NOTE: This document is 92 pages (see more information below)

Appendix A: Roundabout Justification Report

NOTE: In total, this 92-page PDF contains the following technical appendices:

A. Roundabout Justification Report
B. Public Engagement Materials
C. 140th Street Traffic Analysis
D. Roundabout Concepts
E. Diamond Path Striping
F. Environmental Support Documentation
G. Identified Utilities
H. Cost Estimates

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Roundabout Justification Report

For

CSAH 33 (Diamond Path) and 140th Street/Connemara Trail Intersection

in

Apple Valley & Rosemount, Dakota County

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Bryan T. Nemeth, P.E.	43554 Lic. No.	07/02/2020 Date

APPROVED:

City of Apple Valley Engineer	Date
City of Rosemount Engineer	Date
Dakota County Traffic Engineer	Date
Metro District State Aid Engineer	Date

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Introduction

An analysis of the intersection of CSAH 33 (Diamond Path) and 140th Street West/Connemara Trail was completed. The intersection currently provides efficient operations and is anticipated to sufficiently accommodate the forecasted growth in traffic. More notably, half of the reported crashes at the intersection between 2016 and 2018 have involved right angle and left-turn collisions and the intersection has a notable crash history. Dakota County, with the support of the Cities of Apple Valley and Rosemount, is exploring the feasibility of a roundabout at the intersection to improve operations and safety of the intersection and to benefit the existing pedestrian facilities in the area.

Existing Conditions

CSAH 33 is classified as an "Other Minor Arterial" locally known as Diamond Path. CSAH 33 provides a north-south connection to CSAH 31 (Pilot Knob Road), CSAH 42 (150th Street) and CSAH 46 (160th Street), of which CSAH 31 is an A-Minor Arterial - Expander, while CSAH 42 is a Principal Arterial and CSAH 46 is a A-Minor Arterial - Expander. CSAH 31 serves large areas of eastern Apple Valley and the City of Rosemount. At the intersection with 140th Street/Connemara Trail, CSAH 33 is a four-lane undivided urban highway with dedicated left turn lanes. The four-lane urban section transitions to a two-lane rural section approximately 600' north of the intersection. The four-lane section is carried south past the Independent School District (ISD) 196 campus and is transitioned to a two-lane urban section at the intersection at 145th Street. The posted speed limit on CSAH 33 is 45 miles per hour (mph).

Both 140th Street and Connemara Trail are classified as Major Collector roadways. This east-west connection intersects CSAH 33 as a four-lane, urban section without turn lanes and serves as a connecting route between Rosemount and Apple Valley. Connemara Trail was restriped as a three-lane section during the summer of 2019 approximately 200' east of CSAH 33 where the roadway transitions from four lanes to three. The speed limit is posted as 35 mph east of CSAH 33 and 45 mph west of CSAH 33.

Pedestrian facilities are in place along both sides of 140th Street and Connemara Trail, as well as the south leg of CSAH 33. Minnesota Valley Transit Authority (MVTA) serves two bus stops at the intersection. Overhead electric transmission lines and poles run along the east side of CSAH 33.

Figure 1: Project Location Map

Data Collection

The intersection analysis utilized traffic data collected in September 2019. 24-hour turning movement counts were collected. The peak hours were used to analyze traffic operations at the study location. The AM peak hour was found to be from 7:00 to 8:00 AM and the PM peak hour was found to be from 4:00 to 5:00 PM. Existing ADT was estimated below from the counts collected. Traffic volume details can be found in **Appendix A**.

Existing ADT:

140th Street west of CSAH 33 – 7,050
Connemara Trail east of CSAH 33 – 6,150
CSAH 33 north of 140th Street/Connemara Trail – 8,250
CSAH 33 south of 140th Street/Connemara Trail – 11,000

Traffic Forecasting

Growth rates were calculated for each leg of the intersection using the most recent MnDOT AADT volumes and the 2040 Dakota County forecasts. **Table 1** details the most recent MnDOT AADT and growth rate used to calculate the forecasted AADT. Projected 2030 and 2040 peak hour turning movement counts can be found in **Appendix A** of the RJR.

Table 1: Forecasted AADT

Street	Leg	MnDOT Most Recent AADT		Growth Rate	Forecasted Volumes	
		AADT	Year		2030	2040
Connemara Trail	East	6000	2018	0.36%	6300	6500
140th Street W	West	7400	2018	0.06%	7500	7500
CSAH 33	South	10600	2016	0.40%	11200	11800
	North	8100	2016	0.53%	8700	9200

Warrant Analysis

All-way stop control and traffic control signal warrant analyses were completed for the intersection using the 2019 and forecasted traffic volumes.

Traffic Control Signal Warrant Analysis

Traffic signal warrants have been developed as national guidelines to promote continuity of traffic control devices to ensure that traffic signals are installed at intersections that would benefit from their use.

According to the Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD) a traffic control signal should not be installed unless one or more of the warrants can be met, however the satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic signal. Furthermore, a traffic control signal should not be installed unless an engineering study indicates that the traffic control signal will improve the overall safety and operation of the intersection. Finally, the signal should not disrupt the progressive flow of traffic.

All-Way Stop Control Warrant Analysis

All-way stop control can be useful as a safety measure at intersections if safety concerns exist because of high traffic volumes in multiple directions or if there is insufficient sight distance available to see conflicting traffic on an approach to an intersection. The decision to install an all-way stop control should be based on an engineering study. The MnMUTCD identifies the following criteria that should be considered in the engineering study for an all-way stop control installation:

- Condition A: Where traffic control signals are justified, an all-way stop can be installed as an interim measure.
- Condition B: Five or more crashes are reported in a 12-month period.
- Condition C: The volume of either vehicles or a combination of vehicles, pedestrians and bicycles entering the intersection from all approaches for any eight hours of an average day meets the minimum volume requirements set forth in section 2B.7 of the 2018 MnMUTCD.

Further guidance and details are provided in the MnMUTCD. A roundabout is considered to be warranted if the intersection meets warrants for either a traffic signal or an all-way stop. Warrant analysis results are shown for the existing and forecasted volumes in **Table 2** below.

Table 2: Warrants Met

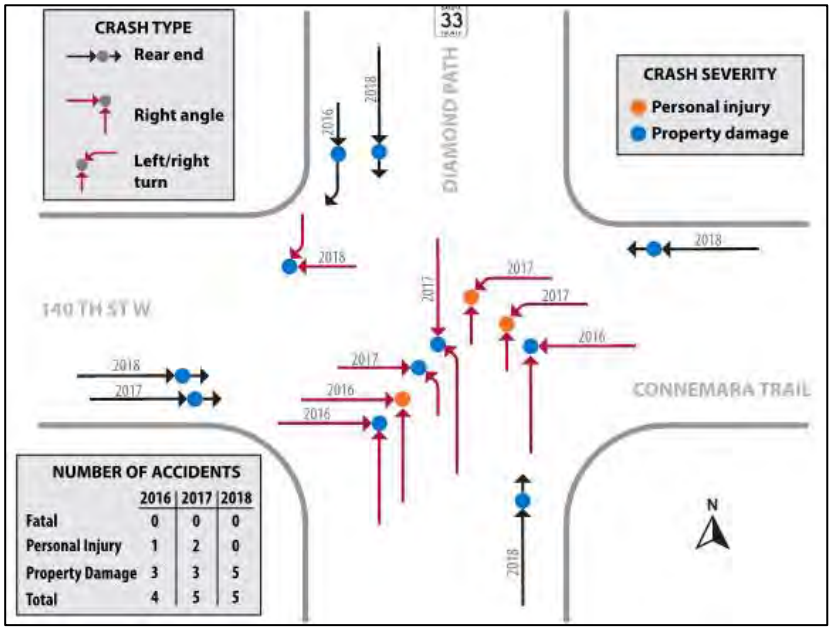
Warrant	Hours Required	Hours Met		
		2019 Volumes	2030 Volumes	2040 Volumes
Warrant 1A	8	**8**	**8**	**8**
Warrant 1B	8	**4**	**7**	**8**
Warrant 2	4	**5**	**7**	**7**
Warant 3	1	**2**	**3**	**4**
AWSC Warrants	8	**15**	**15**	**15**

Warrant analysis shows that the intersection meets signal and all-way stop control warrants under existing and forecasted volumes. Traffic warrant details can be found in **Appendix B** of the RJR.

Safety Analysis

Three-year crash data (2016-2018) was provided by Dakota County. There have been 14 recorded crashes at this intersection between 2016 and 2018. Three of the recorded crashes were classified as minor or possible injury crashes, and the remainder categorized as property damage only. Seven of the observed crashes were reported as right angle or left turn collisions as highlighted in the crash diagram figure shown in **Figure 2.**

Figure 2: Crash Diagram

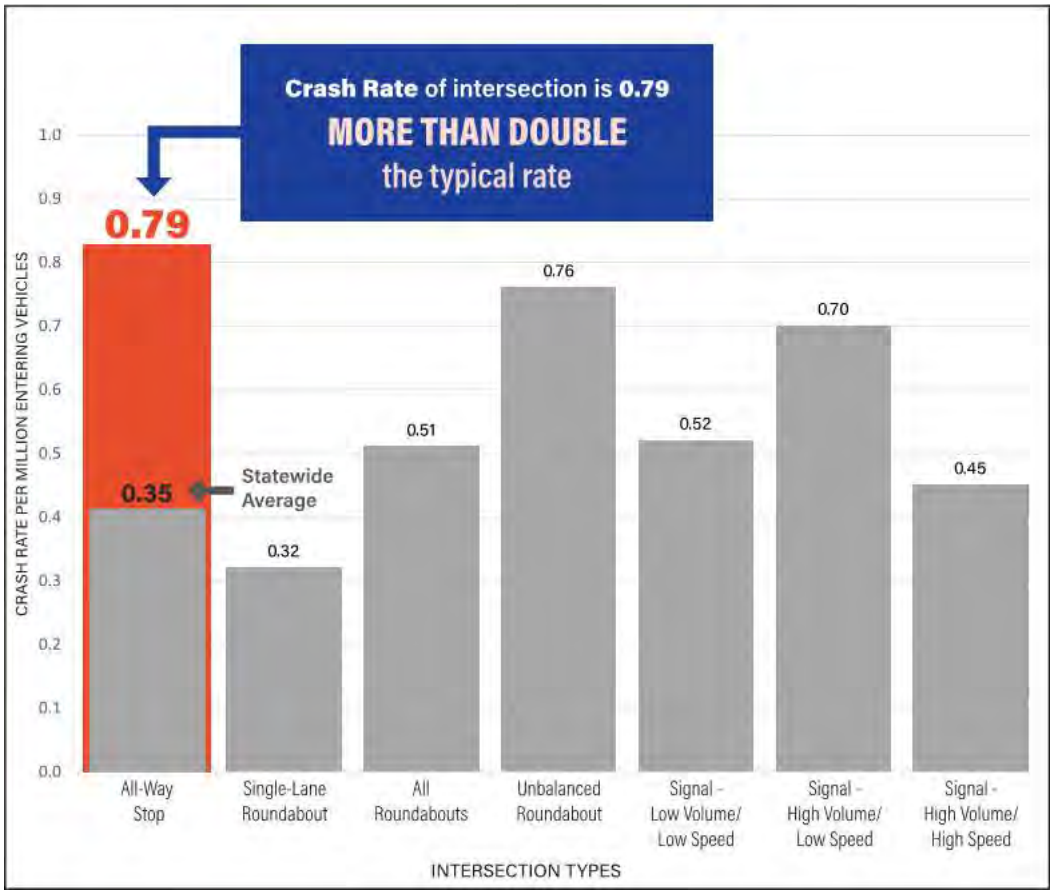


In the three-year data period, the intersection of CSAH 33 and 140th Street W/Connemara Trail is shown to have a Critical Index of 1.08, indicating that the intersection is operating above the expected normal range (critical index >1.0) when compared to other similar intersections statewide. The intersection is statistically considered to be operating outside the expected, normal range.

MnDOT provided additional crash data that included crashes occurring in 2019. Five crashes have been reported in 2019. Two of the crashes were reported as possible injury while the other three were property damage only crashes. Most importantly, all five crashes were reported as right-angle collisions, unusual for an all-way stop controlled intersection.

The intersection may be experiencing an elevated crash rate due to the multi-lane approaches to the all-way stop control and motorists running the stop signs (not coming to a full stop and checking all lanes for opposing traffic). The large total number of lanes approaching the intersection may cause confusion to drivers in determining who has the right-of-way to enter the intersection. A change in traffic control or change in geometry may reduce these crashes caused by driver confusion.

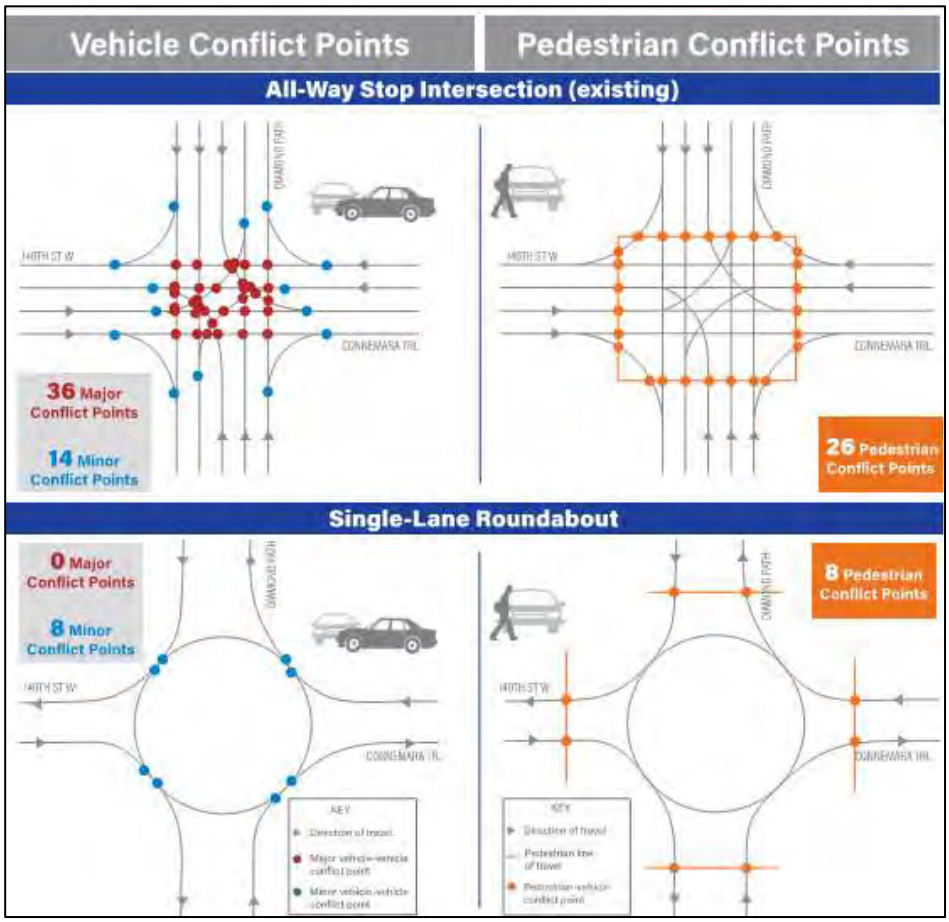
Figure 3: Crash Rate by Intersection Control Type



MnDOT has performed statewide crash safety analyses of various intersection control types. The intersection crash rate at CSAH 33 and 140th Street/Connemara Trail is over two times the average crash rate for statewide all-way stops as highlighted in **Figure 3**. Additionally, the average crash rate for single-lane roundabout in Minnesota is lower than the statewide average for all-way stop controlled intersections.

