2,308	19	121	121	12	12	10	10
Sand/Gravel	150,000	450,000	300,000	108,000	1,385	19	73	73	7	7	6	6
Sandstone	0	2,400,000	2,400,000	864,000	11,077	22	503	503	50	50	40	40
Totals	1,150,000	4,350,000	3,200,000	1,152,000	14,769	-	698	698	70	70	56	56
							1,396		140		112	

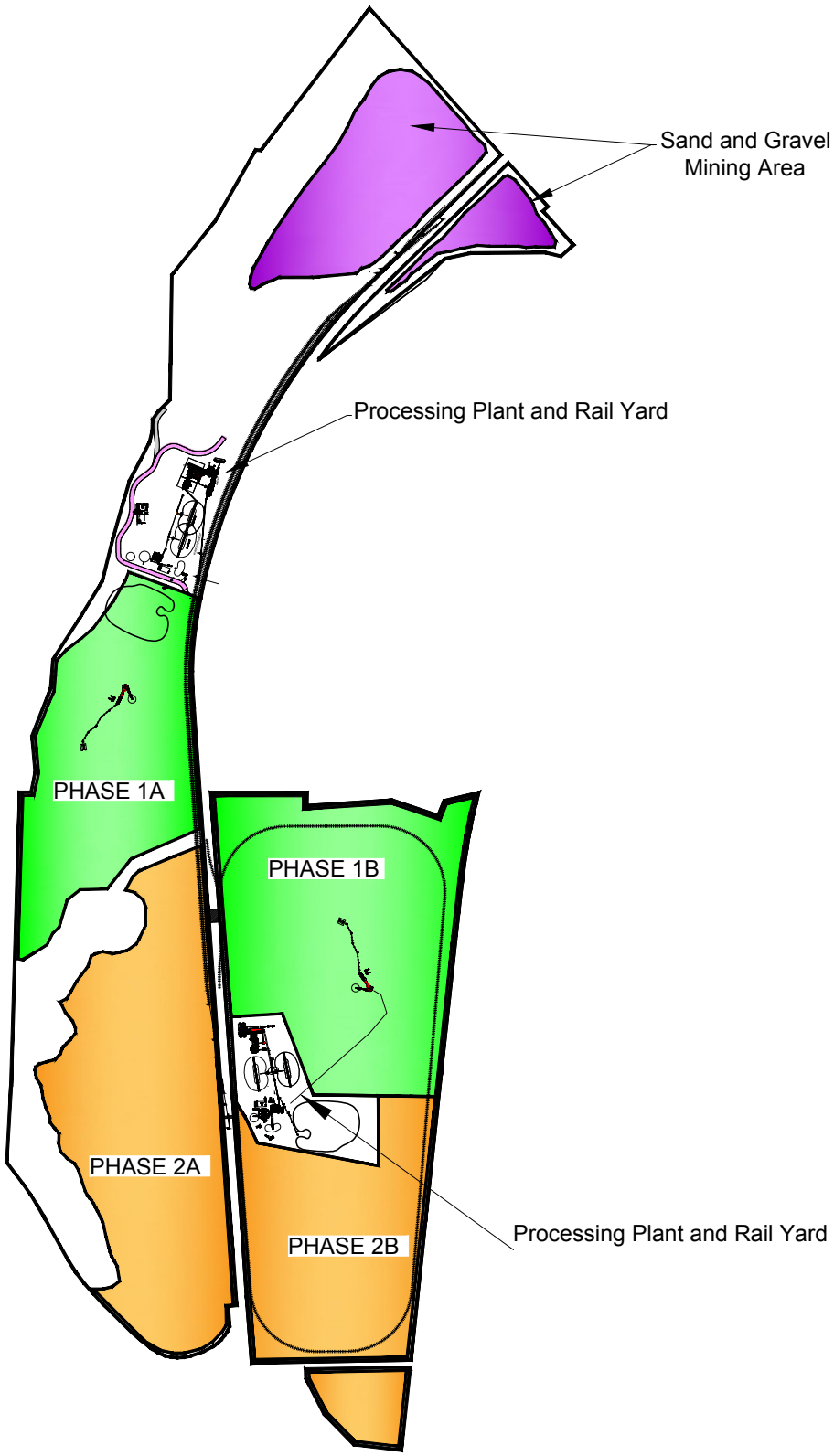
Scenario B **Sandstone - 10% By Truck/90% By Rail**				Peak Demand Season Tons (Q3 = 36%)	Peak Demand Day Tons[1] (Q3 = 78 work days)	Truck Capcity (Tons)	Trucks per Design Day		Peak Hour Design Day Trucks			
	Annual Production (Tons)								A.M. Peak Hour (@ 10% of Daily)		P.M. Peak Hour (@ 8% of Daily)	
Material	Existing	Proposed	Additional				In (Empty)	Out (Full)	In (Empty)	Out (Full)	In (Empty)	Out (Full)
Limestone	1,000,000	1,500,000	500,000	180,000	2,308	19	121	121	12	12	10	10
Sand/Gravel	150,000	450,000	300,000	108,000	1,385	19	73	73	7	7	6	6
Sandstone	0	2,400,000	2,400,000	864,000	1,108	22	50	50	5	5	4	4
Totals	1,150,000	4,350,000	3,200,000	1,152,000	4,800	-	245	245	24	24	20	20
							489		49		39	

	Annual Production (Tons)					Rail Car Capcity (Tons)	Rail Cars per Design Day	
Material	Existing	Proposed	Additional				In (Empty)	Out (Full)
Sandstone	0	2,400,000	2,400,000	864,000	9,969	110	91	91

New Employees (Scenario A or B)	Daily Trips		Peak Hour Design Day Employee Trips			
			A.M. Peak Hour Trips		P.M. Peak Hour Trips	
	In	Out	In	Out	In	Out
New Processing Facilities Employee Trips - 92 employees (56 Day/36 Night Shift)[2]	139	139	34	7	8	31
	278		41		39	

[1] Adjusted Sandstone tonage to account for 10% truck/90% rail scenario

[2] Used ITE "Trip Generation" rate for Light Industrial land use (ITE 110) by employee



* Phases Refer to Sandstone Mining

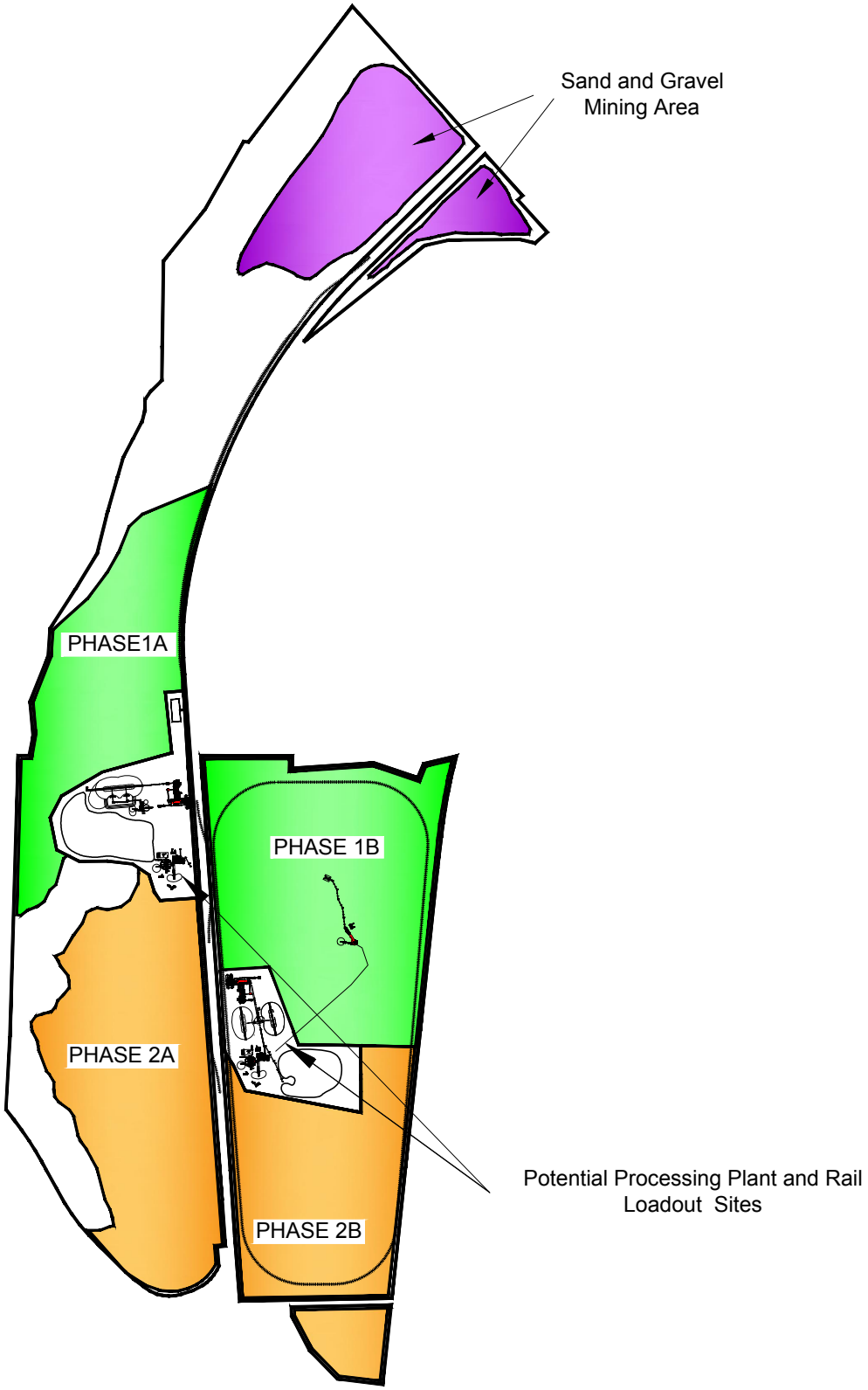
N

Not to Scale

Figure 5-1: Alternative 1

1.2 MT/YR BRP and MS-N
Concept Mine Plan
Merriam Junction Sands
DEIS

Sunde Engineering, PLLC.



* Phases Refer to Sandstone Mining

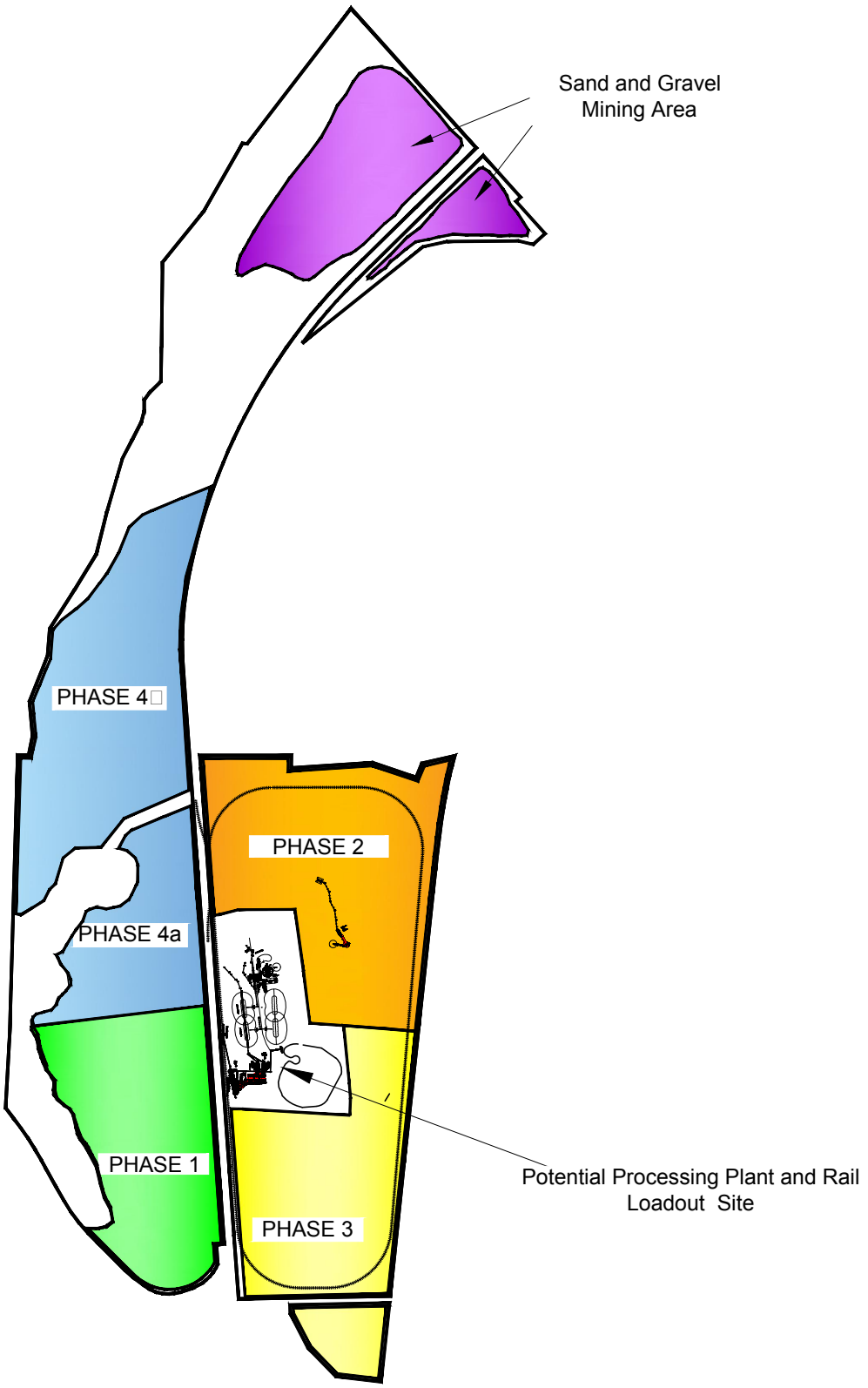
N

Not to Scale

Figure 5-2: Alternative 2

1.2 MT/YR BRP and MS-S
Concept Mine Plan
Merriam Junction Sands
DEIS

Sunde Engineering, PLLC.