A large reason for the inherent safety benefit that roundabouts provide is the reduction of intersection conflict points as illustrated in **Figure 4**. Conflict points are locations where two vehicle movement paths intersect. Where these paths intersect perpendicularly, collisions are more likely to be severe; these points are terms 'Major Conflict Points.' Where vehicle paths intersect in a merging/diverging nature, collisions tend to be less severe and injuries are unlikely; these points are termed 'Minor Conflict Points.' Finally, locations where a vehicular path intersects with a pedestrian crossing are pedestrian conflict points. At the CSAH 33 and 140th Street/Connemara Trail intersection where many lanes are present on all four legs, many conflict points are present. The conflict points associated with a single-lane roundabout is vastly reduced for minor and pedestrian conflict points, and major conflict points are eliminated. The roundabout geometry also reduces vehicle speeds entering and traveling through the roundabout.

Figure 4: Intersection Conflict Points



Similarly, pedestrian safety is improved with roundabout geometry due to the implementation of two-staged crossings. Rather than crossing up to five lanes of traffic traveling in two directions at one time, single lane roundabouts allow pedestrians to cross one lane of traffic traveling in a single direction at one time. Splitter islands provide refuge areas for pedestrians to safely wait for acceptable gaps in traffic and shorten the physical crossing distance therefore limiting pedestrian exposure to traffic.

Crash data, including a detailed crash diagram, can be found in **Appendix C**.

Alternatives

Two alternatives were considered at this location: Do Nothing/Existing Geometry, and a Single-Lane Roundabout. Each alternative is summarized below.

Do-Nothing: Maintain the existing geometry and all-way stop control.

Single-Lane Roundabout: Convert the intersection to a single-lane roundabout.

A signalized intersection was not considered as part of this report as the option is not justified for this location due to speeds and neighborhood context. A traffic signal also does not have County support.

Operations Analysis

The Do-Nothing alternative was analyzed using Synchro/SimTraffic and methods within the Highway Capacity Manual to determine Level of Service (LOS), average vehicle delays, and queue lengths. The roundabout alternative was analyzed using Junctions 9 ARCADY (Assessment of Roundabout Capacity

and Delay) software. Full operations and queueing reports can be found in **Appendix D** of the RJR. **Table 3** shows the existing traffic operations.

Table 3: Existing Operations

Approach	AM Peak Hour					PM Peak Hour				
	LOS by Approach		95% Queue (veh)	LOS		LOS by Approach		95% Queue (veh)	LOS	
	Delay	LOS		Delay	LOS	Delay	LOS		Delay	LOS
Existing Conditions										
140th St EB	7	A	4	10	B	11	B	5	13	B
Connemara Trl WB	8	A	4			12	B	5		
CSAH 33 NB	11	B	5			11	B	4		
CSAH 33 SB	10	B	4			16	C	7		

Under the existing traffic volumes, the intersection operates with acceptable levels of vehicular delay during both peak hours. Average queues on all approaches are typically 2-3 vehicles long, with maximum queues of 150 feet.

Table 4 shows the anticipated traffic results for the Do-Nothing alternative for the 2030 and 2040 forecasted traffic volumes.

Table 4: Do Nothing Traffic Operations Results

Approach	AM Peak Hour					PM Peak Hour				
	LOS by Approach		95% Queue (veh)	LOS		LOS by Approach		95% Queue (veh)	LOS	
	Delay	LOS		Delay	LOS	Delay	LOS		Delay	LOS
Do Nothing - 2030 Volumes										
140th St EB	8	A	4	10	B	12	B	5	14	B
Connemara Trl WB	9	A	4			13	B	5		
CSAH 33 NB	12	B	5			12	B	4		
CSAH 33 SB	10	B	3			17	C	7		
Do Nothing - 2040 Volumes										
140th St EB	8	A	4	11	B	12	B	5	14	B
Connemara Trl WB	9	A	5			13	B	5		
CSAH 33 NB	13	B	7			12	B	5		
CSAH 33 SB	11	B	4			18	C	7		

The Do-Nothing Alternative is shown to see a slight increase in overall and movement delays incrementally as traffic volumes increase at the intersection. However, due to the relatively low levels of forecasted traffic growth, the all-way stop control is anticipated to continue to provide acceptable delays and queues on all approaches during both peak hours. Similarly, average and maximum queues are anticipated to be slightly greater than shown under the existing traffic volumes.

Table 5 shows the anticipated traffic results for the Single-Lane Roundabout alternative for the existing, 2030 and 2040 forecasted traffic volumes.

Table 5: Single-Lane Roundabout Traffic Operations Results

Approach	AM Peak Hour					PM Peak Hour				
	LOS by Approach		95% Queue (veh)	Intersection LOS		LOS by Approach		95% Queue (veh)	Intersection LOS	
	Delay	LOS		Delay	LOS	Delay	LOS		Delay	LOS
Single Lane Roundabout - 2019 Volumes										
140th St EB	5	A	2	8	A	10	B	4	9	A
Connemara Trl WB	8	A	3			6	A	2		
CSAH 33 NB	10	B	7			8	A	4		
CSAH 33 SB	5	A	2			11	B	6		
Single Lane Roundabout - 2030 Volumes										
140th St EB	5	A	2	10	B	11	B	5	11	B
Connemara Trl WB	9	A	4			6	A	3		
CSAH 33 NB	13	B	9			9	A	6		
CSAH 33 SB	6	A	2			14	B	10		
Single Lane Roundabout - 2040 Volumes										
140th St EB	5	A	2	11	B	11	B	4	11	B
Connemara Trl WB	10	B	4			6	A	2		
CSAH 33 NB	14	B	10			9	A	6		
CSAH 33 SB	6	A	2			15	C	9		

The intersection is anticipated to operate at LOS B or better for the overall vehicular delay under single lane roundabout control. Delays and queues are shown to increase as traffic volumes increase at the intersection. Approach delays are anticipated to operate at LOS C or better during the peak hours. Maximum queues are anticipated to be a few vehicles longer than anticipated under AWSC, with a maximum queue reaching up to 250 feet during the AM peak hour peak hour with 2040 forecasted volumes.

Overall, the single-lane roundabout alternative is anticipated to operate similar to the AWSC under the existing and forecasted traffic volumes.

Sensitivity Analysis

A sensitivity analysis for the forecasted volumes was performed by growing the collected volume and turning movement data by 15%, the common standard for maximum error for daily variation, especially in 20-year forecast models. The volumes used in the sensitivity analysis represent the worst-case growth rates of the 2040 forecasted volumes. The existing, forecast, and sensitivity volumes are shown in **Table 6** below.

Table 6: Forecast vs. Sensitivity AADT

Street	Leg	MnDOT Most Recent AADT		2040 Forecast Volumes	Sensitivity Volumes
		AADT	Year		
Connemara Trail	East	6000	2018	6500	7400
140th Street W	West	7400	2018	7500	9100
CSAH 33	South	10600	2016	11800	13000
	North	8100	2016	9200	10000
Daily Entering Vehicles		16050		17500	19750

Table 7 shows the anticipated traffic results for the Do-Nothing alternative for the sensitivity analysis traffic volumes.

Table 7: Do Nothing Sensitivity Analysis Traffic Operations Results

Approach	AM Peak Hour					PM Peak Hour				
	LOS by Approach		95% Queue (veh)	LOS		LOS by Approach		95% Queue (veh)	LOS	
	Delay	LOS		Delay	LOS	Delay	LOS		Delay	LOS
Do Nothing - 15% Sensitivity Volumes										
140th St EB	9	A	3	13	B	17	C	6	21	C
Connemara Trl WB	11	B	4			17	C	6		
CSAH 33 NB	15	C	6			15	C	4		
CSAH 33 SB	12	B	3			31	D	10		

The Do-Nothing Alternative is anticipated to see greater depreciations in traffic operations under the 15% higher than forecasted volumes. Overall and approach delays are anticipated to remain at acceptable levels under these increased traffic volumes. It is noted that several approaches could experience delays that result in LOS C/D, still acceptable service levels.

Table 8 shows the anticipated traffic results for the single-lane roundabout alternative with the 15% sensitivity analysis traffic volumes.

Table 8: Single-Lane Roundabout Sensitivity Analysis Traffic Operations Results

Approach	AM Peak Hour					PM Peak Hour				
	LOS by Approach		95% Queue (veh)	Intersection LOS		LOS by Approach		95% Queue (veh)	Intersection LOS	
	Delay	LOS		Delay	LOS	Delay	LOS		Delay	LOS
Single Lane Roundabout - 15% Sensitivity Volumes										
140th St EB	6	A	2	14	B	17	C	9	17	C
Connemara Trl WB	13	B	7			8	A	3		
CSAH 33 NB	21	C	19			12	B	6		
CSAH 33 SB	6	A	2			26	D	19		

The single-lane roundabout is anticipated to sustain acceptable operations to under the 15% higher than forecasted volumes. Again, several approaches reach the LOS C/D thresholds. The maximum queue length is approximately double those modeled under AWSC, but delays are lower, indicating a shorter backup period and a moving queue.

Traffic volumes above the sensitivity volumes are not anticipated but both the single-lane roundabout and all-way stop would be anticipated to reach unacceptable levels of delay. If volumes increase further than anticipated, an unbalanced 2x1 roundabout may be an option. However, it is unlikely that traffic volumes will reach these levels within the 20-year analysis period.

VISSIM Analysis

The proposed roundabout's proximity to the intersection of Delta Avenue/Delta Place warrants an analysis of the interaction between the two intersections. Delta Avenue is approximately 235 feet east of the CSAH 33 intersection, creating potential for westbound queues blocking access at this intersection, as well as potentially limiting acceptable gaps in traffic for motorists exiting Delta Avenue. VISSIM analysis software was used to best assess this interaction and to understand any operations issues that may arise during the peak hours. ARCADY does not have the ability to simulate multiple intersections or the interactions between those intersections, but the software does provide reliable roundabout operations results during peak conditions. In estimating Delta Avenue traffic, directional entering and exiting volumes from Delta Place were obtained from StreetLight InSight software and calculated based on turning movement count data at the CSAH 33 at 140th Street intersection.

VISSIM analysis conducted for the AM and PM peak hours under 2040 forecast volumes anticipates that the roundabout operates at overall LOS A during both peak periods, an improvement upon the predicted

LOS B by the ARCADY analysis. Similarly, VISSIM analysis anticipates that all movements operate at LOS B or better, while ARCADY analysis shows movements operating at LOS C or better. Predicted queueing patterns are similar between the two software simulations, however, only VISSIM can predict average queues. Average queues anticipated are 50 feet or less on all approaches during the peak periods, signifying that 'rolling queues' are occurring. VISSIM analysis anticipates notable southbound queues originating from the 140th Street roundabout that may reach a maximum of 450 feet during the PM peak hour. However, average queues on this approach are anticipated to measure 50 feet, signifying that for most of the peak period operations on this approach will be improved from the AWSC condition and the longer queues would only be anticipated to occur one time or less during the peak hour. The summarized results of the VISSIM analysis can be found in **Appendix D** of the RJR. Summary tables of the VISSIM operations results for the 140th Street single lane roundabout are shown in **Tables 9 and 10** below.

Table 9: VISSIM Single-Lane Roundabout Traffic Operations Results – AM Peak

Location	Aprch	Total Delay by Movement (sec/veh)			Level of Service by Movement			LOS by Approach		LOS		Queuing (feet)		
		L	T	R	L	T	R	Delay	LOS	Delay	LOS	Storage	Avg	Max
CSAH 33 (Diamond Path) at 140th St/Connemara Trl *Single Lane Roundabout*	EB	3	2	2	A	A	A	2	A	4	A	900	25	125
	WB	8	9	9	A	A	A	9	A			150	25	300
	NB	4	4	4	A	A	A	4	A			650	25	275
	SB	3	3	2	A	A	A	3	A			900	25	125

Table 10: VISSIM Single-Lane Roundabout Traffic Operations Results – PM Peak

Location	Aprch	Total Delay by Movement (sec/veh)			Level of Service by Movement			LOS by Approach		LOS		Queuing (feet)		
		L	T	R	L	T	R	Delay	LOS	Delay	LOS	Storage	Avg	Max
CSAH 33 (Diamond Path) at 140th St/Connemara Trl *Single Lane Roundabout*	EB	12	15	14	B	B	B	14	B	8	A	900	50	375
	WB	4	4	4	A	A	A	4	A			150	25	200
	NB	5	5	4	A	A	A	5	A			650	25	250
	SB	10	9	9	B	A	A	9	A			900	50	450

Operations analysis also considered the proximity of Delta Avenue to CSAH 33 to ensure that adequate gaps are provided for exiting traffic to make a left turn onto Connemara Trail. Analysis anticipates that under 2040 volumes average northbound delays at Delta Avenue are 20 seconds per vehicles or LOS C during the AM peak hour indicating that there are adequate gaps in oncoming traffic for Delta Avenue traffic. Westbound queues at the CSAH 33 roundabout are anticipated to average 25 feet during the AM peak hour with maximum queues of 300 feet resulting in periodic blockage of Delta Avenue. Further investigation was conducted and determined that Delta Avenue may be blocked by these queues for up to eight non-consecutive minutes of the AM peak hour and up to one minute of the PM peak hour.