* Phases Refer to Sandstone Mining

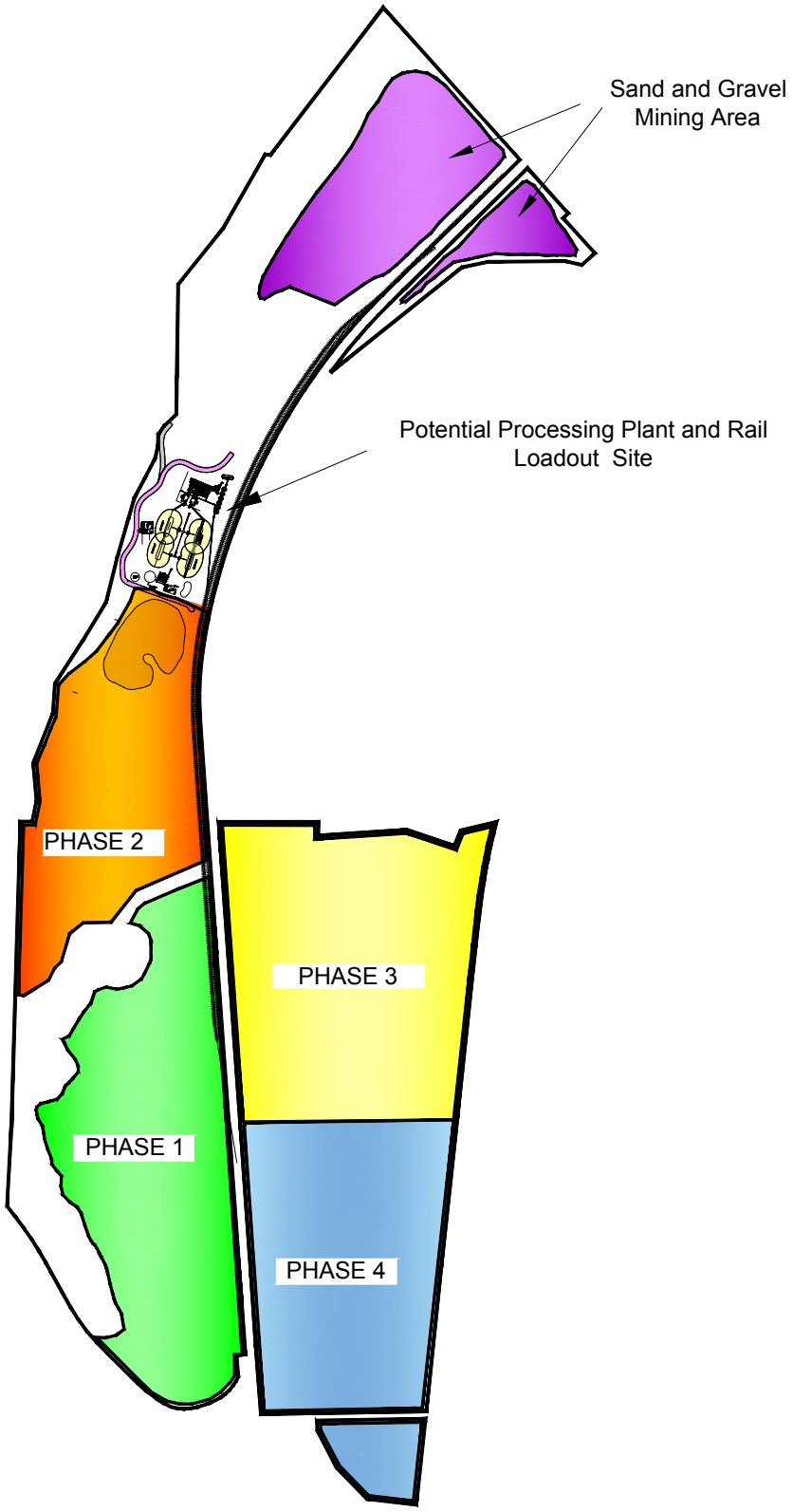
N

Not to Scale

Figure 5-3: Alternative 3

2.4 MT/YR BRP
Concept Mine Plan
Merriam Junction Sands
DEIS

Sunde Engineering, PLLC.



* Phases Refer to Sandstone Mining

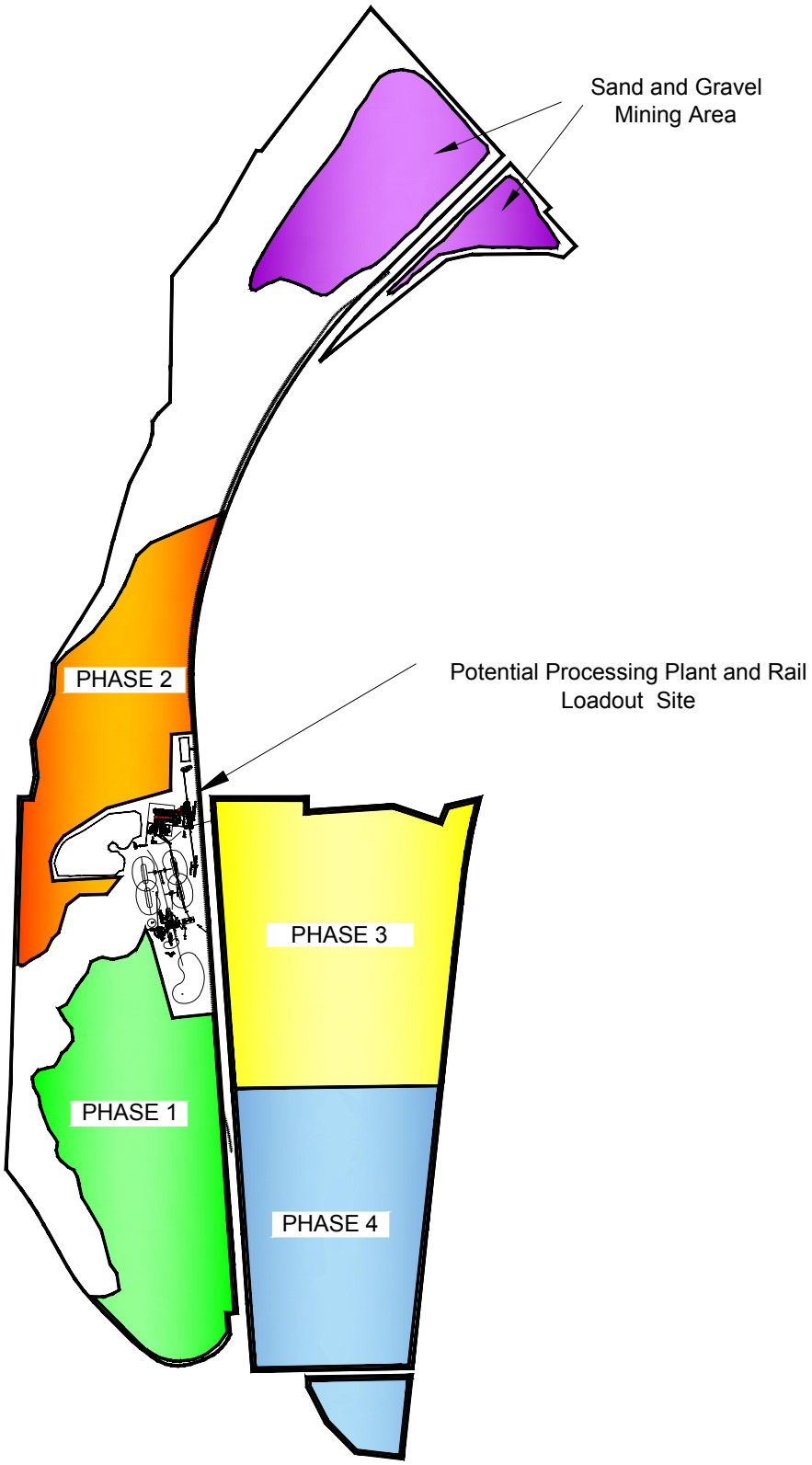
N

Not to Scale

Figure 5-4: Alternative 4

2.4 MT/YR MS-N
Concept Mine Plan
Merriam Junction Sands
DEIS

Sunde Engineering, PLLC.



* Phases Refer to Sandstone Mining

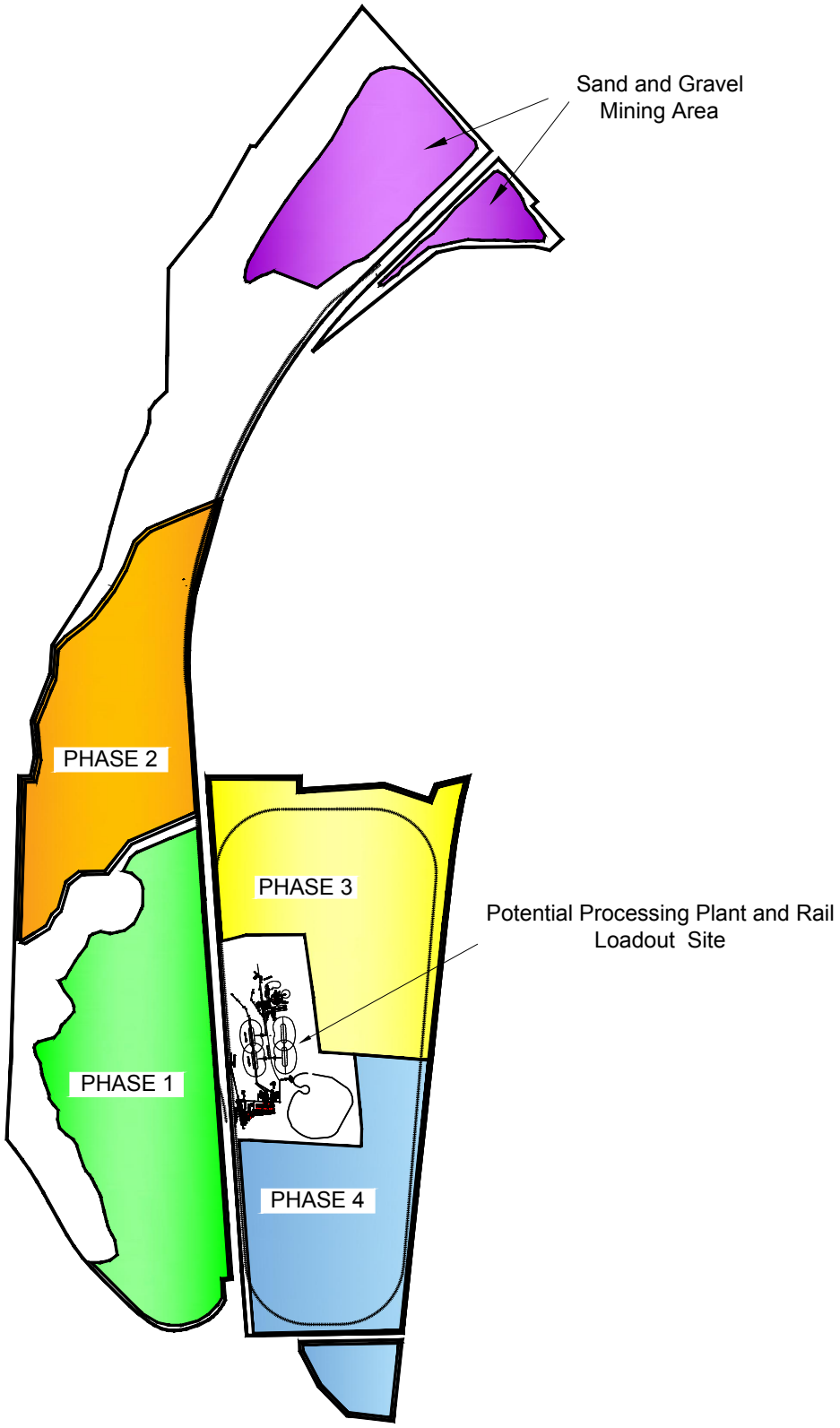
N

Not to Scale

Figure 5-5: Alternative 5

2.4 MT/YR MS-S
Concept Mine Plan
Merriam Junction Sands
DEIS

Sunde Engineering, PLLC.



* Phases Refer to Sandstone Mining

N

Not to Scale

Figure 5-6: Alternative 6

2.4 MT/YR BRP
Concept Mine Plan
Merriam Junction Sands
Scoping EAW

Sunde Engineering, PLLC.

SRF No. 0127741

DRAFT MEMORANDUM

TO: Bruce Malkerson, Attorney at Law
MALKERSON GUNN MARTIN LLP

FROM: Patrick Corkle, PE, PTOE, Principal
Jeff Bednar, TOPS, Senior Traffic Engineering Specialist

DATE: April 24, 2012

SUBJECT: MERRIAM JUNCTION SANDS MINING AND PROCESSING FACILITY
TH 41 SITE ACCESS INTERSECTION DECISION SIGHT DISTANCE ANALYSIS

INTRODUCTION

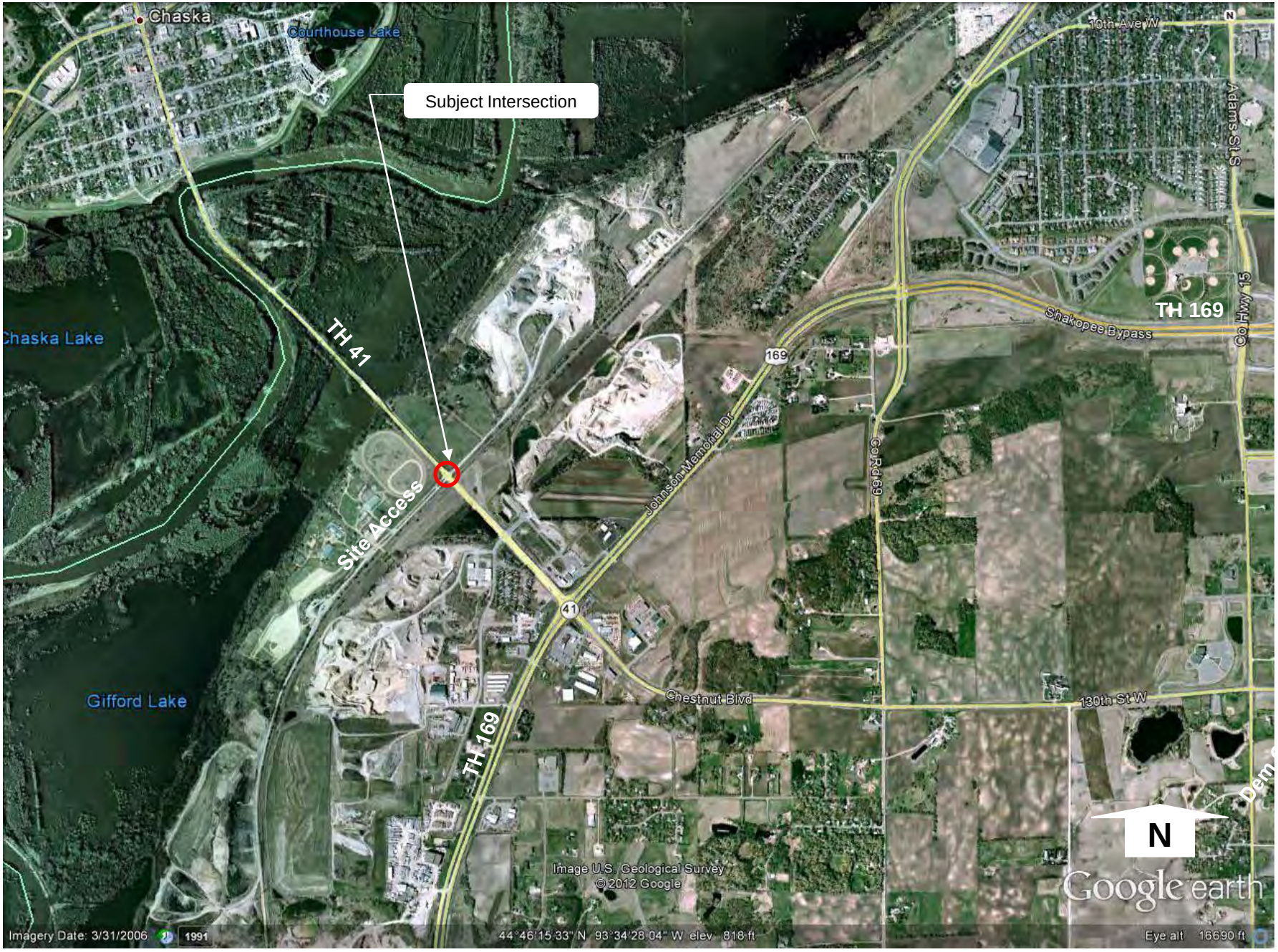
One of the proposed mining and processing facility main site accesses is an access intersection on TH 41 approximately 2,500 feet northwest of TH 169 and just northwest of the Union Pacific (UP) railroad crossing (see Figure One: Project Location). The proposed mining and processing activity will result in additional heavy truck and/or rail traffic at this location. The sight distance from this intersection looking to the northwest (toward southeast bound approaching traffic) is limited by a crest vertical curve approximately 665 feet northwest of the intersection.