Design Considerations

Due to relatively narrow right-of-way at the intersection proper and existing landscaping, fences, and other obstructions encroaching on the right-of-way, preliminary design considered shifting the center of the roundabout to avoid costly impacts to all four corners. It was found that shifting the roundabout to the northwest minimizes impacts to the properties east and south of CSAH 33 by focusing impacts to the west and north side of CSAH 33 where there is more unused space available. The shift also helps avoid costly impacts to the existing overhead utility lines and poles along the east side of CSAH 33.

Furthermore, shifting the roundabout west of center creates more distance between CSAH 33 and Delta Avenue which allows for full development of an eastbound left turn lane serving Delta Place and provides more time for users to determine where acceptable gaps in oncoming traffic are present to make safe movements onto Connemara Trail from Delta Avenue and Delta Place.

Bicycle entry and exit ramps, or access to the trail at intersecting streets will be provided on all legs of the intersection to allow for on-street bicyclists to utilize the trail network and marked pedestrian crossings to navigate the roundabout and avoid using the circulatory roadway.

MVTA bus stops will be accommodated for on the south leg of the roundabout. Due to the conversion to a three-lane section, space is made available for dedicated bus pull-in/out areas where buses can safely pick-up and drop-off riders without impeding traffic.

Recommendations

Analysis of the existing crash history reveals the need for safety countermeasure for the high number of observed left turn and right-angle crashes. The existing all-way stop control is not anticipated to be able to safely serve the forecasted traffic at the intersection. Operations analysis of a single-lane roundabout shows a roundabout treatment would be anticipated to maintain acceptable traffic operations with area traffic growth as well as provide significant safety benefits. The roundabout effectively eliminates the potential for right-angle and left turn crashes that are being experienced at the intersection. Similarly, pedestrian safety is better accommodated by creating two-stage crossings and decreasing the crossing distances on each leg of the intersection. The County has implemented roundabouts in similar environments in numerous locations across the County and strongly supports the installation of a roundabout intersection at CSAH 33 and 140th Street/Connemara Trail.

A sensitivity analysis of the forecasted growth was conducted and determined that a single-lane roundabout is anticipated to have the capacity to provide acceptable operations on all approaches if a higher traffic growth scenario is realized.

RJR Appendix A

Traffic Count Data & Forecasting

CSAH 33 & 140th St. Roundabout

Dakota County, MN

Existing Turning Movements

November 2019

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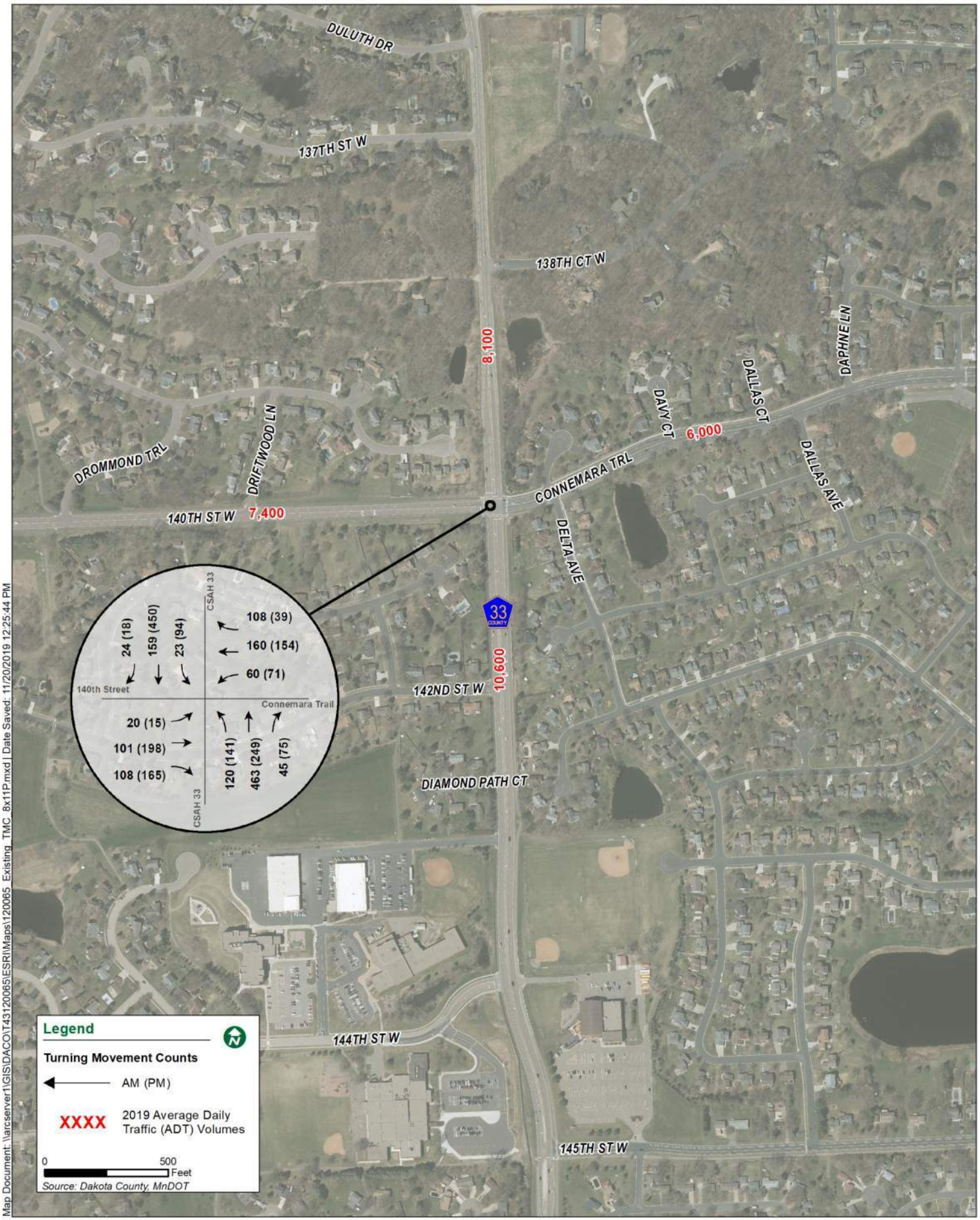

Map Document: \\arcserver1\GIS\DACO\T43120065\ESRI\Maps\120065_Existing_TMC_8x11P.mxd | Date Saved: 11/20/2019 12:25:44 PM

CSAH 33 & 140th St. Roundabout

Dakota County, MN

2030 Turning Movements

March 2020

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Legend

Turning Movement Counts

AM (PM)

XXXX 2030 Average Daily Traffic (ADT) Volumes

0 500 Feet

Source: Dakota County, MnDOT

Note

Forecast volumes depicted assume a confidence level of approximately plus or minus 15 percent.

Map Document: \\arcserver1\GIS\DACO\T43120065\ESRI\Maps\120065_2030_TMC_8x11P.mxd | Date Saved: 3/12/2020 1:56:01 PM

CSAH 33 & 140th St. Roundabout

Dakota County, MN

2040 Turning Movements

March 2020

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Legend

Turning Movement Counts

AM (PM)

XXXX 2040 Average Daily Traffic (ADT) Volumes

0 500 Feet

Source: Dakota County, MnDOT

Note

Forecast volumes depicted assume a confidence level of approximately plus or minus 15 percent.

Map Document: \\arcserver1\GIS\DACO\T43120065\ESRI\Maps\120065_2040_TMC_8x11P.mxd | Date Saved: 3/12/2020 1:55:29 PM

RJR Appendix B

Warrants Analysis

SIGNAL WARRANTS ANALYSIS

2019 Volumes

Minor Rights Excluded

LOCATION: Apple Valley
COUNTY: Dakota
REF. POINT:
DATE: 9/12/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
45	Major App1:	NB CSAH 33	3
45	Major App3:	SB CSAH 33	3
45	Minor App2:	EB 140th Street W	2
35	Minor App4:	WB Connemara Trail	2

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No

THRESHOLDS 1A/1B: 420/630 140/70 140/70

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00	7	20	27	/	6	/	6	/	**/**
1:00 - 2:00	4	10	14	/	4	/	3	/	**/**
2:00 - 3:00	3	9	12	/	9	/	2	/	**/**
3:00 - 4:00	15	5	20	/	1	/	3	/	**/**
4:00 - 5:00	47	8	55	/	4	/	19	/	**/**
5:00 - 6:00	181	39	220	/	6	/	59	/	**/**
6:00 - 7:00	491	110	601	X/	29	/	148	X/X	**X/**
7:00 - 8:00	628	206	834	X/X	121	/X	220	X/X	**X/X**
8:00 - 9:00	443	183	626	X/	80	/X	193	X/X	**X/**
9:00 - 10:00	373	186	559	X/	52	/	189	X/X	**X/**
10:00 - 11:00	264	134	398	/	61	/	102	/X	**/**
11:00 - 12:00	225	146	371	/	74	/X	101	/X	**/**
12:00 - 13:00	273	187	460	X/	92	/X	130	/X	**/**
13:00 - 14:00	224	215	439	X/	98	/X	121	/X	**/**
14:00 - 15:00	334	259	593	X/	131	/X	131	/X	**/**
15:00 - 16:00	392	400	792	X/X	168	X/X	176	X/X	**X/X**
16:00 - 17:00	465	562	1027	X/X	213	X/X	225	X/X	**X/X**
17:00 - 18:00	344	441	785	X/X	220	X/X	213	X/X	**X/X**
18:00 - 19:00	254	278	532	X/	183	X/X	169	X/X	**X/**
19:00 - 20:00	189	185	374	/	152	X/X	109	/X	**/**
20:00 - 21:00	141	170	311	/	120	/X	68	/	**/**
21:00 - 22:00	98	121	219	/	74	/X	43	/	**/**
22:00 - 23:00	51	72	123	/	30	/	20	/	**/**
23:00 - 24:00	22	46	68	/	18	/	8	/	**/**

	Met (Hr)	Required (Hr)	
Warrant 1A	**8**	8	**Satisfied**
Warrant 1B	4	8	Not satisfied
Warrant 2	5	4	**Satisfied**
Warrant 3	2	1	**Satisfied**
Warrant 7	**12**	8	**Satisfied, check accident record**

ALL WAY STOP WARRANT

2019 Volumes
Minor Rights Excluded

LOCATION: Apple Valley
COUNTY: Dakota
REF. POINT:
DATE: 9/12/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
45	Major App1: NB CSAH 33	3
45	Major App3: SB CSAH 33	3
45	Minor App2: EB 140th Street W	2
35	Minor App4: WB Connemara Trail	2

0.70 FACTOR USED? Yes

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00	7	20	6	6	27	12	/
1:00 - 2:00	4	10	4	3	14	7	/
2:00 - 3:00	3	9	9	2	12	11	/
3:00 - 4:00	15	5	1	3	20	4	/
4:00 - 5:00	47	8	4	19	55	23	/
5:00 - 6:00	181	39	6	59	220	65	X/
6:00 - 7:00	491	110	29	148	601	177	X/X
7:00 - 8:00	628	206	121	220	834	341	X/X
8:00 - 9:00	443	183	80	193	626	273	X/X
9:00 - 10:00	373	186	52	189	559	241	X/X
10:00 - 11:00	264	134	61	102	398	163	X/X
11:00 - 12:00	225	146	74	101	371	175	X/X
12:00 - 13:00	273	187	92	130	460	222	X/X
13:00 - 14:00	224	215	98	121	439	219	X/X
14:00 - 15:00	334	259	131	131	593	262	X/X
15:00 - 16:00	392	400	168	176	792	344	X/X
16:00 - 17:00	465	562	213	225	1027	438	X/X
17:00 - 18:00	344	441	220	213	785	433	X/X
18:00 - 19:00	254	278	183	169	532	352	X/X
19:00 - 20:00	189	185	152	109	374	261	X/X
20:00 - 21:00	141	170	120	68	311	188	X/X
21:00 - 22:00	98	121	74	43	219	117	X/
22:00 - 23:00	51	72	30	20	123	50	/
23:00 - 24:00	22	46	18	8	68	26	/

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	**15**	8	**Satisfied**

REMARKS:

SIGNAL WARRANTS ANALYSIS

2030 Volumes
Minor Rights Excluded

LOCATION: Apple Valley
COUNTY: Dakota
REF. POINT:
DATE: 9/12/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
45	Major App1:	NB CSAH 33	3
45	Major App3:	SB CSAH 33	3
45	Minor App2:	EB 140th Street W	2
35	Minor App4:	WB Connemara Trail	2

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No

THRESHOLDS 1A/1B: 420/630 140/70 140/70

HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00	8	21	29	/	5	/	6	/	**/**
1:00 - 2:00	5	10	15	/	4	/	3	/	**/**
2:00 - 3:00	3	9	12	/	8	/	2	/	**/**
3:00 - 4:00	16	5	21	/	1	/	3	/	**/**
4:00 - 5:00	53	8	61	/	4	/	18	/	**/**
5:00 - 6:00	205	41	246	/	6	/	58	/	**/**
6:00 - 7:00	571	117	688	X/X	27	/	146	X/X	**X/X**
7:00 - 8:00	731	218	949	X/X	109	/X	219	X/X	**X/X**
8:00 - 9:00	509	193	702	X/X	72	/X	193	X/X	**X/X**
9:00 - 10:00	423	196	619	X/	46	/	191	X/X	**X/**
10:00 - 11:00	299	142	441	X/	54	/	102	/X	**/**
11:00 - 12:00	254	154	408	/	66	/	101	/X	**/**
12:00 - 13:00	307	198	505	X/	83	/X	130	/X	**/**
13:00 - 14:00	253	227	480	X/	87	/X	121	/X	**/**
14:00 - 15:00	376	274	650	X/X	117	/X	131	/X	**/X**
15:00 - 16:00	438	422	860	X/X	150	X/X	177	X/X	**X/X**
16:00 - 17:00	519	593	1112	X/X	191	X/X	225	X/X	**X/X**
17:00 - 18:00	390	466	856	X/X	197	X/X	214	X/X	**X/X**
18:00 - 19:00	285	294	579	X/	164	X/X	166	X/X	**X/**
19:00 - 20:00	209	196	405	/	136	/X	109	/X	**/**
20:00 - 21:00	156	179	335	/	107	/X	68	/	**/**
21:00 - 22:00	110	128	238	/	66	/	43	/	**/**
22:00 - 23:00	57	76	133	/	27	/	19	/	**/**
23:00 - 24:00	26	49	75	/	16	/	8	/	**/**

	Met (Hr)	Required (Hr)	
Warrant 1A	**8**	8	**Satisfied**
Warrant 1B	7	8	Not satisfied
Warrant 2	7	4	**Satisfied**
Warrant 3	3	1	**Satisfied**
Warrant 7	**12**	8	**Satisfied, check accident record**

ALL WAY STOP WARRANT

2030 Volumes
Minor Rights Excluded

LOCATION: Apple Valley
COUNTY: Dakota
REF. POINT:
DATE: 9/12/2019
OPERATOR: MSL

Speed	Approach Description	Lanes
45	Major App1: NB CSAH 33	3
45	Major App3: SB CSAH 33	3
45	Minor App2: EB 140th Street W	2
35	Minor App4: WB Connemara Trail	2

0.70 FACTOR USED? Yes

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00	8	21	5	6	29	11	/
1:00 - 2:00	5	10	4	3	15	7	/
2:00 - 3:00	3	9	8	2	12	10	/
3:00 - 4:00	16	5	1	3	21	4	/
4:00 - 5:00	53	8	4	18	61	22	/
5:00 - 6:00	205	41	6	58	246	64	X/
6:00 - 7:00	571	117	27	146	688	173	X/X
7:00 - 8:00	731	218	109	219	949	328	X/X
8:00 - 9:00	509	193	72	193	702	265	X/X
9:00 - 10:00	423	196	46	191	619	237	X/X
10:00 - 11:00	299	142	54	102	441	156	X/X
11:00 - 12:00	254	154	66	101	408	167	X/X
12:00 - 13:00	307	198	83	130	505	213	X/X
13:00 - 14:00	253	227	87	121	480	208	X/X
14:00 - 15:00	376	274	117	131	650	248	X/X
15:00 - 16:00	438	422	150	177	860	327	X/X
16:00 - 17:00	519	593	191	225	1112	416	X/X
17:00 - 18:00	390	466	197	214	856	411	X/X
18:00 - 19:00	285	294	164	166	579	330	X/X
19:00 - 20:00	209	196	136	109	405	245	X/X
20:00 - 21:00	156	179	107	68	335	175	X/X
21:00 - 22:00	110	128	66	43	238	109	X/
22:00 - 23:00	57	76	27	19	133	46	/
23:00 - 24:00	26	49	16	8	75	24	/

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	**15**	8	**Satisfied**

REMARKS:

SIGNAL WARRANTS ANALYSIS

2040 Volumes
Minor Rights Excluded

LOCATION: Apple Valley
COUNTY: Dakota
REF. POINT:
DATE: 9/12/2019
OPERATOR: MSL

Speed	Approach Description		Lanes
45	Major App1:	NB CSAH 33	3
45	Major App3:	SB CSAH 33	3
45	Minor App2:	EB 140th Street W	2
35	Minor App4:	WB Connemara Trail	2

0.70 FACTOR USED? YES
POPULATION < 10,000? No
EXISTING SIGNAL ? No

				420/630			140/70	140/70	
HOUR	MAJOR APP. 1	MAJOR APP. 3	TOTAL 1+3	MAJOR 1A/1B	MINOR APP. 2	MINOR 2 1A/1B	MINOR APP. 4	MINOR 4 1A/1B	**MET SAME 1A/1B**
0:00 - 1:00	8	22	30	/	5	/	6	/	**/**
1:00 - 2:00	5	11	16	/	4	/	3	/	**/**
2:00 - 3:00	3	10	13	/	8	/	2	/	**/**
3:00 - 4:00	17	5	22	/	1	/	3	/	**/**
4:00 - 5:00	55	9	64	/	4	/	18	/	**/**
5:00 - 6:00	215	43	258	/	6	/	56	/	**/**
6:00 - 7:00	601	123	724	X/X	27	/	144	X/X	**X/X**
7:00 - 8:00	770	230	1000	X/X	109	/X	219	X/X	**X/X**
8:00 - 9:00	534	203	737	X/X	72	/X	194	X/X	**X/X**
9:00 - 10:00	445	206	651	X/X	46	/	192	X/X	**X/X**
10:00 - 11:00	314	150	464	X/	54	/	102	/X	**/**
11:00 - 12:00	267	162	429	X/	66	/	100	/X	**/**
12:00 - 13:00	322	209	531	X/	83	/X	130	/X	**/**
13:00 - 14:00	267	240	507	X/	87	/X	122	/X	**/**
14:00 - 15:00	395	288	683	X/X	117	/X	131	/X	**/X**
15:00 - 16:00	460	447	907	X/X	150	X/X	177	X/X	**X/X**
16:00 - 17:00	546	627	1173	X/X	191	X/X	227	X/X	**X/X**
17:00 - 18:00	412	492	904	X/X	197	X/X	215	X/X	**X/X**
18:00 - 19:00	301	311	612	X/	164	X/X	165	X/X	**X/**
19:00 - 20:00	221	207	428	X/	136	/X	109	/X	**/**
20:00 - 21:00	165	190	355	/	107	/X	67	/	**/**
21:00 - 22:00	116	135	251	/	66	/	42	/	**/**
22:00 - 23:00	61	80	141	/	27	/	20	/	**/**
23:00 - 24:00	27	52	79	/	16	/	8	/	**/**

	Met (Hr)	Required (Hr)	
Warrant 1A	**8**	8	**Satisfied**
Warrant 1B	**8**	8	**Satisfied**
Warrant 2	7	4	**Satisfied**
Warrant 3	4	1	**Satisfied**
Warrant 7	**12**	8	**Satisfied, check accident record**

ALL WAY STOP WARRANT

2040 Volumes
Minor Rights Excluded

LOCATION: Apple Valley
COUNTY: Dakota
REF. POINT:
DATE: 9/12/2019

OPERATOR: MSL

Speed	Approach Description	Lanes
45	Major App1: NB CSAH 33	3
45	Major App3: SB CSAH 33	3
45	Minor App2: EB 140th Street W	2
35	Minor App4: WB Connemara Trail	2

0.70 FACTOR USED? Yes

					210	140	
HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR TOTAL Σ (APP. 1 & APP. 3)	MINOR TOTAL APP. 2 + APP. 4	WARRANT MET
0:00 - 1:00	8	22	5	6	30	11	/
1:00 - 2:00	5	11	4	3	16	7	/
2:00 - 3:00	3	10	8	2	13	10	/
3:00 - 4:00	17	5	1	3	22	4	/
4:00 - 5:00	55	9	4	18	64	22	/
5:00 - 6:00	215	43	6	56	258	62	X/
6:00 - 7:00	601	123	27	144	724	171	X/X
7:00 - 8:00	770	230	109	219	1000	328	X/X
8:00 - 9:00	534	203	72	194	737	266	X/X
9:00 - 10:00	445	206	46	192	651	238	X/X
10:00 - 11:00	314	150	54	102	464	156	X/X
11:00 - 12:00	267	162	66	100	429	166	X/X
12:00 - 13:00	322	209	83	130	531	213	X/X
13:00 - 14:00	267	240	87	122	507	209	X/X
14:00 - 15:00	395	288	117	131	683	248	X/X
15:00 - 16:00	460	447	150	177	907	327	X/X
16:00 - 17:00	546	627	191	227	1173	418	X/X
17:00 - 18:00	412	492	197	215	904	412	X/X
18:00 - 19:00	301	311	164	165	612	329	X/X
19:00 - 20:00	221	207	136	109	428	245	X/X
20:00 - 21:00	165	190	107	67	355	174	X/X
21:00 - 22:00	116	135	66	42	251	108	X/
22:00 - 23:00	61	80	27	20	141	47	/
23:00 - 24:00	27	52	16	8	79	24	/

	Met (Hr)	Required (Hr)	
Allway Stop Warrant:	**15**	8	**Satisfied**

REMARKS:

RJR Appendix C

Intersection Safety Screening

Intersection Safety Screening

Intersection: C.S.A.H. 33 at 140th Street W/Connemara Trail

Crash Data, 2016-2018.

Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	1
Possible Injury	2
Property Damage	11
Total Crashes	14

Intersection Characteristics	
Entering Volume	16,100
Traffic Control	All stop
Environment	Urban
Speed Limit	50 mph

Annual crash cost = $139,867

Statewide Comparison *All Way Stop*

Total Crash Rate	
Observed	0.79
Statewide Average	0.34
Critical Rate	0.73
Critical Index	**1.08**

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.72
Critical Rate	6.14
Critical Index	**0.00**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

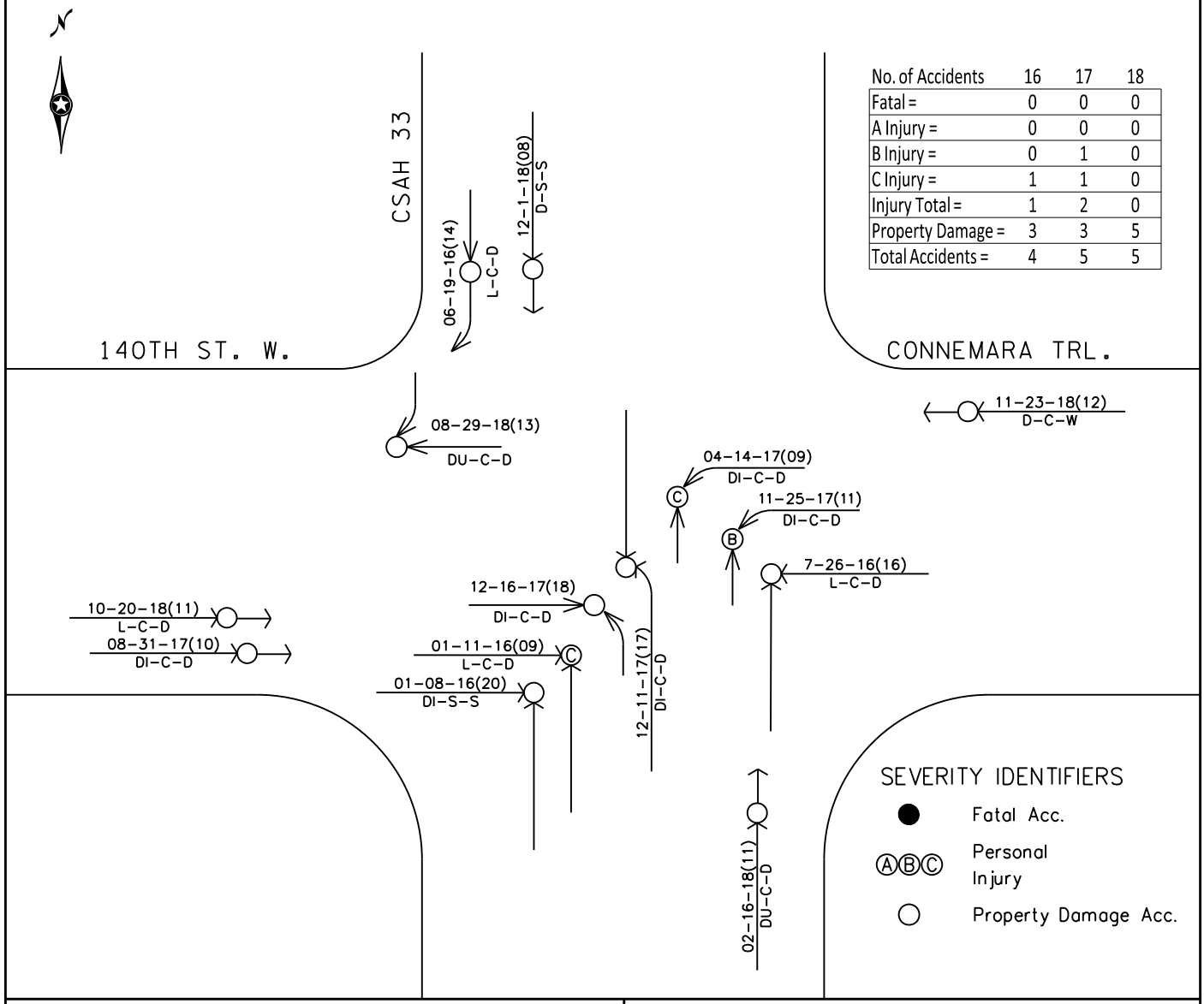
The observed total crash rate for this period is 0.79 per MEV; this is 1.1 times the critical rate. If crashes were reduced by 1 over three years, this intersection would perform within normal range.

The observed fatal and serious injury crash rate for this period is 0.00 per 100 MEV; this is 100% below the critical rate. The intersection operates within the normal range.

COLLISION DIAGRAM
BOLTON & MENK, INC.