The main objective of this analysis is to complete time-based sight distance measurements and calculations for heavy trucks and report the findings and recommendations.

EXISTING CONDITIONS

The subject intersection is located on TH 41 (a 55 mph, two-lane, principal arterial highway) about 1,200 feet northwest of the traffic signal controlled major intersection of TH 41 and Dem Con Drive. This section of TH 41 currently carries a daily traffic volume of 17,000 with 8.5 percent heavy commercial truck traffic. TH 41 northwest of the subject intersection is a two-lane undivided roadway. TH 41 southeast of the intersection is a two-lane undivided roadway that transitions to a divided roadway 600 feet to the southeast (see Figure 2: Existing Conditions).

The existing subject intersection is a four legged, side-street stop controlled, single lane approach intersection that serves the surrounding rural commercial/industrial land use. Sight distance from this intersection looking to the west (toward southeast bound approaching traffic) is limited by a crest vertical curve approximately 665 ft northwest of the intersection. There is also a single track Union Pacific (UP) railroad crossing with gate arm protection and overhead illumination less than 75 feet southeast of the intersection. According to the Federal Railroad Administration, this rail line serves an average of five trains per day (ranging from a few cars to more than 100 cars) running at 30 to 45 mph (top speed identified was 49 mph).



H:\Projects\7741\TS\Sight_DistFigure1

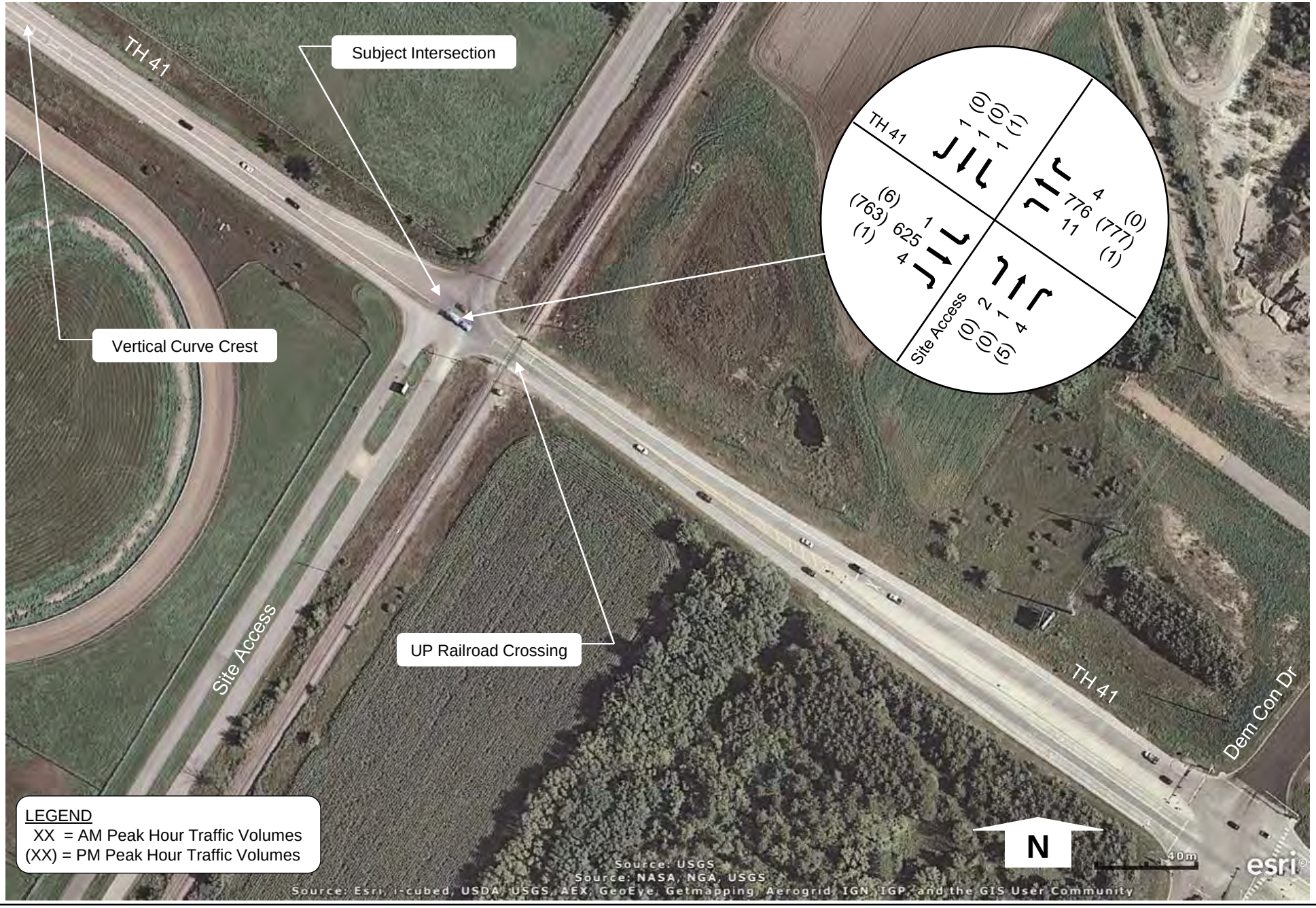
SRF Consulting Group, Inc

0127741 April 2012

Existing Conditions

Figure 1

Merriam Junction Sands Mining and Processing Facility – TH 41 Site Access Intersection Sight Distance Analysis
Malkerson Gunn Martin LLP



H:\Projects\7741\TSIS\ight_DistFigure2

SRF Consulting Group, Inc

0127741 April 2012

Existing Conditions

Merriam Junction Sands Mining and Processing Facility – TH 41 Site Access Intersection Sight Distance Analysis
Malkerson Gunn Martin LLP

Figure 2

SRF conducted time-based intersection sight distance observations at the subject intersection (looking northwest toward southeast bound approaching traffic) for one hour (3:00 to 4:00 PM) on Tuesday, March 13, 2012. The time gap or interval (in seconds) between successive southeast bound approaching vehicles was recorded. This time gap is described as the interval in seconds from seeing the headlamps of a southeast bound approaching vehicle as it emerges from behind the crest until it arrives at the center of the intersection.

An analysis and review of these time-based intersection sight distance observations reveals:

- The average time gap in southeast bound traffic flow was 9.6 seconds
- The minimum time gap in southeast bound traffic flow was 6.6 seconds
- The maximum time gap in southeast bound traffic flow was 12.3 seconds

Note that the wide range in observed time gap indicates a wide range in the approach speeds of the southeast bound traffic on TH 41. This wide range in approach speeds was the basis for selection of the time-based versus a measured distance-based sight distance analysis.

Sight distance observations were not collected for traffic approaching the subject intersection from the southeast (or northwest bound traffic) because sight distance in this direction is effectively unrestricted.

The following information is based on the 2011 American Association of State Highway and Transportation Officials (AASTHO), A Policy on Geometric Design of Highways and Streets (also known as the AASHTO Green Book):

- Acceptable gap for a stopped combination truck to turn left onto a two-lane highway with no median and grades of three percent or less = 11.5 seconds.

- Acceptable gap for a stopped combination truck to turn right onto a two-lane highway with no median and grades of three percent or less = 10.5 seconds.

Based on these heavy truck turning acceptable gaps and the time gaps observed at the subject intersection, it is estimated that only 14 percent of the available gaps are adequate for left-turning heavy trucks and 31 percent of the available gaps are adequate for right-turning heavy trucks.

Intersection turning movement counts for the morning and afternoon peak periods were collected at the subject intersection by SRF on Tuesday, March 13, 2012. These turning movement counts (see Figure 2: Existing Conditions) will serve as a basis for a Poisson distribution analysis. This Poisson distribution analysis was conducted for the morning and afternoon peak hours at the subject side-street stop controlled intersection to determine how many acceptable time gaps are available in the TH 41traffic flow to accommodate left and right-turning heavy trucks.

Results of the Poisson distribution analysis shown in Table 1 indicate that the number of heavy truck left-turning acceptable gaps available at the subject intersection is limited. The number of heavy truck right-turning acceptable gaps available at the subject intersection is more reasonable.

Table 1
Existing Peak Hour Acceptable Gap - Poisson Distribution Analysis Results

TH 41 and Merriam Sands Site Access (side-street stop controlled)	Acceptable Gaps Available	
	A.M. Peak	**P.M. Peak**
11.5 second heavy truck left-turning acceptable gaps	15	11
10.5 second heavy truck right-turning acceptable gaps	101	82

A review of available MnDOT crash data for the five year period from 2006 through 2010 indicates that there is not a significant crash problem at the existing intersection. During this timeframe only one intersection related property damage crash was reported at the intersection (northeast bound left-turn and southeast bound through). However, during this same period seven, primarily northeast bound rear-end crashes occurred associated with the adjacent railroad crossing. There was one non-severe injury and six property damage crashes at this crossing.

FINDINGS

Based on this TH 41 and Merriam Sands access intersection traffic study the following findings are offered for consideration:

1. Sight distance from the subject intersection looking to the west (toward southeast bound approaching traffic) is limited by a crest vertical curve approximately 665 ft northwest of the intersection. The proposed mining and processing activity will result in additional heavy truck and/or rail traffic at this location.

2. Based on the heavy truck turning acceptable gaps (from 2011 AASHTO Green Book) and the time gaps observed in the southeast bound traffic at the subject intersection, it is estimated that only 14 percent of the available gaps are adequate for left-turning heavy trucks and 31 percent of the available gaps are adequate for right-turning heavy trucks.

3. Results of a Poisson distribution analysis of peak hour traffic volumes shown in Table 1 indicate that the number of heavy truck left-turning acceptable gaps available at the subject intersection is limited. The number of heavy truck right-turning acceptable gaps available at the subject intersection is more reasonable.

4. A review of available MnDOT crash data for the five year period from 2006 through 2010 indicates that there is not a significant crash problem at the existing intersection. During this timeframe only one intersection related property damage crash was reported at the intersection (involved a northeast bound left-turn and southeast bound through).

5. During this same period seven, primarily northeast bound rear-end crashes occurred associated with the adjacent railroad crossing. There was one non-severe injury and six property damage crashes at this crossing.

RECOMMENDATIONS

1. Since the number of acceptable gaps available for left-turning heavy trucks at the subject intersection is limited, it is recommended that the planning and design of the Merriam Sands Mining and Processing Facility account for this limitation by reducing the demand to have heavy trucks make this turning movement.

2. Should it be required that a significant number of heavy trucks make the northeast bound left-turn at the subject intersection, alternative access improvements should be considered.

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Appendix A

U.S. DOT - CROSSING INVENTORY INFORMATION
AS OF 4/20/2012

Crossing No.: ***185342L*** Update Reason: ***Changed Crossing*** Effective Begin-Date of Record: ***10/04/06***

Railroad: ***UP*** ***Union Pacific RR Co. [UP]*** End-Date of Record:

Initiating Agency ***State*** Type and Positiion: ***Public At Grade***

Part I Location and Classification of Crossing

Division:	***TWIN CITIES***	State:	***MN***
Subdivision:	***MERRIAM***	County:	***SCOTT***
Branch or Line Name:	***ML***	City:	***Near SHAKOPEE***
Railroad Milepost:	***0031.53***	Street or Road Name:	***ST HWY 41***
RailRoad I.D. No.:	***7610***	Highway Type & No.:	***MNTH 41***
Nearest RR Timetable Stn:	***SHAKOPEE***	HSR Corridor ID:	
Parent Railroad:		County Map Ref. No.:	***25***
Crossing Owner:		Latitude:	***44.7708814***
ENS Sign Installed:		Longitude:	***-93.5848525***
Passenger Service:	***None***	Lat/Long Source:	***Actual***
Avg Passenger Train Count:	***0***	Quiet Zone:	***No***
Adjacent Crossing with Separate Number:	***No***		

Private Crossing Information:

Category: Public Access:

Specify Signs: Specify Signals:

ST/RR A	ST/RR B	ST/RR C	ST/RR D
Railroad Use:			

State Use: ***F1095***

Narrative:

Emergency Contact: ***(800)848-8715*** Railroad Contact: State Contact: ***(651)366-3667***

Part II Railroad Information

Number of Daily Train Movements: Less Than One Movement Per Day: ***No***

Total Trains: ***5*** Total Switching: ***0*** Day Thru: ***3***

Typical Speed Range Over Crossing: From ***30*** to ***49*** mph Maximum Time Table Speed: ***49***

Type and Number of Tracks: Main: ***1*** Other ***0*** Specify:

Does Another RR Operate a Separate Track at Crossing? ***No***

Does Another RR Operate Over Your Track at Crossing? ***No***

U.S. DOT - CROSSING INVENTORY INFORMATION
Continued

Crossing ***185342L***

Effective Begin-Date of Record: ***10/04/06***

End-Date of Record:

Part III: Traffic Control Device Information

Signs:

Crossbucks:	***0***	Highway Stop Signs:			***0***
Advanced Warning:	***Yes***	Hump Crossing Sign:			***No***
Pavement Markings:	***Stop Lines and RR Xing Symbols***	Other Signs:	***1***	Specify:	***W10-2***
			1		***W14-3***

Train Activated Devices:

Gates:	***2***	4 Quad or Full Barrier:			***No***
Mast Mounted FL:	***0***	Total Number FL Pairs:			***0***
Cantilevered FL (Over):	***0***	Cantilevered FL (Not over):			***0***
Other Flashing Lights:	***0***	Specify Other Flashing Lights:			
Highway Traffic Signals:	***0***	Wigwags:	***0***	Bells:	***1***
Other Train Activated Warning Devices:		Special Warning Devices Not Train Activated:			
Channelization:	***None***	Type of Train Detection:			***None***
Track Equipped with Train Signals?	***No***	Traffic Light Interconnection/Preemption:			***Not Interconnected***

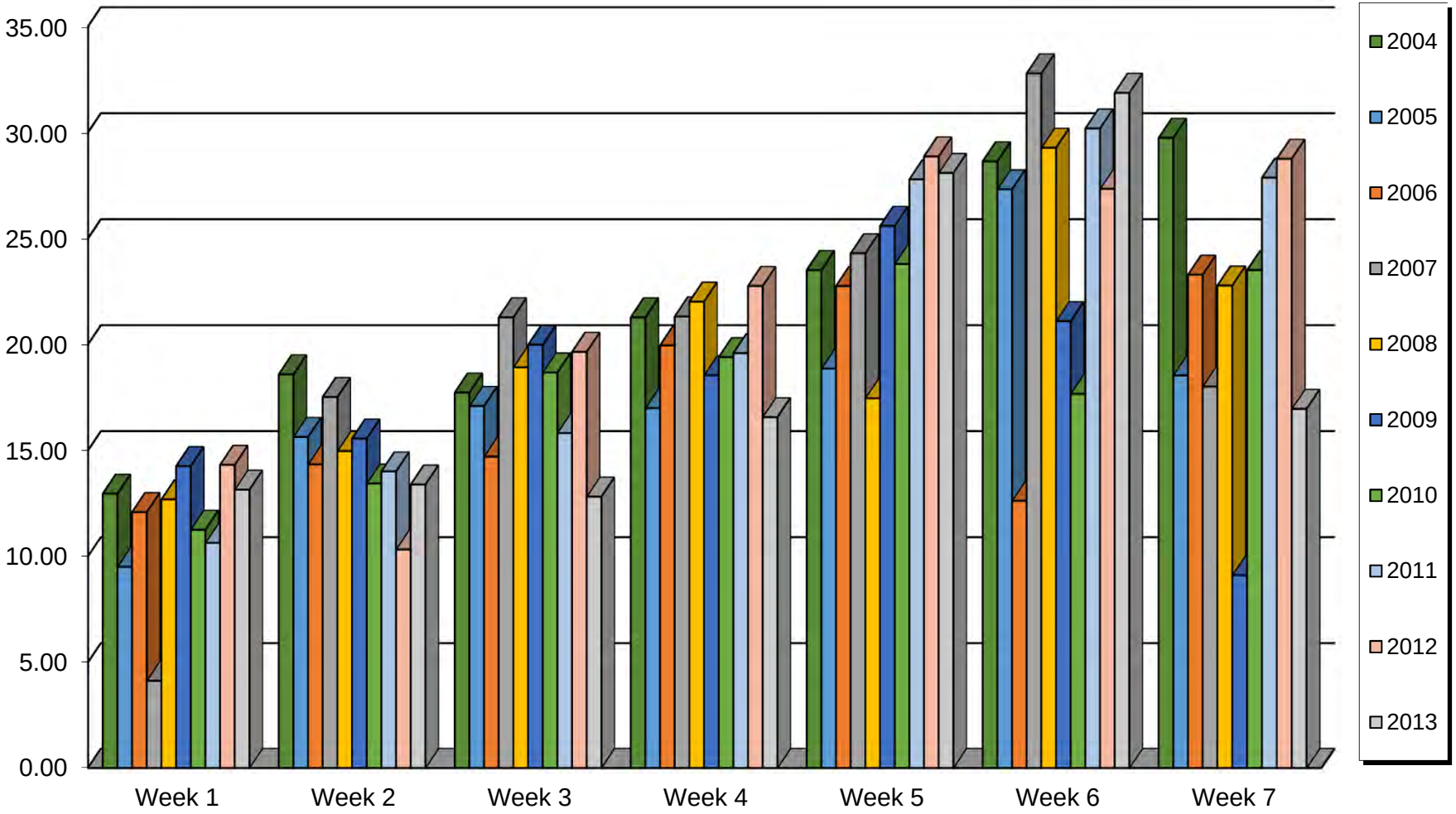
Part IV: Physical Characteristics

Type of Development:	***Open Space***	Smallest Crossing Angle:	***60 to 90 Degrees***
Number of Traffic Lanes Crossing Railroad:	***2***	Are Truck Pullout Lanes Present?	***No***
Is Highway Paved?	***Yes***		
Crossing Surface:	***Concrete***	If Other:	
Nearby Intersecting Highway?	***Less than 75 feet***	Is it Signalized?	***No***
Does Track Run Down a Street?	***No***	Is Crossing Illuminated?	***Yes***
Is Commercial Power Available?	***Yes***		

Part V: Highway Information

Highway System:	***Other FA Highway - Not NHS***	Functional Classification of Road at Crossing:	***Rural Minor Arterial***
Is Crossing on State Highway System:	***Yes***		
Annual Average Daily Traffic (AADT):	***015800***	AADT Year:	***2004***
Estimated Percent Trucks:	***10***	Avg. No of School Buses per Day:	***2***
Posted Highway Speed:	***55***		

Minnesota Renaissance Festival
Saturday Daily Attendance History
In 1,000s of Attendees from 2004 - 2013



Corrigendum page 14 (prepared by Sunde Engineering, PLLC):

The Traffic Impact Analysis was based on alternatives presented in the Merriam Junction Sands Scoping EAW. As part of refined project design, minor modifications were made to the alternatives as presented in the DEIS. These included moving the processing plant from the Malkerson Sales property to the Bryan Rock property for Alternative 6. For the purposes of the traffic Impact Study, Alternative 6 should be removed from its association with Site Access Option C: silica sand transported from the Malkerson Sales Property only, and added to Site Access Option B: silica sand transported from the Bryan Rock Property only. The appropriate corrections are redlined below.

Alternative 1: Two 1.2 million ton (MT)/year silica sand processing plants. "Processing plants" refers to both a wet plant and a dry plant throughout this document. One plant to be located on the Bryan Rock plant site and one plant located on the Malkerson Sales northern plant site. Alternative 1 includes two separate loadout facilities.
Alternative 2: Two 1.2 MT/year silica sand processing plants. One plant to be located on the Bryan Rock plant site and one plant located on the Malkerson Sales southern plant site. Alternative 2 includes two separate rail yards and loadout facilities.
Alternative 3: One 2.4 MT/year silica sand processing plant located on the Bryan Rock plant site. Alternative 3 includes one rail yard and loadout facility.
Alternative 4: One 2.4 MT/year silica sand processing plant located on the Malkerson Sales northern plant site. Alternative 4 includes one rail yard and loadout facility.
Alternative 5: One 2.4 MT/year silica sand processing plant located on the Malkerson Sales southern plant site. Alternative 5 includes one rail yard and loadout facility.
Alternative 6: One 2.4 MT/year silica sand processing plant located on the Bryan Rock ~~Malkerson Sales northern~~ plant site. Alternative 6 includes one rail yard loadout facility.
No Build Alternative: This alternative considers continued limestone quarry, sand and gravel mining and processing operations. No silica sand mining, processing and loadout are associated with this alternative.

Site Access Options
Because the various site configuration alternatives will result in different traffic patterns depending upon which plant sites are developed, three individual Site Access Options were identified to simplify yet adequately represent traffic impacts associated with the various alternatives including:

Site Access Option A: Site Alternatives 1 and 2 (these two alternatives will generate similar traffic volume and patterns with silica sand transported from both Bryan Rock and Malkerson Sales Properties).
Site Access Option B: Site Alternatives 3 and 6, silica sand transported from the Bryan Rock Property only.
Site Access Option C: Site Alternatives 4 and ~~,~~ 5~~, and 6~~ (these three alternatives will generate similar traffic volumes and patterns with silica sand transported from the Malkerson Sales property only).

2. Merriam Junction Sands Facilities Traffic Impact Study Addendum 1

Potential cumulative effects analysis surrounding land uses

SRF Consulting Group, Inc. | Engineers Planners Designers

Memorandum

SRF No 01507741.02

To: Bruce Malkerson, Co-President
Bill Bryan, Co-President
Merriam Junction Sands, Inc.

From: Jeff Bednar, TOPS, Senior Traffic Engineering Specialist
Joe DeVore, Traffic Engineer

Date: May 26, 2016

Subject: Merriam Junction Sands Facilities – Traffic Study Addendum

Introduction

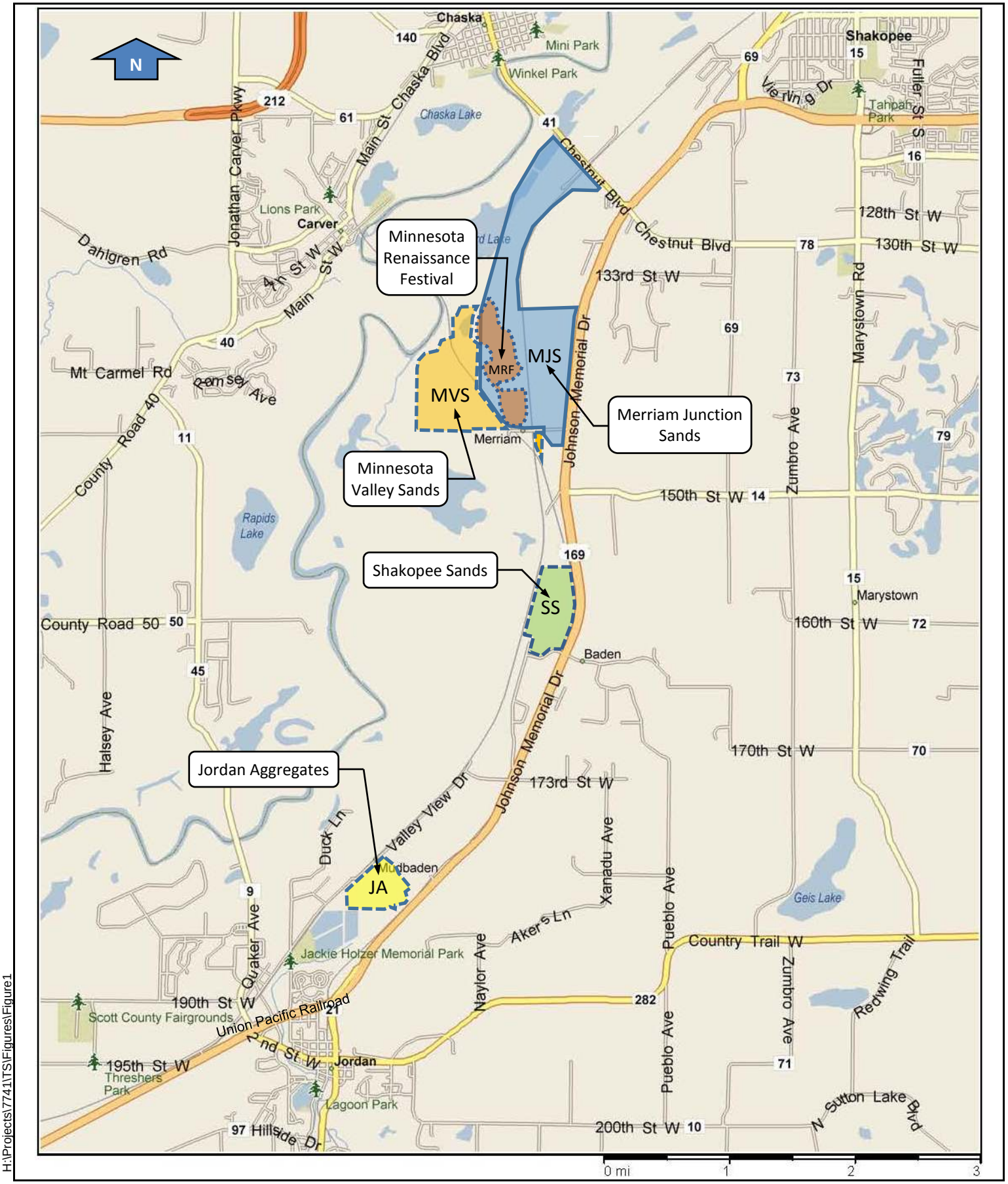
This memorandum was prepared to analyze adjacent land uses for the existing and proposed Merriam Junction Sands mining and processing facility. Based on environmental documents for adjacent land uses, trip generation estimates were compared to background growth rates previously assumed in TIS. The adjacent projects analyzed include: Shakopee Sands, formerly Great Plains Sands (GPS); Jordan Aggregates; Minnesota Valley Sands (MVS); and the Minnesota Renaissance Festival.

Previous Findings

Previous analysis concluded that based on existing area growth patterns, historical ADT volumes, and recent forecasts for year 2040 daily traffic volumes (Scott County Travel Demand Model), an annual background traffic growth rate of one percent was applied to the existing peak hour volumes to develop year 2017 and year 2026 no build traffic forecasts. Traffic generated from on-going limestone, sand, and gravel production is included in the no build traffic forecasts.

The TIS traffic forecasts were only extended out to 10 years after opening due to uncertainty in market demand for the materials proposed to be mined and processed at the proposed Site and potential major improvements to the supporting transportation system (i.e., access management and a potential new interchange at TH 169/TH 41 pending legislative action and funding).

Under year 2026 no build p.m. peak hour conditions, the LOS at the TH 169/TH 41 intersection will be degraded to unacceptable levels indicating the need for longer range improvements. Combined with the existing traffic safety problem at the TH 169/TH 41 intersection, the need for longer range improvements has resulted in this intersection being ranked number one in the 2014 Regional Solicitation Grants listing of Principal Arterial roadway expansion projects being considered for future funding, along with additional appropriate funding sources and strategies.



H:\Projects\7741\TS\Figures\Figure1

Consulting Group, Inc

0157741
May 2016

Project Location and Adjacent or Nearby Land Uses

Figure 1

Merriam Junction Sands Facilities | Traffic Impact Study Update
MJS Inc. | Louisville Township | Scott County, MN.

Adjacent Land Use Trip Generation

Environmental documentation that was referenced for the adjacent projects included:

- Great Plains Sands (GPS) IUP Expected Traffic Description
- Jordan Aggregates Traffic Technical Report
- Minnesota Valley Sands Scoping EAW

Based on these reports and previous information in the TIS, daily and peak hour expected trips were combined in order to compare to the background growth rate assumed in the TIS. These adjacent land uses to the Merriam Junction Sands are located along Valley View Dr and 145th St W. As with the Merriam Junction Sands TIS, most of these trips from adjacent development use Hwy 169/145th St W and TH 41/Valley View Dr Intersections to access the regional network.

Trip Generation Comparison

Truck and employee trip generation estimates analyzed for adjacent land use to the MJS facility. Daily and weekday peak hour trips were compared to the background growth assumed in the TIS. A complete trip generation is included in Attachment A.