LOCATION: C.S.A.H. 33 AT 140TH STREET/CONNEMARA TRAIL
TIME PERIOD: 01/01/2016 - 12/31/2018 DATE: 11/18/2019
PREPARED BY: M. LARSON

No. of Accidents	16	17	18
Fatal =	0	0	0
A Injury =	0	0	0
B Injury =	0	1	0
C Injury =	1	1	0
Injury Total =	1	2	0
Property Damage =	3	3	5
Total Accidents =	4	5	5



KEY

- Motor Vehicle Backing Up
- Motor Vehicle Out of Control
- Motor Vehicle Ahead
- Rear End
- Right Angle
- Left Turn
- Fixed Object
- Pedestrian
- Bicycle/Moped
- Motorcycle
- Deer
- School Bus
- Parking

NOTES

[1] ADT = 16,100

[2] CR = 0.79, CI = 1.08

[3] SR = 0.00

Light:	Weather:	Surface:
L= Daylight (1)	C= Clear or Cloudy (1 or 2)	D= Dry (1)
DN= Dawn (2)	R= Rain (3)	W= Wet (2)
DU= Dusk (3)	S= Snow or Sleet (4 or 5)	S= Snow or Ice (3 or 4)
DI= Dark, Lighted (4)	F= Fog, Smog, Smoke (6)	M= Muddy (5)
Do= Dark, Lights Off (5)	B= Blowing Sand/Dust (7)	DB= Debris (6)
D= Dark, Unlighted (6)	W= Severe Crosswinds (8)	O= Oily (7)
X= Unknown (99)	X= Other or Unknown (99)	X= Other or Unknown (99)

Other Vehicle — Injury Type — [Date]-[Time (hrs)]-[Light-Weather-Surface]

RJR Appendix D

Operations Analysis Results
(SimTraffic Reports available upon request)

Table 1: No Build Traffic Operations Analysis - CSAH 33 & 140th St Roundabout Feasibility Study

Intersection	Year	Peak Hour	Intersection Delay (1.)		NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR		Maximum Delay-LOS (2.)		Limiting Movement (3.)	Max Approach Queue		
																															Direction	Average Queue	Max Queue
CSAH 33 & 140th Street W/Connemara Trail *All-Way Stop Controlled*	2019	AM	10	B	8	A	13	B	6	A	6	A	11	B	3	A	7	A	11	B	4	A	9	A	11	B	5	A	13	B	NBT	NBT	75	125
		PM	13	B	12	B	13	B	6	A	11	B	17	C	10	B	11	B	14	B	8	A	14	B	13	B	5	A	17	C	SBT	SBT	75	175
	2030	AM	10	B	8	A	13	B	7	A	7	A	11	B	3	A	8	A	11	B	4	A	10	B	11	B	5	A	13	B	NBT	NBT/R	75	125
		PM	14	B	12	B	14	B	6	A	11	B	18	C	9	A	12	B	15	C	9	A	15	C	14	B	5	A	18	C	SBT	SBT	100	175
	2040	AM	11	B	9	A	15	C	8	A	8	A	12	B	4	A	8	A	12	B	4	A	10	B	11	B	6	A	15	C	NBT	NBT	75	175
		PM	14	B	13	B	14	B	6	A	12	B	19	C	10	B	14	B	15	C	9	A	15	C	14	B	4	A	19	C	SBT	SBT	100	175

1. Delay in seconds per vehicle
2. Maximum delay and LOS on any approach and/or movement
3. Limiting Movement is the highest delay movement.

Table 2: Peak Hour Queues By Movement - Existing Conditions Geometry

Intersection	Year	Peak Hour	Queue Lengths																			
			EBL/T		EBT/R		WBL/T		WBT/R		NBL		NBT		NBT/R		SBL		SBT		SBT/R	
			Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
CSAH 33 & 140th Street W/Connemara Trail *All-Way Stop Controlled*	2019	AM	50	75	50	100	50	100	50	100	50	100	75	125	50	100	25	50	50	100	50	75
		PM	50	75	75	125	75	125	50	100	50	100	50	100	50	100	50	100	75	175	75	150
	2030	AM	50	75	50	100	50	100	50	100	50	100	75	125	75	125	25	50	50	75	50	75
		PM	50	100	75	125	75	125	50	100	50	100	75	100	50	100	50	100	100	175	75	175
	2040	AM	50	75	50	100	75	100	50	125	50	100	75	175	75	150	25	50	50	100	50	75
		PM	50	100	75	125	75	125	50	125	50	125	50	100	50	100	50	100	100	175	75	175

Table 1. 2040 AM Traffic Operational Analysis

Location	Aprch	Demand volumes				Modeled Volumes				Model - Demand					Total Delay by Movement (sec/veh)			Level of Service by Movement			LOS by Approach		LOS		Queuing (feet)		
		L	T	R	Total	L	T	R	Total	L	T	R	Total	%	L	T	R	L	T	R	Delay	LOS	Delay	LOS	Storage	Avg	Max
CSAH 33 (Diamond Path) at 140th St/Connemara Trl *Single Lane Roundabout*	EB	20	101	111	232	17	96	118	231	-3	-5	7	-1	0%	3	2	2	A	A	A	2	A	4	A	900	25	125
	WB	71	156	125	352	68	159	123	350	-3	3	-2	-2	-1%	8	9	9	A	A	A	9	A			150	25	300
	NB	120	520	56	696	126	514	56	696	6	-6	0	0	0%	4	4	4	A	A	A	4	A			650	25	275
	SB	31	180	24	235	34	175	24	233	3	-5	0	-2	-1%	3	3	2	A	A	A	3	A			900	25	125
Connemara Trl at Delta Ave *Stop Controlled*	EB		188		188		186		186		-2		-2	-1%		0		A	A	A	0	A	4	A		0	0
	WB		269		269		269		269		0		0	0%		1		A	A	A	1	A				25	50
	NB	83		15	98	82		16	98	-1		1	0	0%	22		13	C	A	B	20	C				25	125

Westbound Connemara Trl Queuing	
Queue Length (ft)	Number of Minutes
0-50	35
50-100	12
100-150	6
>150	8

1. Distance measured from CSAH 33 (Diamond Path)
2. Queues over 150 ft start to block Delta Avenue

Table 2. 2040 PM Traffic Operational Analysis

Location	Aprch	Demand volumes				Modeled Volumes				Model - Demand					Total Delay by Movement (sec/veh)			Level of Service by Movement			LOS by Approach		LOS		Queuing (feet)		
		L	T	R	Total	L	T	R	Total	L	T	R	Total	%	L	T	R	L	T	R	Delay	LOS	Delay	LOS	Storage	Avg	Max
CSAH 33 (Diamond Path) at 140th St/Connemara Trl *Single Lane Roundabout*	EB	15	202	165	382	14	195	172	381	-1	-7	7	-1	0%	12	15	14	B	B	B	14	B	8	A	900	50	375
	WB	85	150	46	281	85	151	44	280	0	1	-2	-1	0%	4	4	4	A	A	A	4	A			150	25	200
	NB	141	279	90	510	147	273	92	512	6	-6	2	2	0%	5	5	4	A	A	A	5	A			650	25	250
	SB	111	505	21	637	118	493	22	633	7	-12	1	-4	-1%	10	9	9	B	A	A	9	A			900	50	450
Connemara Trl at Delta Ave *Stop Controlled*	EB		403		403		405		405		2		2	0%		0		A	A	A	0	A	2	A		0	0
	WB		227		227		227		227		0		0	0%		1		A	A	A	1	A				0	0
	NB	54		6	60	53		7	60	-1		1	0	0%	18		16	C	A	C	18	C				25	75

Westbound Connemara Trl Queuing	
Queue Length (ft)	Number of Minutes
0-50	49
50-100	7
100-150	3
>150	1

1. Distance measured from CSAH 33 (Diamond Path)
2. Queues over 150 ft start to block Delta Avenue

Appendix B: Public Engagement Materials

COUNTY ROAD 33
Roundabout Feasibility Study

INTRODUCTION

The County has periodically evaluated needs and options for this 4-way-stop intersection since 2008. Today's traffic volumes and anticipated growth are now causing increased concerns about safety and delays. Preliminary analysis and recent experience suggest a roundabout should be a good long-term solution.

Goals

- Improve safety
- Enhance pedestrian usability
- Maintain mobility
- Encourage lower speeds

Tentative Timeline

2020: Feasibility study and preliminary engineering design

2021: Final engineering design, including right-of-way and utility details

2022: Construction

Project Contact

Doug Abere, Project Manager
doug.abere@co.dakota.mn.us
952-891-7101

What You Can Do Today

- Review materials
- Talk to project staff
- Provide input

www.co.dakota.mn.us (*search for* County Road 33)

COUNTY ROAD 33
Roundabout Feasibility Study

STUDY OVERVIEW

The primary focus of this study is the intersection of Diamond Path and 140th Street/Connemara Trail to determine:

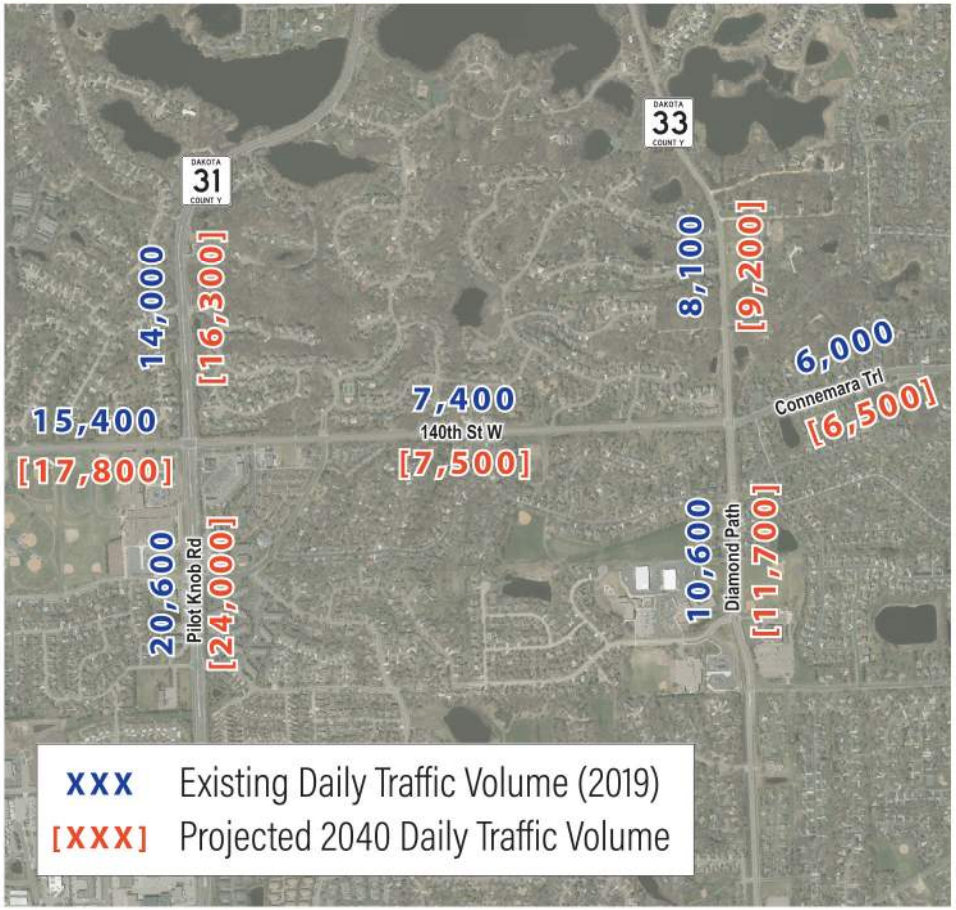
How is the 4-way stop working now?
How will it work in the future?

Is a roundabout appropriate for this location?

Other intersection considerations:

- Connemara Trail was recently converted from a 4-lane to a 3-lane roadway
- 140th Street is currently a 4-lane roadway but traffic volumes are compatible with a 3-lane roadway
- Diamond Path, north of 140th Street/Connemara Trail, does not have a sidewalk or trail
- The roundabout would be similar to the one north of Farmington at Highway 3 (Chippendale Ave) and 195th St/190th St

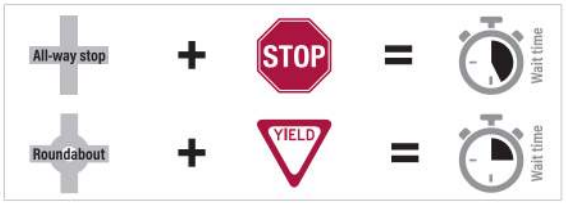
Daily Traffic Volumes



COUNTY ROAD 33
Roundabout Feasibility Study

OPERATIONS

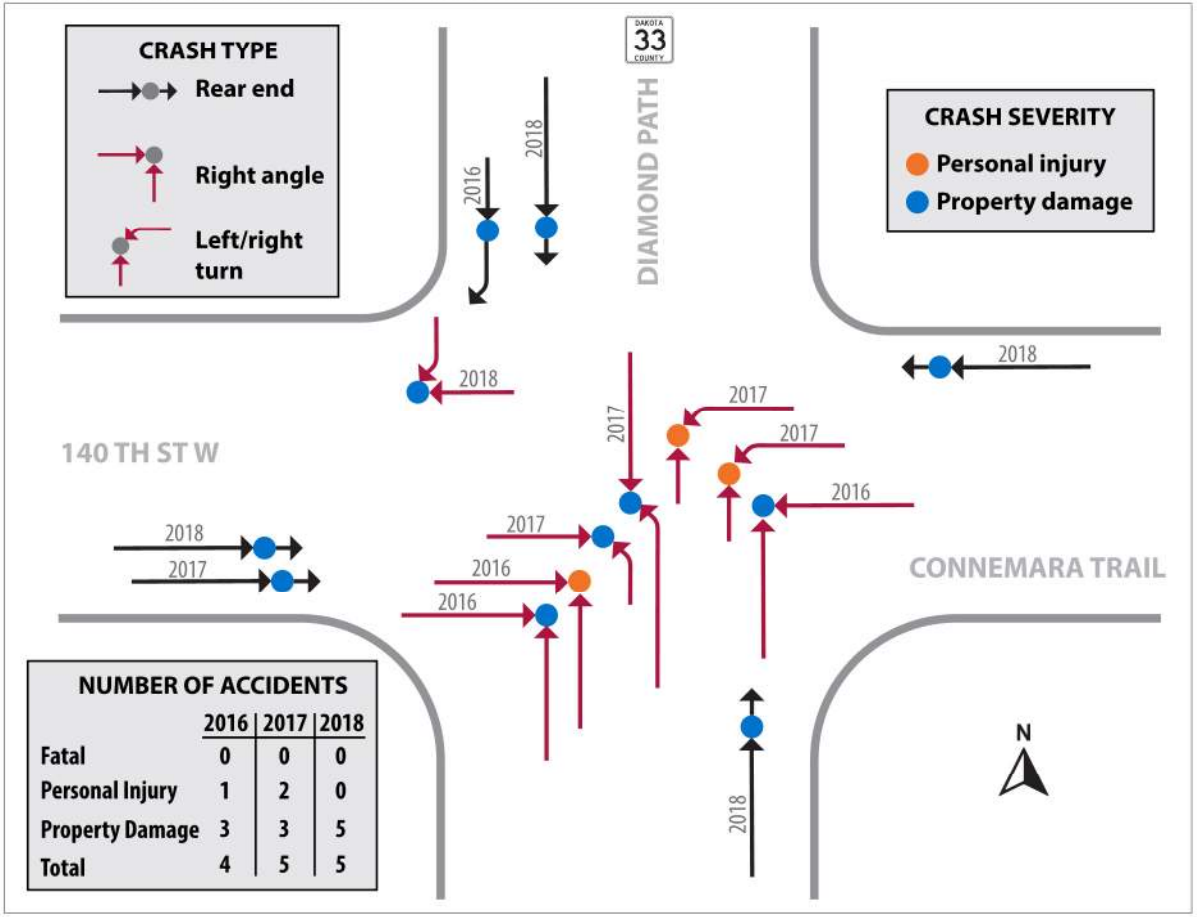
At this 4-way stop intersection, the typical maximum backup is 5 vehicles. A roundabout would likely have the same backup length but traffic flow would improve (shorter wait times).



Safety is the primary need at this intersection.

SAFETY

High number of right-angle and turning crashes. These type of crashes are not typical at an all-way stop-controlled intersection.



NUMBER OF ACCIDENTS

	2016	2017	2018
Fatal	0	0	0
Personal Injury	1	2	0
Property Damage	3	3	5
Total	4	5	5

www.co.dakota.mn.us (*search for* County Road 33)

COUNTY ROAD 33
Roundabout Feasibility Study

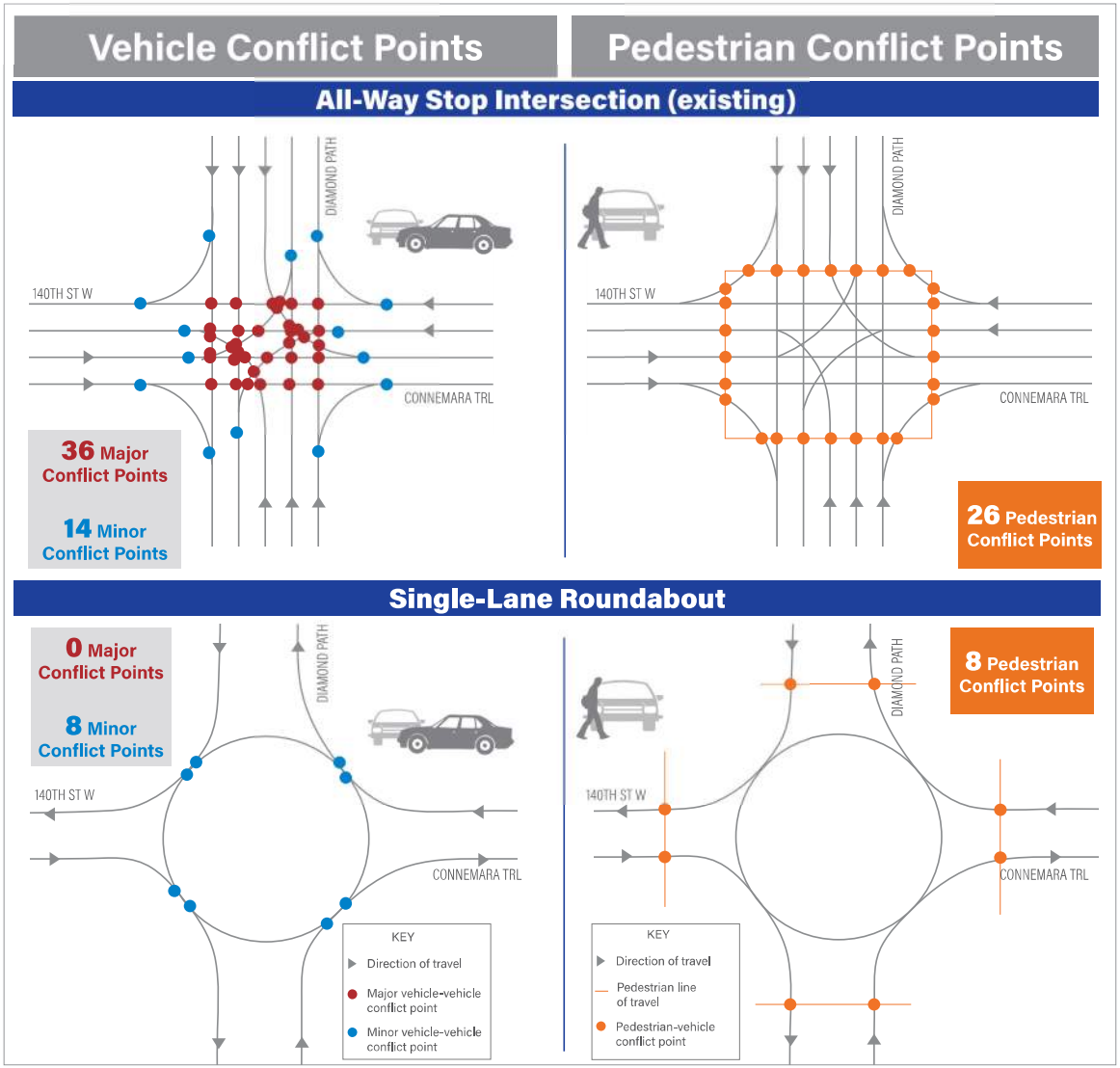
CONFLICT POINTS

The high number of crashes at this intersection may be due to the high number of lanes and resulting conflict points.

A roundabout would:

- reduce the number of minor and major conflict points for both vehicles and pedestrians
- **reduce the number of right-angle crashes, which tend to be more severe**

Roundabouts reduce crash risk by reducing the number of conflict points.



Major Conflict Points:
More likely to cause severe collisions such as T-bones and turning crashes, resulting in major injury or property damage

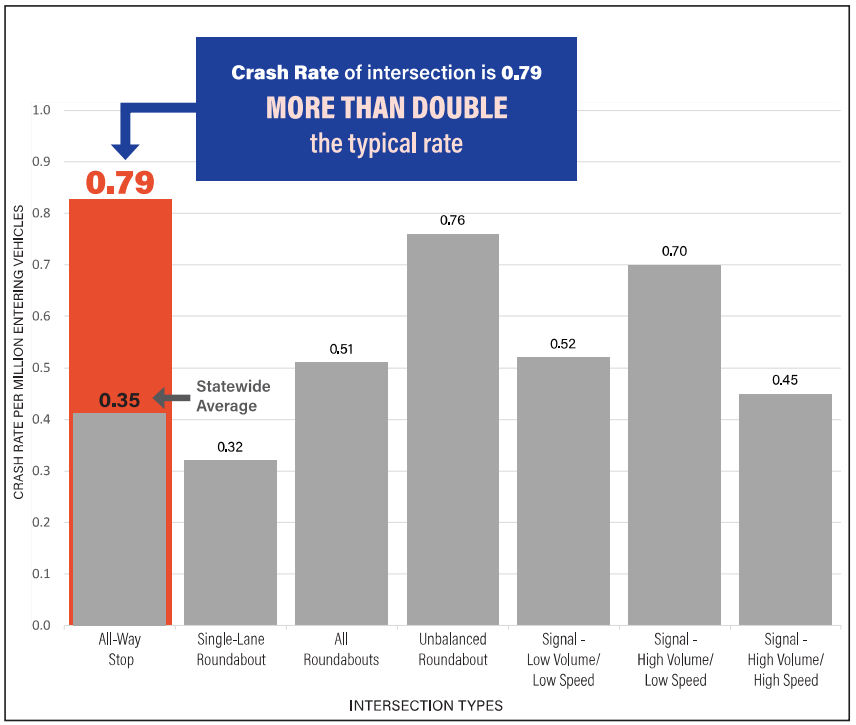
Minor Conflict Points:
More likely to cause minor collisions such as slow-speed rear-end crashes, resulting in minor injury or property damage

www.co.dakota.mn.us (*search for* County Road 33)

CRASH RATES

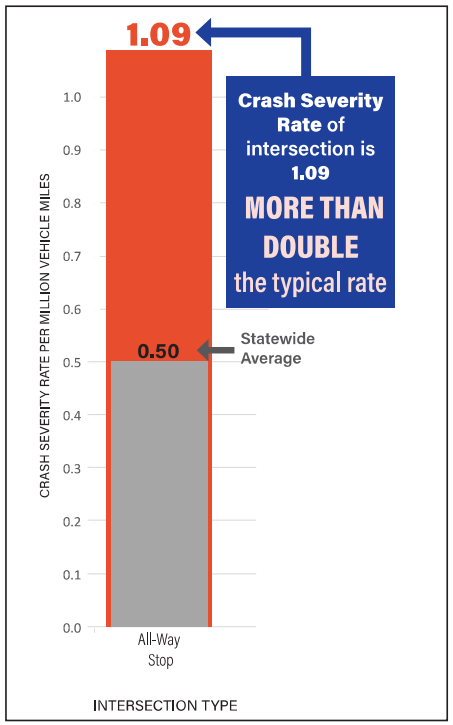
Intersection Crash Rate

Crash rate is the number of crashes per million vehicles entering the intersection. At this intersection, the crash rate is **more than double** that of a typical all-way stop intersection.



Risk of Fatal or Serious Injury Crashes

Fortunately, there have been no fatal or serious injury crashes at the intersection. But we must consider the risks. The number of personal injury crashes (not serious) is a concern for the future, resulting in a crash severity rate of 1.09, **double the statewide average**.



The many **conflict points** and **crash history** at the intersection indicate **more safety risk** than typical for an all-way stop.

COUNTY ROAD 33
Roundabout Feasibility Study

WHY A ROUNDABOUT?

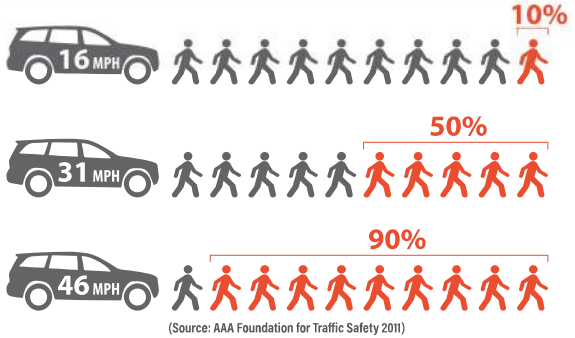
What is it?

A roundabout is a one-way circular intersection where traffic flows around a center island. At entry, drivers yield to traffic in the roundabout. All drivers must yield to pedestrians in crosswalks.

Advantages:

- Fewer injury crashes & fatalities
- Increased pedestrian safety
- Less vehicle delay and pollution

Risk of serious injury in pedestrian-vehicle crash



(Source: AAA Foundation for Traffic Safety 2011)

Benefits

- All vehicles move through the intersection at 15-20 mph
- Greater human interaction between drivers and pedestrians
- Two-stage pedestrian crossing
- Simplified decision making for drivers and pedestrians
- Effective in moving heavy left turning traffic
- Reduces traffic congestion, delays, and serious injury crashes

Challenges

- Footprint may be larger than a traditional intersection
- Right-of-way needs
- Driver understanding of yield upon entry
- Aggressive driving

Dakota County Goals Addressed

- INCREASE PEDESTRIAN SAFETY & CONNECTIONS
- PROVIDE SAFE FACILITIES
- LOWER VEHICLE SPEEDS
- REDUCE PEDESTRIAN & VEHICLE CONFLICT POINTS
- REDUCE CONGESTION & IMPROVE CIRCULATION

www.co.dakota.mn.us (*search for* County Road 33)

COUNTY ROAD 33
Roundabout Feasibility Study

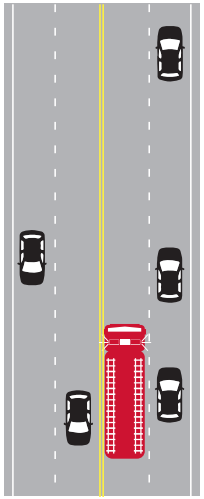
140th Street — Possible 4-Lane to 3-Lane Conversion

- Can handle existing and future traffic (up to 16,000 vehicles/day)
- 19-47% reduction in crashes
- Reduced conflict chances, 3 vs. 6
- Safer street crossings
- Fewer lanes to cross
- Traffic calming
- Improved emergency response time

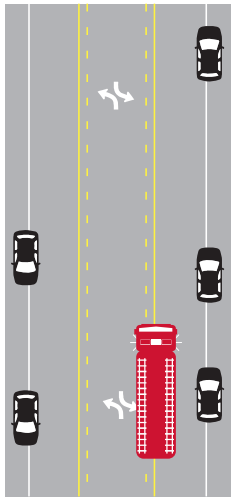
Crossing only one lane of traffic at a time reduces the risk of crashes and serious injuries.
— AARP