Table 1: AADT Comparison of Adjacent Land Use

AADT Comparison of Adjacent Land Use Trip Generation	Existing	Year 2026 No Build	TIS Background Growth (2015-2026)	Adjacent Land Use Trip Generation	Percentage of Background Growth
Hwy 169 N of TH 41	29,500	32,450	2,950	372	13%
Hwy 169 S of TH 41	28,000	30,800	2,800	93	3%
TH 41 W of Hwy 169	18,400	20,240	1,840	46	2%
Chestnut Blvd E of Hwy 169	4,650	5,115	465	11	2%

Results of the trip generation comparison shown in Table 1 indicate that the expected trip generation of the adjacent land use is expected to be covered in the assumed background growth in the TIS. The largest impact of the trip generation is to Hwy 169 north of TH 41, but this impact is only about 13% or the assumed background growth in the TIS.

Other Trip Generation Considerations

The Minnesota Renaissance Festival was analyzed due to the amount of event traffic it creates. This traffic is primarily only on weekends from late August through early October. Annual attendance reaches 300,000 but because this traffic is constrained to weekends and has its own traffic control through a series of one-way approaches, it does not affect the weekday peak hour analysis. Trucking companies also have the ability to limit truck operations during the high attendance weekends of the Renaissance Festival.

The Trail of Terror is another short term seasonal outdoor entertainment event with annual attendance significantly less than the Minnesota Renaissance Festival that takes place on select Fridays, Saturdays, and Sundays, from mid- to late-October through early November. The Minnesota Renaissance Festival, Trail of Terror, and other events on these sites are primarily short term, seasonal, weekend, outdoor entertainment events. The focus of the TIS is the typical weekday commuter peak hours; therefore, these events were precluded from the detailed future traffic operations analysis during the weekday peak period.

Potential Impacts

The potential impacts of the weekday daily and peak hour trips from the adjacent developments to the Merriam Junction Sands mining and processing facility will be minimal. Daily and peak hour vehicle trips generated will be 522 and 87 vehicles respectively and can both be absorbed into the background growth assumed in the Traffic Impact Study. Most of this site generated traffic is assumed to access the developments using the TH 41/Valley View Drive intersection.

As concluded in the TIS, the LOS at the TH 169/TH 41 intersection will be unacceptable by the year 2026 no build conditions indicating the need for longer range improvements. Combined with the existing traffic safety problem at the TH 169/TH 41 intersection, the need for longer range improvements has resulted in this intersection being ranked number one in the 2014 Regional Solicitation Grants listing of Principal Arterial roadway expansion projects being considered for future funding along with additional appropriate funding sources and strategies.

Appendix A:

Trip Generation Estimates of Adjacent or Nearby Land Uses

Daily Traffic	MJS (comparison)	Adjacent Land Uses			**Total**
		Great Plains Sand	Jordan Aggregates	Minnesota Valley Sands	
Employees	278	74	20	20	**114**
Trucks	1,396	38	220	150	**408**
Vehicle Trips	1,674	112	240	170	**522**
Railroad Cars (90-110 Tons)	-	23	0	100	**123**

Peak Hour Traffic	MJS (comparison)	Adjacent Land Uses			**Total**
		Great Plains Sand	Jordan Aggregates	Minnesota Valley Sands	
Employees	41	20	10	10	**40**
Trucks	140	10	22	15	**47**
Vehicle Trips	181	30	32	25	**87**
Railroad Cars (90-110 Tons)	-	-	-	-	**0**

Daily Trip Generation Evaluation

Roadway Segment	Existing AADT Volume	Year 2026 No Build AADT Volume	Background Growth (daily trips assigned)	Adjacent Land Use (daily trips assigned)	**Percentage of Background Growth**
TH 169 N of TH 41	29,500	32,450	2,950	372	**13%**
TH 169 S of TH 41	28,000	30,800	2,800	93	**3%**
TH 41 W of TH 169	18,400	20,240	1,840	46	**2%**
Chestnut Blvd E of TH 169	4,650	5,115	465	11	**2%**

3. Merriam Junction Sands Facilities Traffic Impact Study Addendum 2

Response to traffic impact study technical review comments

SRF Consulting Group, Inc. | Engineers Planners Designers

Memorandum

SRF No 01507741.03

To: Bruce Malkerson, Co-President
Bill Bryan, Co-President
Merriam Junction Sands, Inc.

From: Jeff Bednar, TOPS, Senior Traffic Engineering Specialist

Date: April 24, 2019

Subject: Merriam Junction Sands Facilities - Traffic Impact Study Addendum No. 2

Introduction

This memorandum was prepared in order to respond to comments submitted by CH2M, the Scott County consultant retained to review the May 26, 2016, Merriam Junction Sands Facilities - Traffic Impact Study. The review comments made by CH2M, are contained in a technical memorandum dated March 13, 2018 (see Appendix A).

Review Comments and Responses

The CH2M review of the Merriam Junction Sands (MJS) Facilities - Traffic Impact Study, identifies a number of items they believe Scott County may want to request greater clarification or additional analyses. These review comments and following responses include:

1. **Forecast traffic volumes (Figures 8-13 of the MJS Facilities - Traffic Impact Study)**

   - **Comment:** The 2017 and 2026 forecasts did not specifically indicate the number of site generated trips as part of the turning volumes at each of the six study network intersections. Showing how inbound and outbound trips are expected to travel through the network would add clarity to the operations analyses.
   - **Response:** Inbound and outbound site-generated trips are shown on Figures 8B through 13B.

2. **Intersection Levels of Service (Table 3 & 5 in the MJS Facilities - Traffic Impact Study)**

   - **Comment:** The reported peak hour Level of Service only documents the overall letter grade for each intersection but it appears that site generated trips only contribute to certain movements at each intersection. Reporting Level of Service by approach and movement would provide additional clarity about the expected impacts to the quality of intersections operations. (Note – this would not require any additional analysis, merely providing more of the information that the analysis software produces).
   - **Response:** The full traffic analysis model output/reports are contained in Appendix B.

3. Intersection Level of Service

- **Comment:** Given that trucks make up around 75% of the site generated traffic and trucks are both longer than passenger vehicles and have different acceleration characteristics, it would be useful to know if the operational software was adjusted for this higher fraction of trucks. It would also be useful to report the impact of these additional trucks on expected queue lengths at each intersection and how these forecast queue lengths relate to the amount of storage available to accommodate turning traffic.
- **Response:** Background heavy truck through traffic was assumed at 10 percent and site-generated heavy truck traffic was assumed from 75 percent to 100 percent, depending on the specific movement. These heavy truck percentages were included in the traffic analysis model and therefore were accounted for in the operational results related to congestion, delay and queuing. The full traffic analysis model output/reports are contained in Appendix B. Note that there are no site-generated turn movements where queues exceed storage lengths.

4. Trucks and Heavy Vehicles

- **Comment:** A traffic safety perspective notices a potential issue of having large trucks move on and off Highway 169 is a great concern. Highway 169 currently has almost 30,000 vehicles per day moving at speeds around 65 miles per hour – this makes truck movements on and off the highway far more of a challenge and presents a high risk for conflicts. MnDOT studies document that full open (all movements allowed) intersections along high speed/volume expressways are high risk locations. Other than a brief discussion about sight distance in an appendix, the issue of special accommodations for large, heavy, slow moving vehicles is not discussed. It seems reasonable to at least discuss the desirability of restricting turning movements through median openings and of providing auxiliary acceleration and deceleration lanes wherever trucks are moving through uncontrolled intersections.
- **Response:** The Highway 169/41/78 interchange construction project, which began in September 2018, is well underway. This major highway improvement project will provide much improved operational conditions since it will include a full interchange at Highway 169/41/78 and an overpass at 147th Street that would include closure and replacement of the direct access at 145th Street with a reduced conflict/restricted intersection at 150th Street. The interchange construction project also includes closing the full access at Bryan Rock/Anchor Block main entrance on Highway 169. This access will be restricted to a right-in/right-out only. A southbound acceleration land will be added and the right turn lane will be extended an additional 700 feet (see Figure A: Plan Excerpt). These improvements address concerns noted above regarding large trucks moving on and off Highway 169.

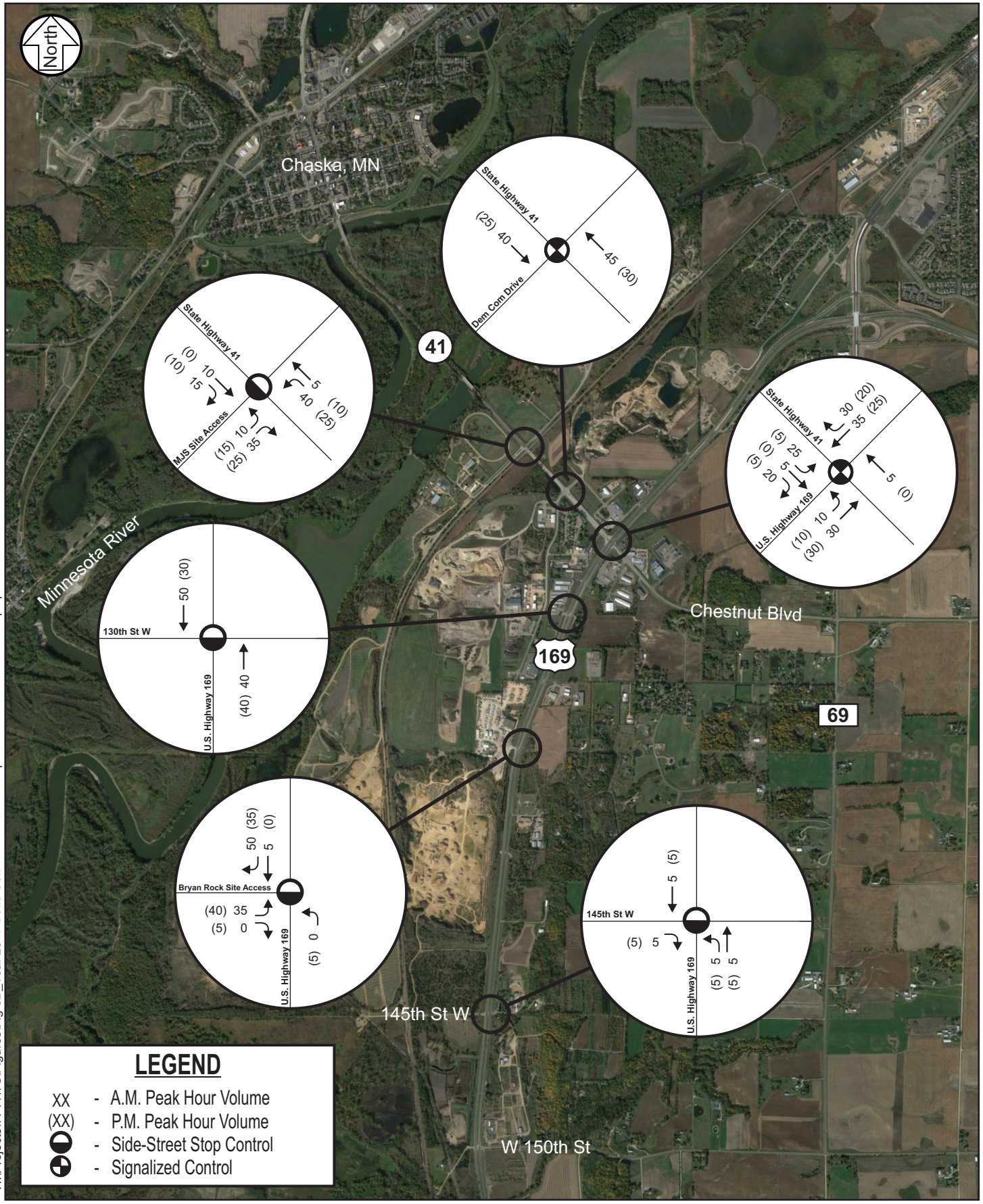
  The operational concerns expressed in the comment above are in large part adequately addressed by the Highway 169/41/78 interchange and 147th Street overpass construction project which includes restricting turning movements through median openings and provision of auxiliary acceleration and deceleration lanes at appropriate locations.

5. Conclusions

- **Comment:** No short-term mitigations are suggested. A better understanding of performance measures (Level of Service, delay and Queues) by approach and movement might provide additional insight about opportunities for improvements related to the movements through intersections associated with site generated traffic.
- **Response:** The full traffic analysis model output/reports are contained in Appendix B. Note that there are no site-generated turn movements where queues exceed storage lengths or where other operational concerns were identified that would require short-term improvements.
- **Comment:** Long term mitigations discussed include upgrading to a grade separated interchange at the Highway 41/169 intersection and a reference to access management modifications along Highway 169. Additional information should be provided about the status of the Highway 41/169 interchange improvement – is it in a capital improvement program and when is it scheduled? If the interchange is not programmed, additional mitigation measures should be considered. The discussion of access management indicates that it should be expected that the elimination/reduction of direct site access will be a priority. However, no further discussion of the details of an access management plan are included. This seems to be an error of omission. If any of the properties that now have direct access to Highway 169 are owned by the current proposer, now would be a good time to consider reduced or modified access because to wait until some future date would most likely result in either Scott County or MnDOT having to go through a condemnation process to achieve the desired level of access management.
- **Response:** The Highway 169/41/78 interchange construction project began in September 2018 and is well underway. Shown in Appendix C is the current Winter-Early Spring Construction Activities summary. Note that the Highway 169/41/78 interchange construction project does include a full interchange at Highway 169/41/78 and an overpass at 147th Street that would include closure and replacement of the direct access at 145th Street with a reduced conflict/restricted intersection at 150th Street. The interchange construction project also includes a restricted right-in/right-out only access at Bryan Rock's main entrance, with an acceleration lane, and a 700 foot extension of the existing right turn lane.

  Site access operations and safety at the Highway 41/Site Access intersection will continue to be monitored and traffic management plans will be developed and implemented to address any traffic operations and safety concerns should they become apparent. The site owners/operators will support MnDOT and Scott County, as appropriate, in any future opportunities to further improve the operations and safety of the site access on Highway 41.

Figures 8B through 13B: Site-Generated Traffic Volumes



H:\Projects\7741\TS\Figures\Fig 8B_Year 2017 Build Conditions - Access Option A - Site-Generated Trips.pdf

SRF Consulting Group, Inc.

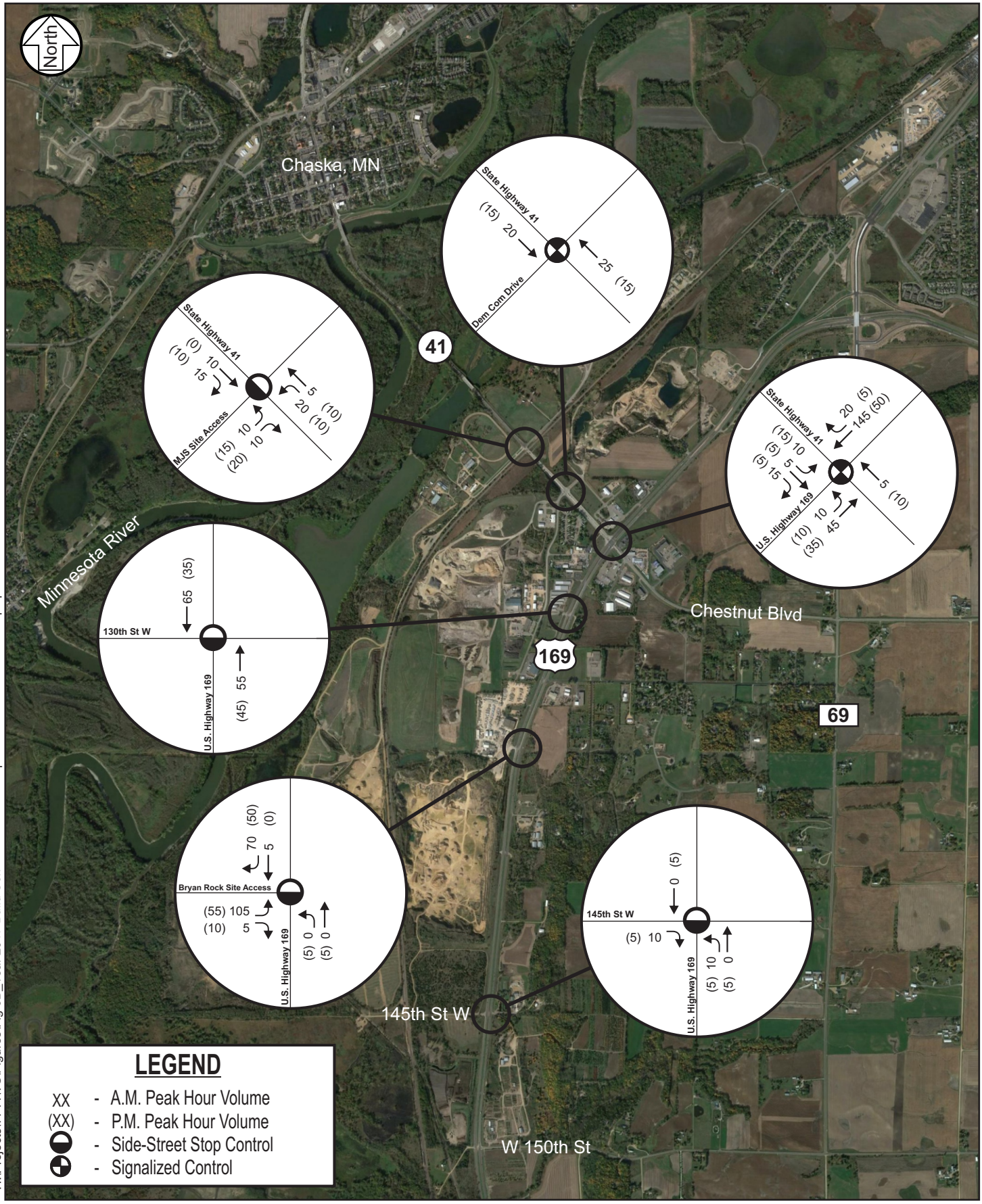
Year 2017 Build Conditions - Access Option A - Site-Generated Trips

Figure 8B

Merriam Junctions Sands Facility | Traffic Impact Study

MJS Inc. | Louisville Township | Scott County, MN

0157741
April 2019



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SRF Consulting Group, Inc.

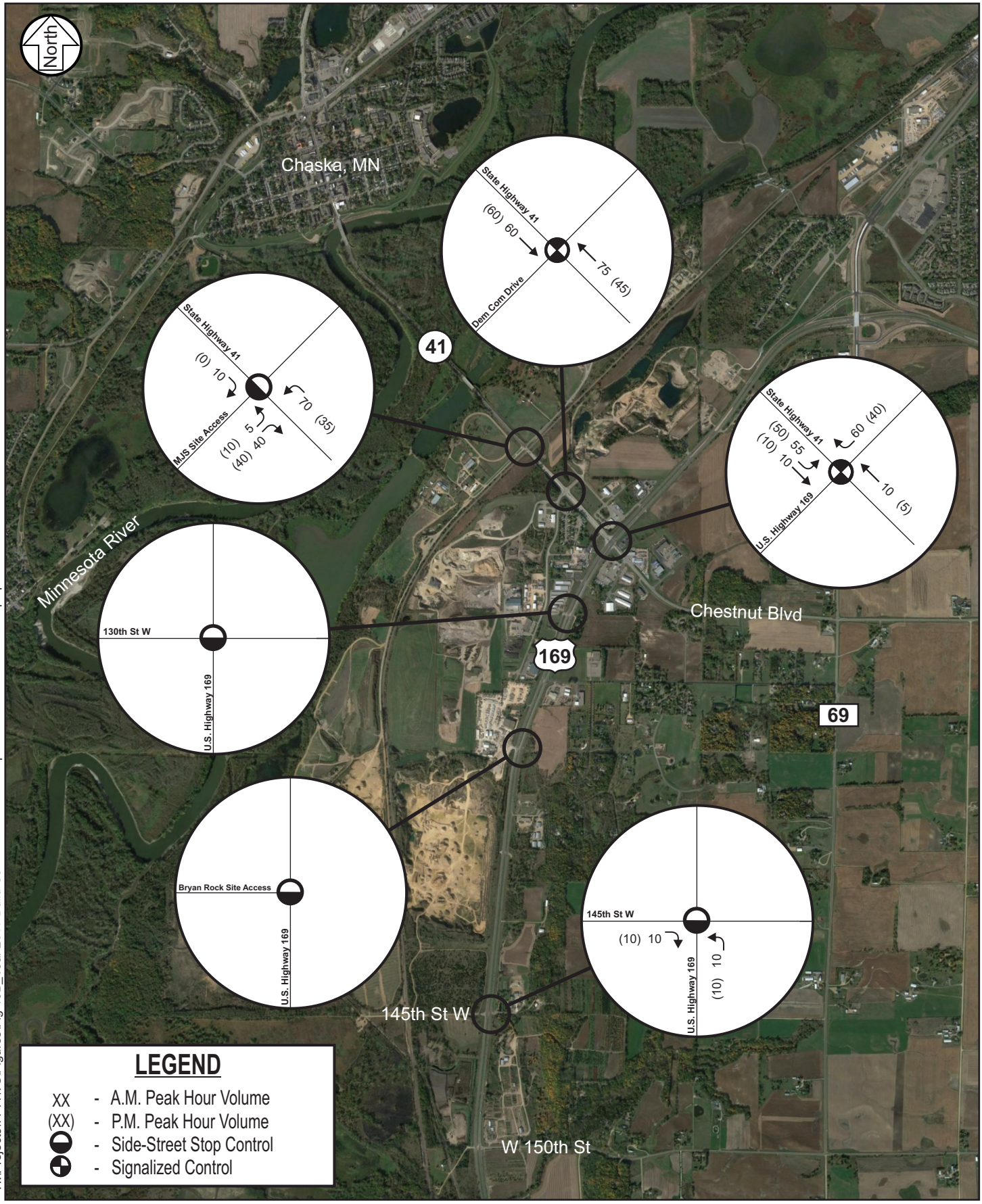
Year 2017 Build Conditions - Access Option B - Site-Generated Trips

Figure 9B

Merriam Junctions Sands Facility | Traffic Impact Study

MJS Inc. | Louisville Township | Scott County, MN

0157741
April 2019



H:\Projects\77411\TS\Figures\Fig 10B_Year 2017 Build Conditions - Access Option C - Site Generated Trips.pdf

SRF Consulting Group, Inc.

Year 2017 Build Conditions - Access Option C - Site-Generated Trips

Figure 10B

Merriam Juctions Sands Facility | Traffic Impact Study

MJS Inc. | Louisville Township | Scott County, MN

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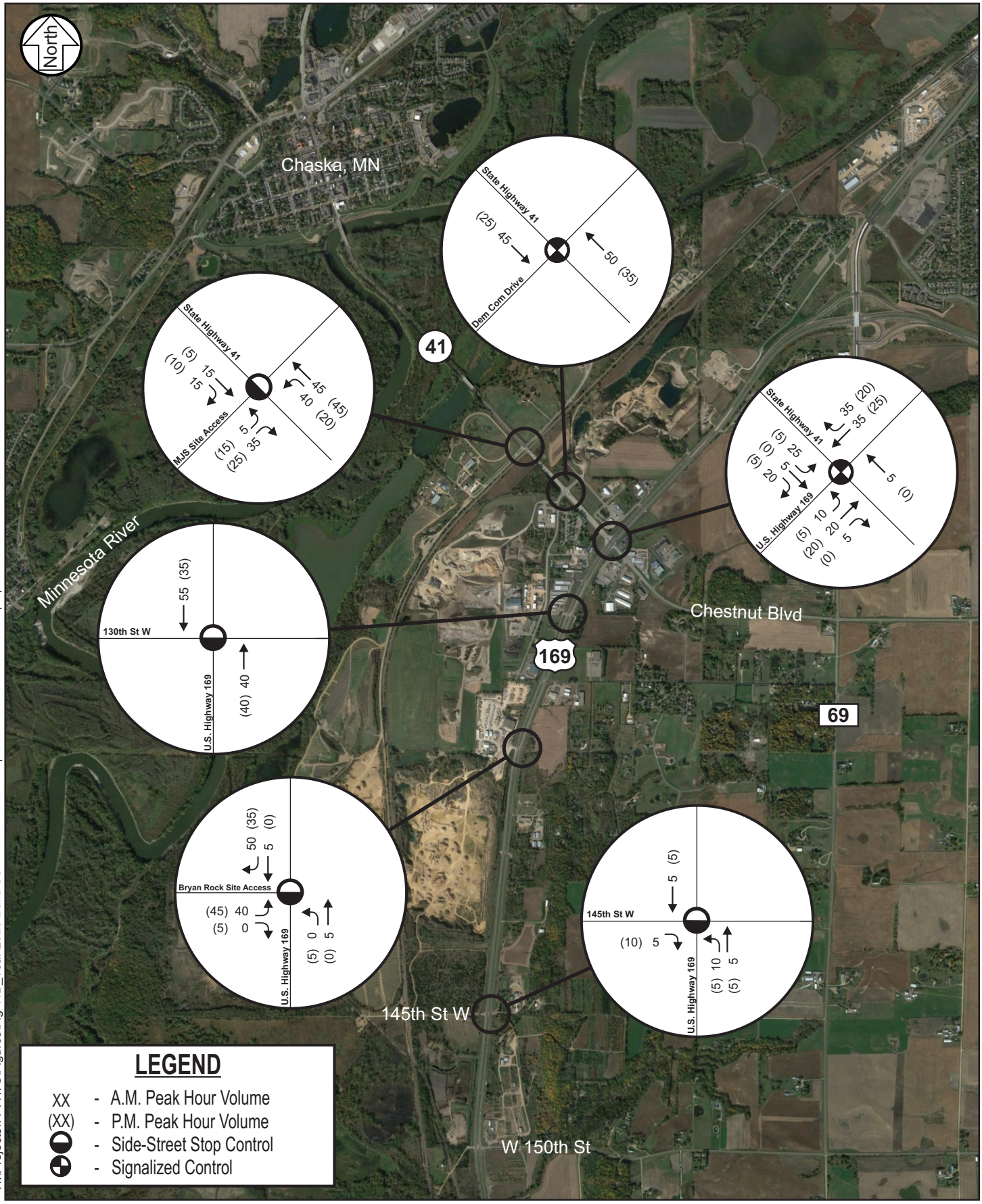
April 2019



H:\Projects\7741\TS\Figures\Fig 11B_Year 2026 Build Conditions - Access Option A - Site-Generated Trips.pdf

SRF Consulting Group, Inc.

Year 2026 Build Conditions - Access Option A - Site-Generated Trips

Figure 11B

Merriam Juctions Sands Facility | Traffic Impact Study

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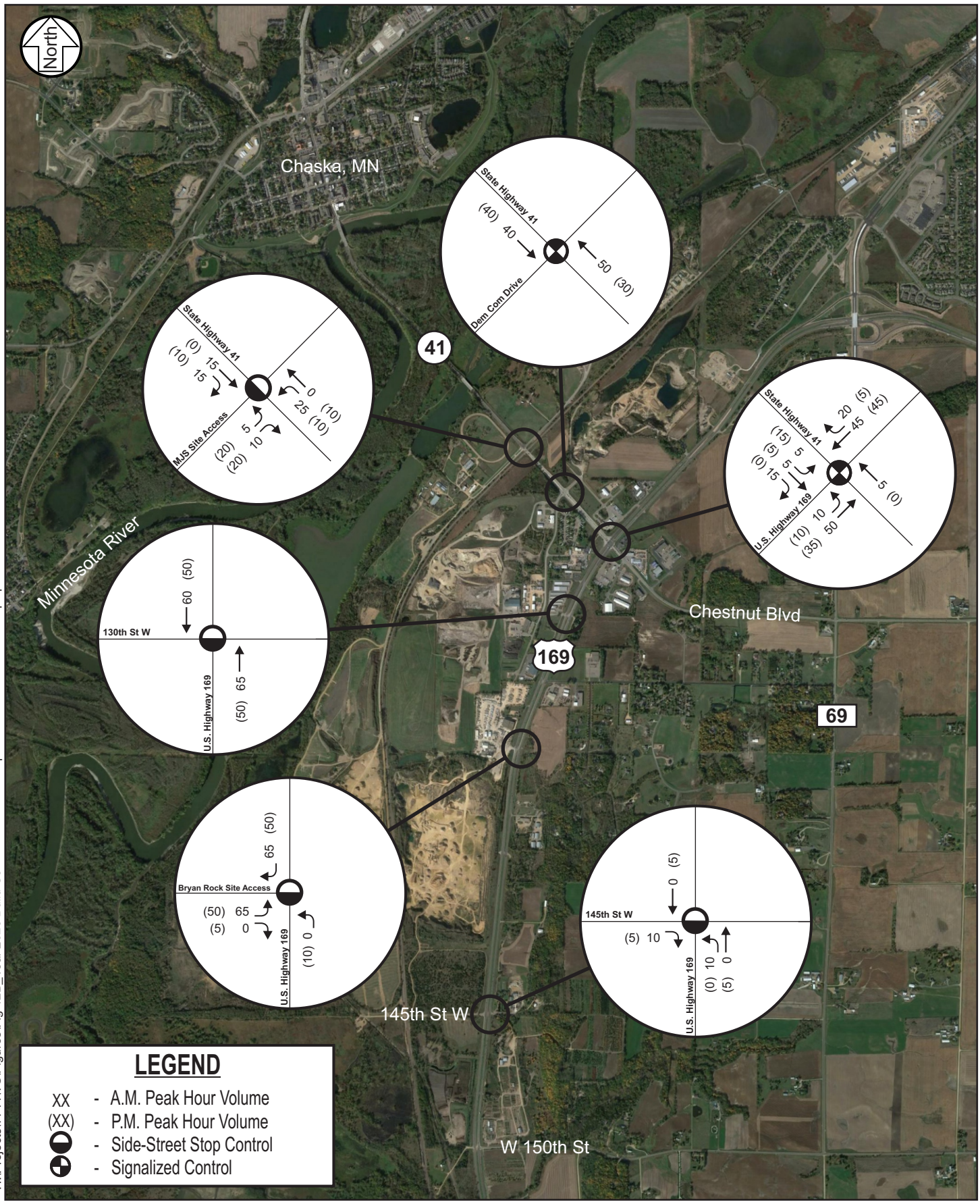

H:\Projects\7741\TS\Figures\Fig 12B_Year 2026 Build Conditions - Access Option B - Site Generated Trips.pdf

SRF Consulting Group, Inc.