Emergency Vehicle Access

BEFORE
4 Lanes

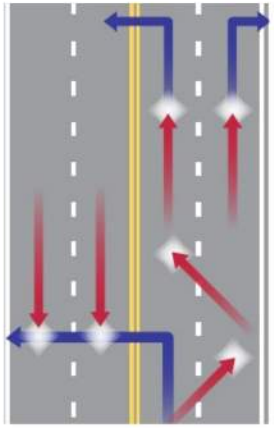


AFTER
3 Lanes

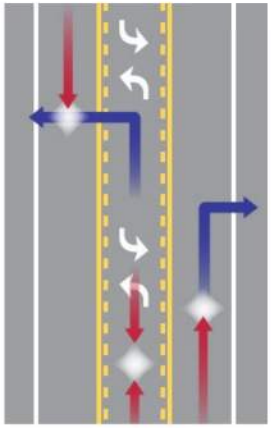


Conflict Points

BEFORE
4 Lanes

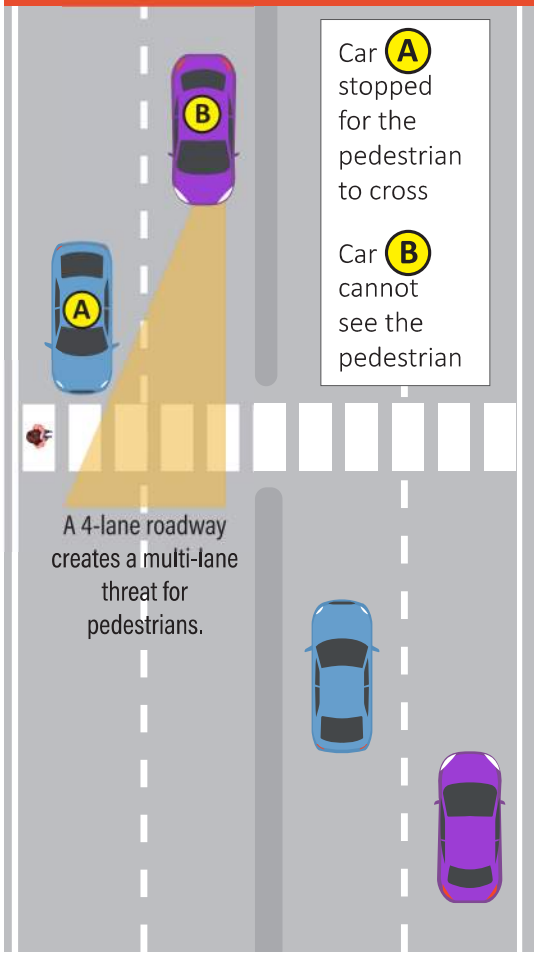


AFTER
3 Lanes



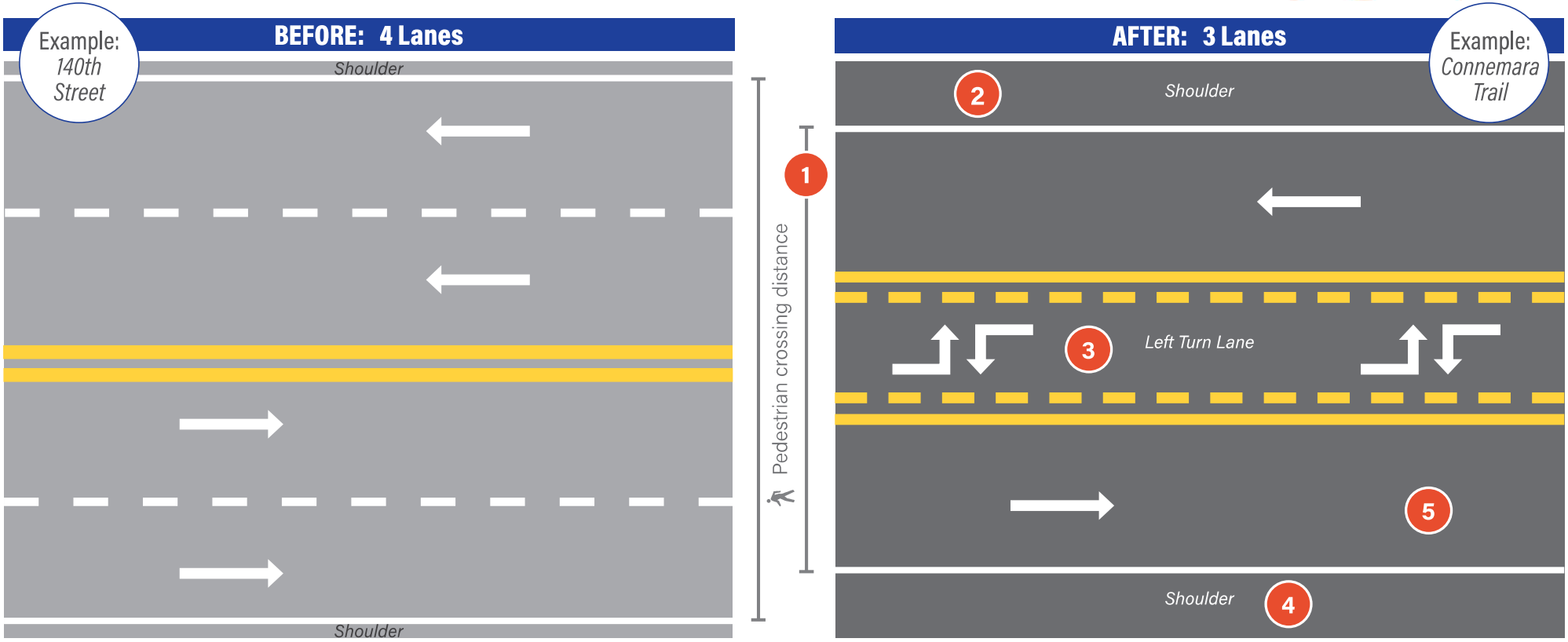
A 4-lane roadway has more conflict points than a 3-lane.

Pedestrian Crossing Safety



COUNTY ROAD 33
Roundabout Feasibility Study

4-Lane to 3-Lane Conversion is Possible on 140th Street by Restriping Only



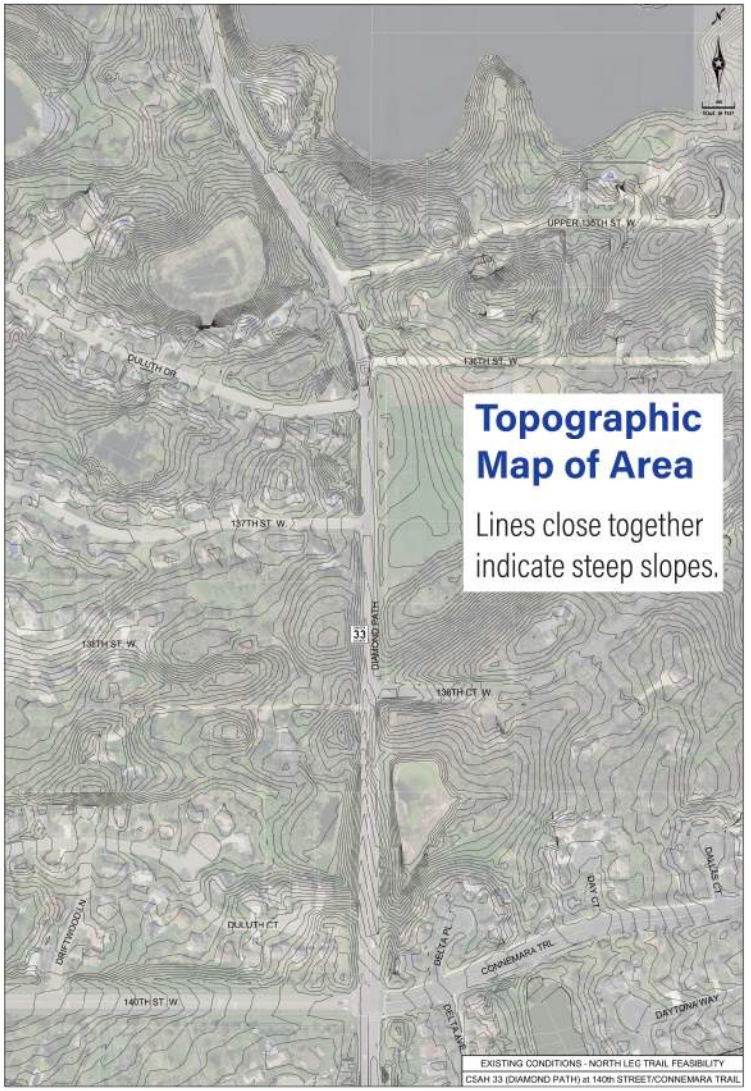
A 4-lane to 3-lane conversion reduces the number of lanes on a roadway to better utilize available space. Benefits include increased safety, reduced conflict points, and improved mobility.

Benefits of 3 Lanes

1. Shorter pedestrian crossing distance
2. Wide shoulder for bicycles & emergency pull-off
3. Protected left turns
4. Buffer zone between moving vehicles & pedestrians
5. Allows left turns to not impede through-traffic

TRAIL CONSIDERATIONS

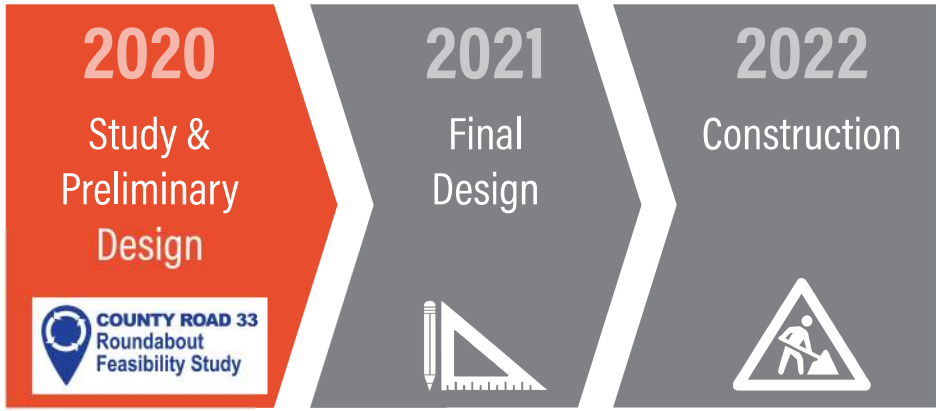
- Design for new roundabout will connect existing trails and provide crossings at all four streets.
- Currently there are no trails north of 140th Street/Connemara Trail (wide shoulder is sometimes used).
- New trails and roadway improvements to the north will be planned in studies beginning in 2024.
- Diamond Path (CR 33) to the north includes challenging terrain (grades and water features).
- Current roundabout design will anticipate possible trail connections to the north.
- **What do you think?** Are trails or roadway improvements needed to the north?



NEXT STEPS

- Review input from this open house
- Develop roundabout alternatives
- Evaluate the impact of each alternative
- Meet with residents & stakeholders
- Determine & refine recommended alternative
- Next open house in April/May

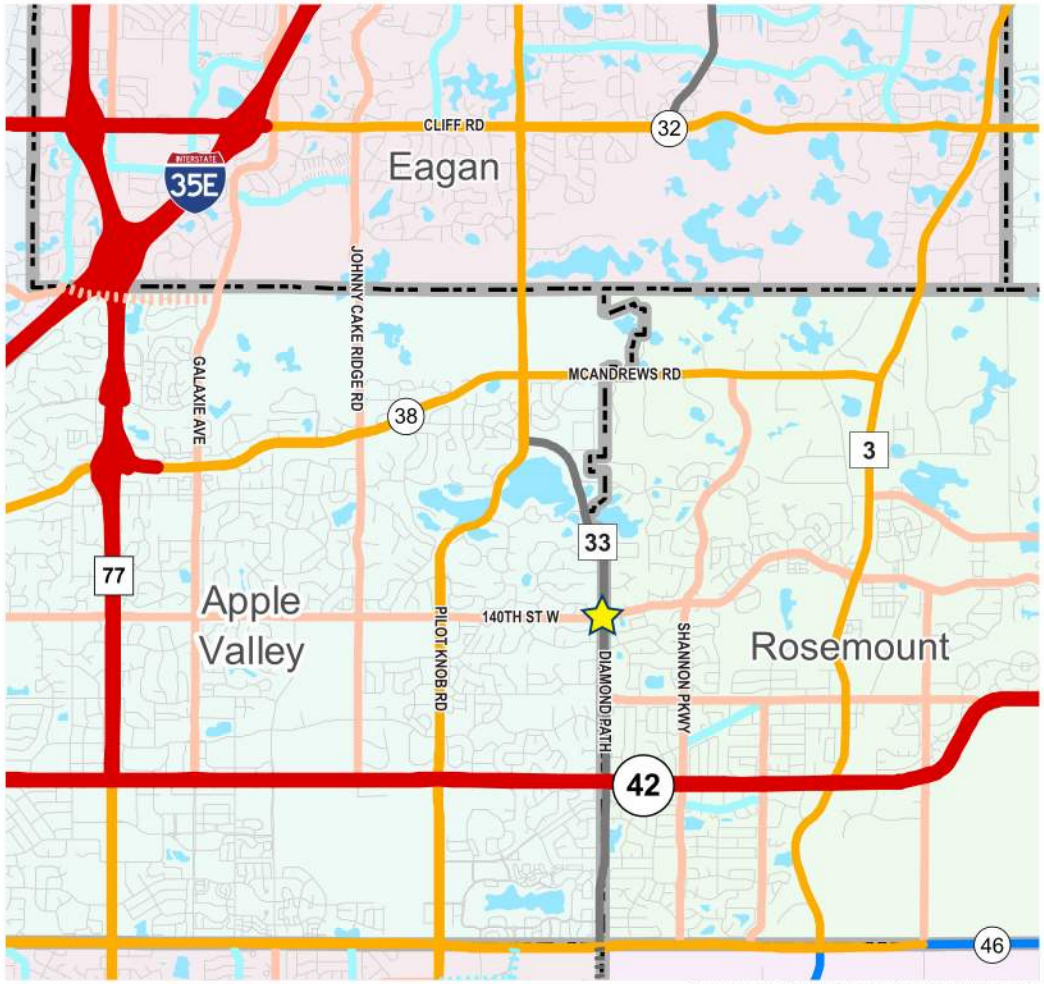
Long Term Plan



After completion of the feasibility study, preliminary design will occur. Next year the design will be finalized with construction currently planned for 2022.

REGIONAL CONTEXT

- Roadway classifications identify the functions for roads before determining street widths, speed limits, intersection control, or other design features.
- Non-transportation factors, such as land use and development, are also considered for planning and designing streets and highways.