Year 2026 Build Conditions - Access Option B - Site-Generated Trips

Figure 12B

Merriam Juctions Sands Facility | Traffic Impact Study

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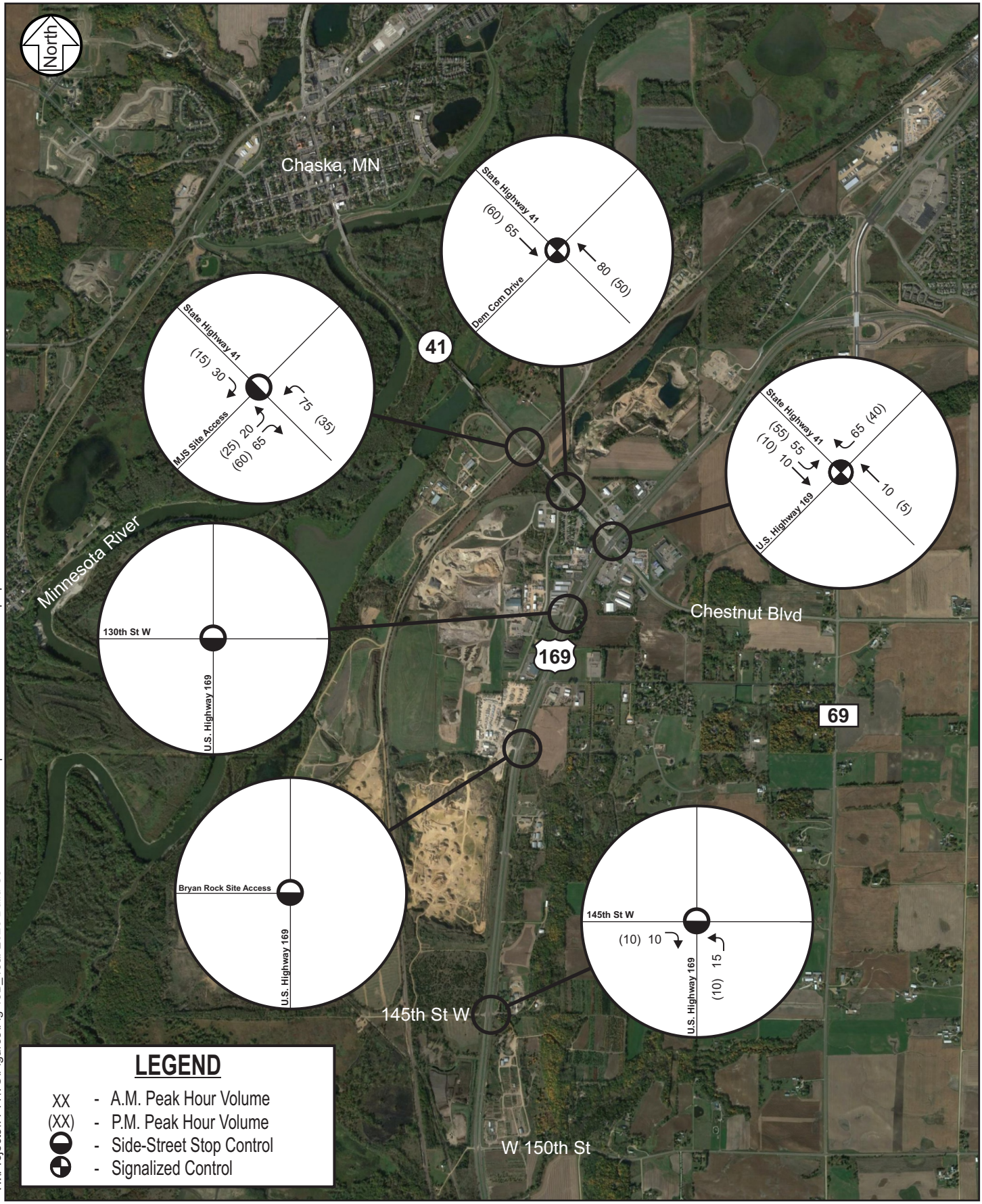

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SRF Consulting Group, Inc.

Year 2026 Build Conditions - Access Option C - Site-Generated Trips

Figure 13B

Merriam Juctions Sands Facility | Traffic Impact Study

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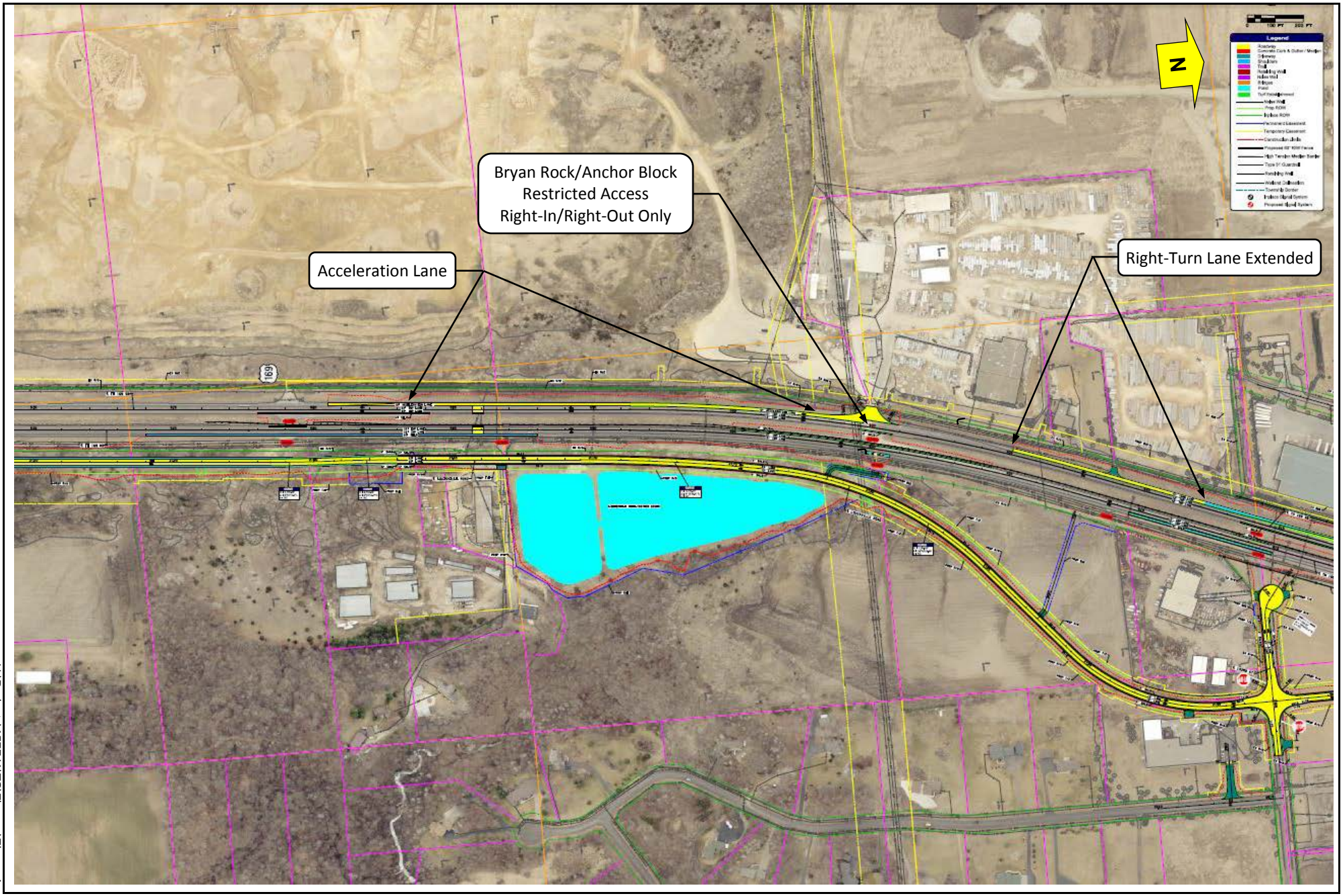
Figure A: Plan Excerpt



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Highway 169 Reconstruction Project Plan Excerpt

Figure A

Merriam Junction Sands Facilities | Traffic Impact Study Update
MJS Inc. | Louisville Township | Scott County, MN.

Appendix A: CH2M, Technical Memorandum dated March 13, 2018

TECHNICAL MEMORANDUM

Review of Merriam Junction Sands Facilities Traffic Impact Study – DRAFT

PREPARED FOR:	Scott County, Minnesota
COPY TO:	Kenneth Olson, Terracon Consultants, Inc.
PREPARED BY:	CH2M
DATE:	March 13, 2018

Scott County is in the process of reviewing environmental documents associated with a proposal to increase the level of mineral extraction from property bounded by U.S. Highway 169, 145th Street South, the Minnesota River and State Highway 41. A component of the environmental documentation involves assessing potential traffic related impacts due to traffic generated by the new/increased levels of mineral extraction. A traffic impact study documenting an analytical approach and conclusions about potential impacts was prepared by SRF Consulting Group and submitted to Scott County as part of the project development process. This traffic study was reviewed by CH2M and the following comments are provided for Scott County's consideration.

The components of the Traffic Impact Study (TIS) include site traffic generation, directional orientation, forecast traffic volumes, impact analysis and conclusions. In summary, the TIS indicates:

- The increased level of mineral extraction will generate a total of 1,674 new daily vehicle trips and 181 peak hour trips – the worst-case scenario with all product leaving the site by truck (no additional rail cars).
- Growth in background traffic levels associated with development on other sites in the area will increase daily traffic volumes along Highways 41 and 169 by 465 to 2,950 vehicles per day.
- Many intersections along the study road network currently experience moderate to severe levels of congestions due to the high levels of traffic along both Highways 41 and 169 and in the short term, additional site generated traffic would be expected to slightly increase levels of congestion.
- In the long term, congestion levels will increase but this would be mostly due to the increase in background traffic associated with nearby development.
- By 2026, operational levels at the intersection of Highways 41 and 169 will be unacceptable and this supports the need for implementation of the regionally sponsored replacement of the current traffic signal controlled intersection with a grade separated interchange.
- The future addition of the interchange at Highway 41/169 would likely also include modifications to site access points along both highways as well as completion of frontage/service road systems.
- Potential traffic impacts to the system are considered minimal and beyond the identified regional road system improvements, no specific intersection mitigation measures are proposed.

The review of the TIS indicates a number of items where Scott County may want to request either greater clarification or additional analyses. These include:

- Forecast traffic volumes (Figures 8-13)
  - The 2017 and 2026 forecasts did not specifically indicate the number of site generated trips as part of the turning volumes at each of the six study network intersections. Showing how inbound and outbound trips are expected to travel through the network would add clarity to the operations analyses.
- Intersection Levels of Service (Table 3 & 5)
  - The reported peak hour Level of Service only documents the overall letter grade for each intersection but it appears that site generated trips only contribute to certain movements at each intersection. Reporting Level of Service by approach and movement would provide additional clarity about the expected impacts to the quality of intersections operations. (Note – this would not require any additional analysis, merely providing more of the information that the analysis software produces.)
- Intersection Level of Service
  - Given that trucks make up around 75% of the site generated traffic and trucks are both longer than passenger vehicles and have different acceleration characteristics, it would be useful to know if the operational software was adjusted for this higher fraction of trucks. It would also be useful to report the impact of these additional trucks on expected queue lengths at each intersection and how these forecast queue lengths relate to the amount of storage available to accommodate turning traffic.
- Trucks and Heavy Vehicles
  - A traffic safety perspective notices a potential issue of having large trucks move on and off Highway 169 is a great concern. Highway 169 currently has almost 30,000 vehicles per day moving at speeds around 65 miles per hour – this makes truck movements on and off the highway far more of a challenge and presents a high risk for conflicts. MnDOT studies document that full open (all movements allowed) intersections along high speed/volume expressways are high risk locations. Other than a brief discussion about sight distance in an appendix, the issue of special accommodations for large, heavy, slow moving vehicles is not discussed. It seems reasonable to at least discuss the desirability of restricting turning movements through median openings and of providing auxiliary acceleration and deceleration lanes wherever trucks are moving through uncontrolled intersections.

- Conclusions
  - No short-term mitigations are suggested. A better understanding of performance measures (Level of Service, delay and Queues) by approach and movement might provide additional insight about opportunities for improvements related to the movements through intersections associated with site generated traffic.
  - Long term mitigations discussed include upgrading to a grade separated interchange at the Highway 41/169 intersection and a reference to access management modifications along Highway 169. Additional information should be provided about the status of the Highway 41/169 interchange improvement – is it in a capital improvement program and when is it scheduled? If the interchange is not programmed, additional mitigation measures should be considered. The discussion of access management indicates that it should be expected that the elimination/reduction of direct site access will be a priority. However, no further discussion of the details of an access management plan are included. This seems to be an error of omission. If any of the properties that now have direct access to Highway 169 are owned by the current proposer, now would be a good time to consider reduced or modified access because to wait until some future date would most likely result in either Scott County or MnDOT having to go through a condemnation process to achieve the desired level of access management.

Appendix B: Full Traffic Analysis Model Output/Reports

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	1	626	4	11	788	4	2	1	4	1	1	1
Future Vol, veh/h	1	626	4	11	788	4	2	1	4	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	1	720	5	13	906	5	2	1	5	1	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	911	0	0	725	0	0	1661	1662	723	1663	1662	909
Stage 1	-	-	-	-	-	-	725	725	-	935	935	-
Stage 2	-	-	-	-	-	-	936	937	-	728	727	-
Critical Hdwy	4.2	-	-	4.2	-	-	7.2	6.6	6.3	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.29	-	-	3.59	4.09	3.39	3.59	4.09	3.39
Pot Cap-1 Maneuver	716	-	-	842	-	-	74	93	413	74	93	322
Stage 1	-	-	-	-	-	-	404	418	-	308	334	-
Stage 2	-	-	-	-	-	-	308	333	-	403	417	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	716	-	-	842	-	-	71	90	413	71	90	322
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	90	-	71	90	-
Stage 1	-	-	-	-	-	-	403	417	-	307	324	-
Stage 2	-	-	-	-	-	-	296	323	-	397	416	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	31.7	40.1
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	143	716	-	-	842	-	-	106
HCM Lane V/C Ratio	0.056	0.002	-	-	0.015	-	-	0.033
HCM Control Delay (s)	31.7	10	0	-	9.3	0	-	40.1
HCM Lane LOS	D	B	A	-	A	A	-	E
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	6	829	1	1	756	0	0	0	6	1	0	0
Future Vol, veh/h	6	829	1	1	756	0	0	0	6	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	6	855	1	1	779	0	0	0	6	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	779	0	0	856	0	0	1649	1649	856	1652	1649	779
Stage 1	-	-	-	-	-	-	868	868	-	781	781	-
Stage 2	-	-	-	-	-	-	781	781	-	871	868	-
Critical Hdwy	4.2	-	-	4.2	-	-	7.2	6.6	6.3	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.29	-	-	3.59	4.09	3.39	3.59	4.09	3.39
Pot Cap-1 Maneuver	803	-	-	751	-	-	76	95	346	75	95	383
Stage 1	-	-	-	-	-	-	336	359	-	376	394	-
Stage 2	-	-	-	-	-	-	376	394	-	335	359	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	803	-	-	751	-	-	75	93	346	73	93	383
Mov Cap-2 Maneuver	-	-	-	-	-	-	75	93	-	73	93	-
Stage 1	-	-	-	-	-	-	331	354	-	371	393	-
Stage 2	-	-	-	-	-	-	375	393	-	324	354	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	15.6	55
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	346	803	-	-	751	-	-	73
HCM Lane V/C Ratio	0.018	0.008	-	-	0.001	-	-	0.014
HCM Control Delay (s)	15.6	9.5	0	-	9.8	0	-	55
HCM Lane LOS	C	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	626	4	11	788	4	2	1	4	1	1	1
Future Vol, veh/h	1	626	4	11	788	4	2	1	4	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	1	734	5	13	924	5	2	1	5	1	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	929	0	0	739	0	0	1693	1694	737	1695	1694	927
Stage 1	-	-	-	-	-	-	739	739	-	953	953	-
Stage 2	-	-	-	-	-	-	954	955	-	742	741	-
Critical Hdwy	4.2	-	-	4.2	-	-	7.2	6.6	6.3	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.29	-	-	3.59	4.09	3.39	3.59	4.09	3.39
Pot Cap-1 Maneuver	704	-	-	832	-	-	70	89	406	70	89	314
Stage 1	-	-	-	-	-	-	397	412	-	301	327	-
Stage 2	-	-	-	-	-	-	301	327	-	395	411	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	704	-	-	832	-	-	67	86	406	67	86	314
Mov Cap-2 Maneuver	-	-	-	-	-	-	67	86	-	67	86	-
Stage 1	-	-	-	-	-	-	396	411	-	300	317	-
Stage 2	-	-	-	-	-	-	289	317	-	389	410	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	33.2	41.9
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	136	704	-	-	832	-	-	101
HCM Lane V/C Ratio	0.06	0.002	-	-	0.016	-	-	0.035
HCM Control Delay (s)	33.2	10.1	0	-	9.4	0	-	41.9
HCM Lane LOS	D	B	A	-	A	A	-	E
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	829	1	1	756	0	0	0	6	1	0	0
Future Vol, veh/h	6	829	1	1	756	0	0	0	6	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	6	872	1	1	795	0	0	0	6	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	795	0	0	873	0	0	1682	1682	873	1685	1682	795
Stage 1	-	-	-	-	-	-	885	885	-	797	797	-
Stage 2	-	-	-	-	-	-	797	797	-	888	885	-
Critical Hdwy	4.2	-	-	4.2	-	-	7.2	6.6	6.3	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.29	-	-	3.59	4.09	3.39	3.59	4.09	3.39
Pot Cap-1 Maneuver	792	-	-	740	-	-	72	90	338	71	90	375
Stage 1	-	-	-	-	-	-	329	352	-	368	387	-
Stage 2	-	-	-	-	-	-	368	387	-	328	352	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	792	-	-	740	-	-	71	88	338	69	88	375
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	88	-	69	88	-
Stage 1	-	-	-	-	-	-	324	347	-	362	386	-
Stage 2	-	-	-	-	-	-	367	386	-	317	347	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	15.9	58
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	338	792	-	-	740	-	-	69
HCM Lane V/C Ratio	0.019	0.008	-	-	0.001	-	-	0.015
HCM Control Delay (s)	15.9	9.6	0	-	9.9	0	-	58
HCM Lane LOS	C	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	1	626	4	11	788	4	2	1	4	1	1	1
Future Vol, veh/h	1	626	4	11	788	4	2	1	4	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	1	748	5	13	942	5	2	1	5	1	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	947	0	0	753	0	0	1725	1726	751	1727	1726	945
Stage 1	-	-	-	-	-	-	753	753	-	971	971	-
Stage 2	-	-	-	-	-	-	972	973	-	756	755	-
Critical Hdwy	4.2	-	-	4.2	-	-	7.2	6.6	6.3	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.29	-	-	3.59	4.09	3.39	3.59	4.09	3.39
Pot Cap-1 Maneuver	693	-	-	822	-	-	67	85	398	66	85	307
Stage 1	-	-	-	-	-	-	390	406	-	294	321	-
Stage 2	-	-	-	-	-	-	294	320	-	388	405	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	693	-	-	822	-	-	64	82	398	63	82	307
Mov Cap-2 Maneuver	-	-	-	-	-	-	64	82	-	63	82	-
Stage 1	-	-	-	-	-	-	389	405	-	293	310	-
Stage 2	-	-	-	-	-	-	282	309	-	381	404	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	34.3	44
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	131	693	-	-	822	-	-	96
HCM Lane V/C Ratio	0.064	0.002	-	-	0.016	-	-	0.037
HCM Control Delay (s)	34.3	10.2	0	-	9.5	0	-	44
HCM Lane LOS	D	B	A	-	A	A	-	E
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	6	829	1	1	756	0	0	0	6	1	0	0
Future Vol, veh/h	6	829	1	1	756	0	0	0	6	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	7	940	1	1	857	0	0	0	7	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	857	0	0	941	0	0	1814	1814	941	1817	1814	857
Stage 1	-	-	-	-	-	-	955	955	-	859	859	-
Stage 2	-	-	-	-	-	-	859	859	-	958	955	-
Critical Hdwy	4.2	-	-	4.2	-	-	7.2	6.6	6.3	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.2	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.29	-	-	3.59	4.09	3.39	3.59	4.09	3.39
Pot Cap-1 Maneuver	750	-	-	697	-	-	58	75	308	57	75	345
Stage 1	-	-	-	-	-	-	300	327	-	340	362	-
Stage 2	-	-	-	-	-	-	340	362	-	299	327	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	750	-	-	697	-	-	57	73	308	55	73	345
Mov Cap-2 Maneuver	-	-	-	-	-	-	57	73	-	55	73	-
Stage 1	-	-	-	-	-	-	294	320	-	333	361	-
Stage 2	-	-	-	-	-	-	339	361	-	287	320	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	17	71.8
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	308	750	-	-	697	-	-	55
HCM Lane V/C Ratio	0.022	0.009	-	-	0.002	-	-	0.021
HCM Control Delay (s)	17	9.8	0	-	10.2	0	-	71.8
HCM Lane LOS	C	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	647	25	42	803	4	17	1	27	1	1	1
Future Vol, veh/h	1	647	25	42	803	4	17	1	27	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	10	10	78	78	10	10	78	10	78	10	10	10
Mvmt Flow	1	759	29	49	941	5	20	1	32	1	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	946	0	0	788	0	0	1819	1820	774	1834	1832	944
Stage 1	-	-	-	-	-	-	776	776	-	1042	1042	-
Stage 2	-	-	-	-	-	-	1043	1044	-	792	790	-
Critical Hdwy	4.2	-	-	4.88	-	-	7.88	6.6	6.98	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.88	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.88	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.902	-	-	4.202	4.09	4.002	3.59	4.09	3.39
Pot Cap-1 Maneuver	694	-	-	576	-	-	39	74	299	56	73	307
Stage 1	-	-	-	-	-	-	296	396	-	268	297	-
Stage 2	-	-	-	-	-	-	202	296	-	371	390	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	694	-	-	576	-	-	33	61	299	42	60	307
Mov Cap-2 Maneuver	-	-	-	-	-	-	33	61	-	42	60	-
Stage 1	-	-	-	-	-	-	295	395	-	267	244	-
Stage 2	-	-	-	-	-	-	164	243	-	330	389	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	136.7	60
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	72	694	-	-	576	-	-	69
HCM Lane V/C Ratio	0.733	0.002	-	-	0.085	-	-	0.051
HCM Control Delay (s)	136.7	10.2	0	-	11.8	0	-	60
HCM Lane LOS	F	B	A	-	B	A	-	F
HCM 95th %tile Q(veh)	3.4	0	-	-	0.3	-	-	0.2

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	6	842	14	17	773	0	17	0	27	1	0	0
Future Vol, veh/h	6	842	14	17	773	0	17	0	27	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	10	10	78	78	10	10	78	10	78	10	10	10
Mvmt Flow	6	885	15	18	813	0	18	0	28	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	813	0	0	900	0	0	1754	1754	893	1768	1761	813
Stage 1	-	-	-	-	-	-	905	905	-	849	849	-
Stage 2	-	-	-	-	-	-	849	849	-	919	912	-
Critical Hdwy	4.2	-	-	4.88	-	-	7.88	6.6	6.98	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.88	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.88	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.902	-	-	4.202	4.09	4.002	3.59	4.09	3.39
Pot Cap-1 Maneuver	780	-	-	515	-	-	43	81	251	62	81	366
Stage 1	-	-	-	-	-	-	246	345	-	344	366	-
Stage 2	-	-	-	-	-	-	267	366	-	315	342	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	780	-	-	515	-	-	40	75	251	52	75	366
Mov Cap-2 Maneuver	-	-	-	-	-	-	40	75	-	52	75	-
Stage 1	-	-	-	-	-	-	242	340	-	339	343	-
Stage 2	-	-	-	-	-	-	250	343	-	275	337	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	93	75.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	83	780	-	-	515	-	-	52
HCM Lane V/C Ratio	0.557	0.008	-	-	0.035	-	-	0.02
HCM Control Delay (s)	93	9.7	0	-	12.2	0	-	75.7
HCM Lane LOS	F	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	2.5	0	-	-	0.1	-	-	0.1

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	647	25	42	803	4	17	1	27	1	1	1
Future Vol, veh/h	1	647	25	42	803	4	17	1	27	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	10	10	78	78	10	10	78	10	78	10	10	10
Mvmt Flow	1	818	32	53	1015	5	21	1	34	1	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1020	0	0	850	0	0	1961	1962	834	1978	1976	1018
Stage 1	-	-	-	-	-	-	836	836	-	1124	1124	-
Stage 2	-	-	-	-	-	-	1125	1126	-	854	852	-
Critical Hdwy	4.2	-	-	4.88	-	-	7.88	6.6	6.98	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.88	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.88	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.902	-	-	4.202	4.09	4.002	3.59	4.09	3.39
Pot Cap-1 Maneuver	650	-	-	541	-	-	30	60	274	44	59	278
Stage 1	-	-	-	-	-	-	272	371	-	241	271	-
Stage 2	-	-	-	-	-	-	179	271	-	342	365	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	650	-	-	541	-	-	24	46	274	31	46	278
Mov Cap-2 Maneuver	-	-	-	-	-	-	24	46	-	31	46	-
Stage 1	-	-	-	-	-	-	271	370	-	240	210	-
Stage 2	-	-	-	-	-	-	137	210	-	297	364	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	261.9	79.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	54	650	-	-	541	-	-	52
HCM Lane V/C Ratio	1.054	0.002	-	-	0.098	-	-	0.073
HCM Control Delay (s)	261.9	10.5	0	-	12.4	0	-	79.6
HCM Lane LOS	F	B	A	-	B	A	-	F
HCM 95th %tile Q(veh)	4.8	0	-	-	0.3	-	-	0.2

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	842	14	17	773	0	17	0	27	1	0	0
Future Vol, veh/h	6	842	14	17	773	0	17	0	27	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	10	10	78	78	10	10	78	10	78	10	10	10
Mvmt Flow	7	955	16	19	877	0	19	0	31	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	877	0	0	971	0	0	1892	1892	963	1908	1900	877
Stage 1	-	-	-	-	-	-	977	977	-	915	915	-
Stage 2	-	-	-	-	-	-	915	915	-	993	985	-
Critical Hdwy	4.2	-	-	4.88	-	-	7.88	6.6	6.98	7.2	6.6	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-	6.88	5.6	-	6.2	5.6	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.88	5.6	-	6.2	5.6	-
Follow-up Hdwy	2.29	-	-	2.902	-	-	4.202	4.09	4.002	3.59	4.09	3.39
Pot Cap-1 Maneuver	737	-	-	480	-	-	34	67	226	49	66	336
Stage 1	-	-	-	-	-	-	222	319	-	316	341	-
Stage 2	-	-	-	-	-	-	243	341	-	286	316	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	737	-	-	480	-	-	31	61	226	39	60	336
Mov Cap-2 Maneuver	-	-	-	-	-	-	31	61	-	39	60	-
Stage 1	-	-	-	-	-	-	217	312	-	309	315	-
Stage 2	-	-	-	-	-	-	224	315	-	242	309	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	151.5	100.1
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	66	737	-	-	480	-	-	39
HCM Lane V/C Ratio	0.756	0.009	-	-	0.04	-	-	0.029
HCM Control Delay (s)	151.5	9.9	0	-	12.8	0	-	100.1
HCM Lane LOS	F	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	3.4	0	-	-	0.1	-	-	0.1

Appendix C: Highway 169/41/78 Interchange Project Winter-Early Spring Construction Activities

DEPARTMENT OF TRANSPORTATION

Highways 169/41/78 Interchange

WINTER - EARLY SPRING 2019 CONSTRUCTION ACTIVITIES

TO SHAKOPEE

N

MINNESOTA 41

Weckman Rd

169

Marine Dr

128th St

Dem Con Dr

Ventura Crt

Emery Way

130th St

78

Louisville Rd

169

133rd St

Louisville Rd

169

145th St

147th St

Red Rock Dr

14

Smith Dr

TO JORDAN

Scott

LEGEND

- Project Area
- Future Frontage Road
- Noise Wall
- Stormwater Pond
- New Overpass
- New Retaining Wall