Source: Functional Classification System, Metropolitan Council, May 2018

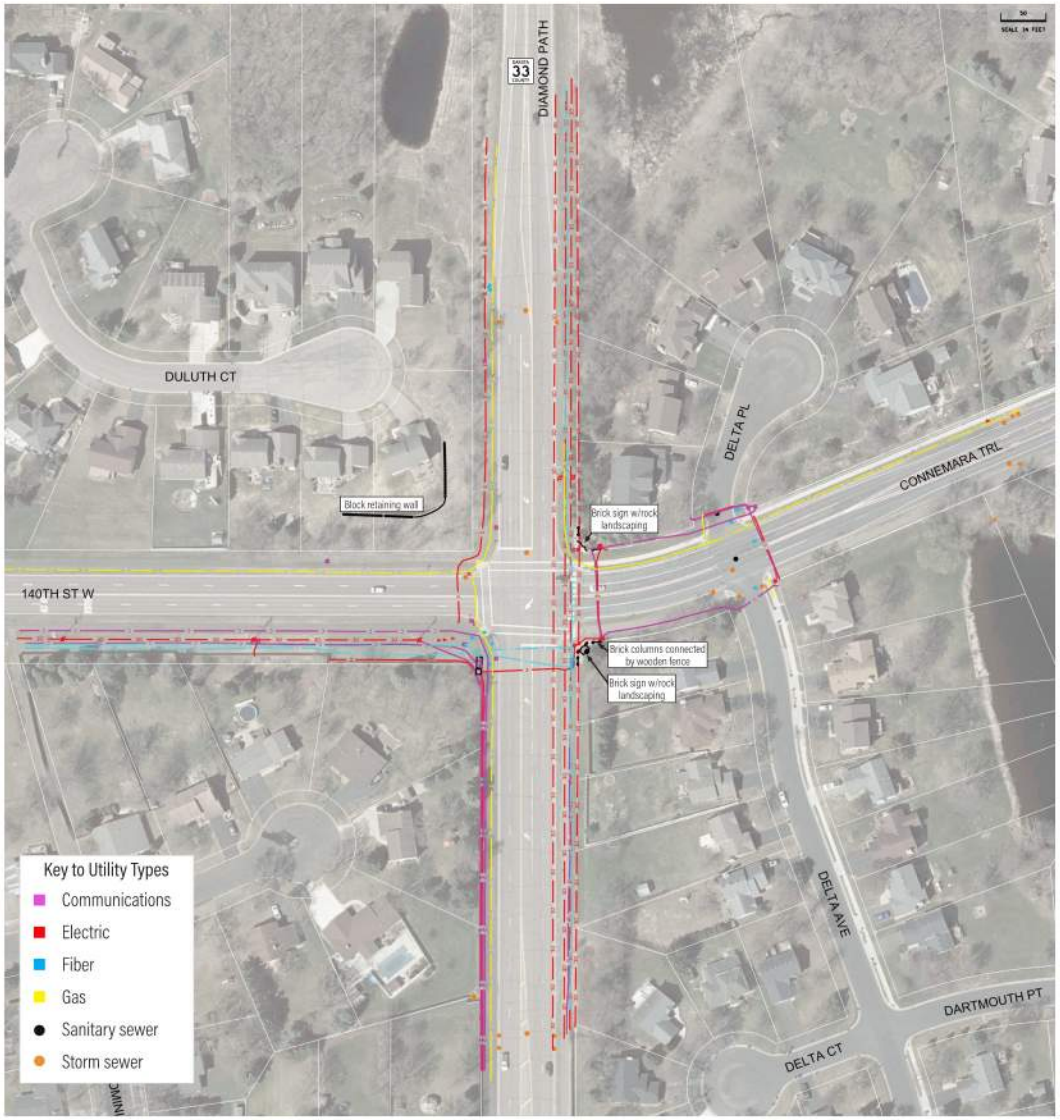
Key to Roadway Classifications
Principal Arterial
A-Minor Expander
Other Arterial
Major Collector
Major Collector - planned
Minor Collector

SURVEY & UTILITIES

Survey of the intersection area was completed in Fall 2019.

There are numerous utilities around the intersection.

The alternatives will review impacts to properties, utilities, and structures.



INTERSECTION TRAFFIC CONTROL

All-way stops are used for

- Moderate traffic volumes.
- Balanced traffic.
- Speed limits of 40 mph or less.

Drawbacks

- Inefficient and cause delay.
- Multiple lanes can increase crash risk.
- Increased crash risk when disregarded.
- Constant stopping/acceleration is noisy.

Traffic signals are used for

- Consistently high volume of traffic.
- Collector or arterial corridor intersections.

Drawbacks

- Introduces additional decision making.
- Increased crash risk when disregarded.
- Increased risk of fatal or serious injury crashes.
- Creates delay, particularly for higher volume movements.
- Higher speeds.

Roundabouts are used for

- Moderate to high traffic volumes.
- Improving traffic flow.

Drawbacks

- May have higher construction cost and right-of-way needs.
- Potential for more property damage crashes.
- Not suitable for six-lane or principal arterial roadways.

COUNTY ROAD 33
Roundabout Feasibility Study

Open House Feedback

February 6, 2020 • 4:30-6:30 pm • Rosemount Community Center

About **3 out of 4** attendees supported a **single-lane roundabout** at the intersection of *County Road 33 (Diamond Path) and 140th Street W/Connemara Trail*.

- **62** attendees
- **20** written comments
- **Many** verbal comments

Concerns about a having **roundabout** at this intersection

- Pedestrian safety
- Snow plowing
- Usability by school buses & emergency vehicles
- Proximity to Delta Ave & Delta Place
- Potential impact to private properties
- Lack of experience using them
- Increased traffic congestion
- Cost of building

Other comments

- Existing intersection needs help
- Some prefer a traffic signal in place of a roundabout
- Accommodate existing neighborhood signs
- Support for pedestrian connection to the north
- Most in favor of conversion of 140th St to 3-lane roadway (like Connemara Trl)
- Desire for improved sight lines along Connemara Trl

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COUNTY ROAD 33
Roundabout Feasibility Study

INTRODUCTION

The County has periodically evaluated needs and options for this 4-way-stop intersection since 2008. Today's traffic volumes and anticipated growth are now causing increased concerns about safety and delays. Preliminary analysis and recent experience suggest a roundabout should be a good long-term solution.

Goals

- Improve safety
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- Maintain mobility
- Encourage lower speeds

Tentative Timeline

2020: Feasibility study and preliminary engineering design

2021: Final engineering design, including right-of-way and utility details

2022: Construction

Project Contact

Doug Abere, Project Manager
doug.abere@co.dakota.mn.us
952-891-7101

What You Can Do

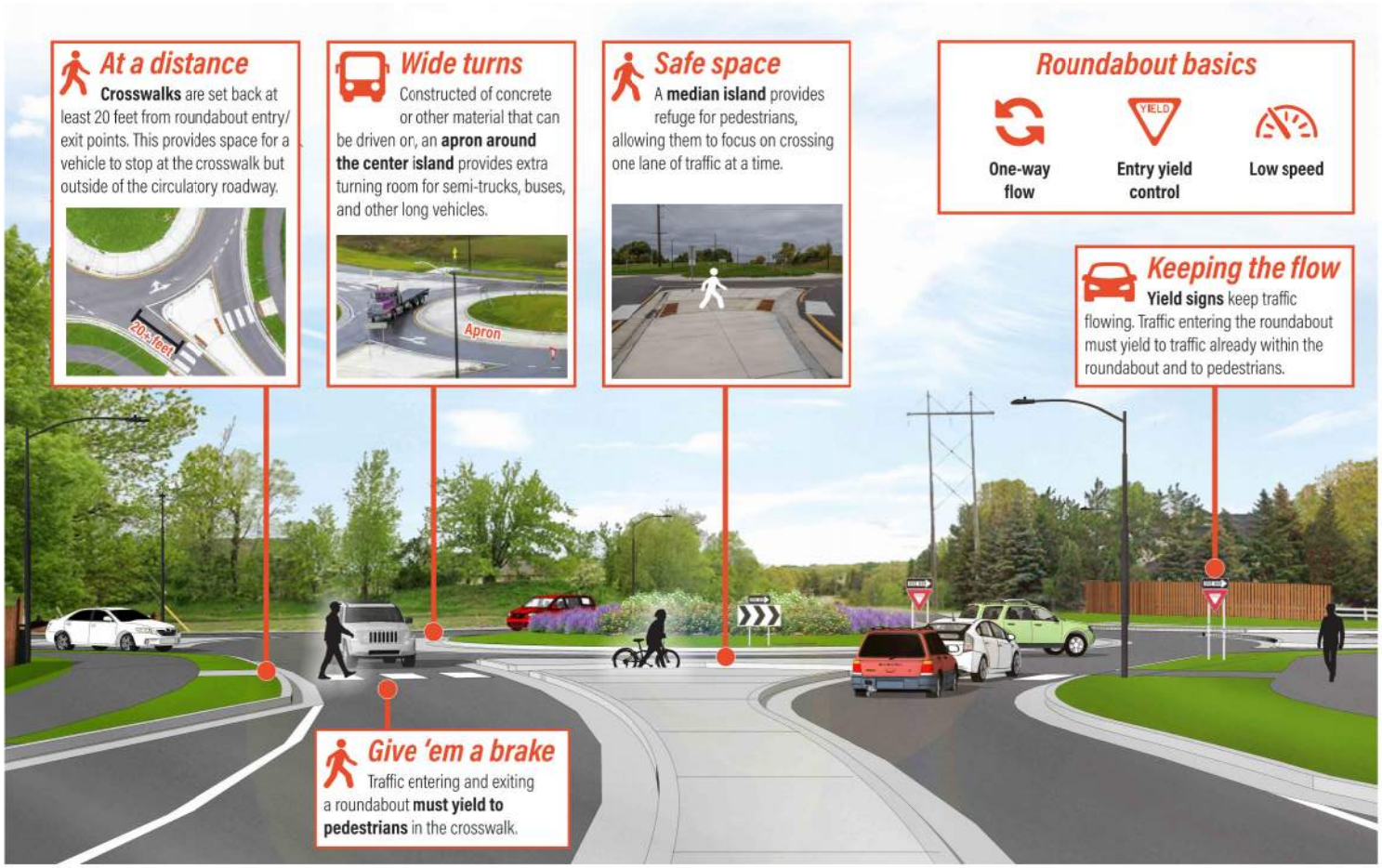
- **Review materials including drawings, maps and videos.**
- **See a concept drawing of the roundabout.**
- **Submit feedback using the online form.**

www.dakotacounty.us (*search* "County Road 33")

COUNTY ROAD 33
Roundabout Feasibility Study

ROUNDABOUT FEATURES

A single-lane roundabout is designed to improve safety for all users.



Roundabout Rules

Drivers

- Slow down.
- Yield to pedestrians.
- Yield to vehicles already in the roundabout.
- Continue through roundabout until you reach your exit.
- Yield to pedestrians when exiting a roundabout.

When an emergency vehicle approaches, **do not stop within the roundabout**. Continue to your exit, then pull over to stop.

The driver of a vehicle is not required to use a turn signal **when exiting a roundabout.**

Pedestrians

- Cross only at crosswalks.
- Use the median island at the halfway point to check for approaching traffic.

Stop, look, listen. **Pedestrians have the right of way at a crosswalk,** but they should make sure drivers see them before crossing.

Bicyclists

- Ride with traffic inside the roundabout or use the crosswalks appropriately.
- Follow same rules as vehicles when riding with traffic.

COUNTY ROAD 33
Roundabout Feasibility Study

WHAT WE'VE HEARD

Open House Feedback

February 6, 2020 • 4:30-6:30 pm • Rosemount Community Center

- **62** attendees
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- **Many** verbal comments

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Concerns about a having **roundabout** at this intersection

- Pedestrian safety
- Snow plowing
- Usability by school buses & emergency vehicles
- Proximity to Delta Ave & Delta Place
- Potential impact to private properties
- Lack of experience using them
- Increased traffic congestion
- Cost of building

Other comments

- Existing intersection needs help
- Some prefer a traffic signal in place of a roundabout
- Accommodate existing neighborhood signs
- Support for pedestrian connection to the north
- Most in favor of conversion of 140th Street to three-lane roadway (like Connemara Trail)
- Desire for improved sight lines along Connemara Trail

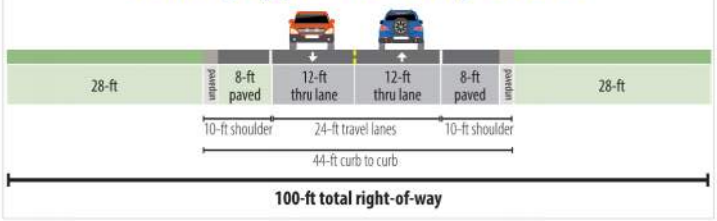
www.dakotacounty.us (*search* "County Road 33")

COUNTY ROAD 33
Roundabout Feasibility Study

COUNTY ROAD 33 N STUDY IN 2024

A new trail and other roadway improvements on County Road 33 (Diamond Path) between Pilot Knob Road and 140th Street/Connemara Trail will be considered in a study beginning in 2024. The right-of-way width, which ranges from 90 to 125 feet wide, and other conditions along the corridor will determine which improvement options can be used where.

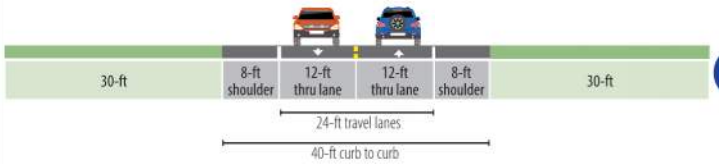
Existing Typical Roadway Section



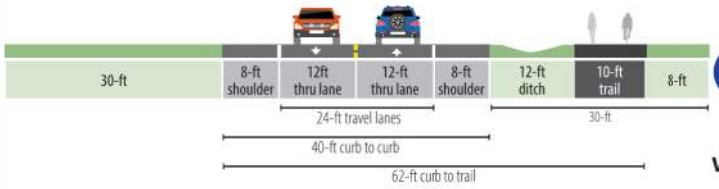
Roadway Options (Based on an average right-of-way width of 100 feet.)

* Widths of thru lanes and left turn lanes are preliminary. 11-ft-wide thru lanes and 12-ft-wide left turn lanes may be considered.

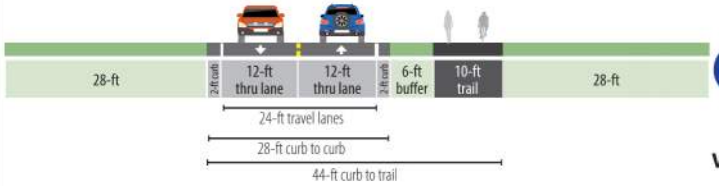
Two-lane roadway*



A D **Rural**

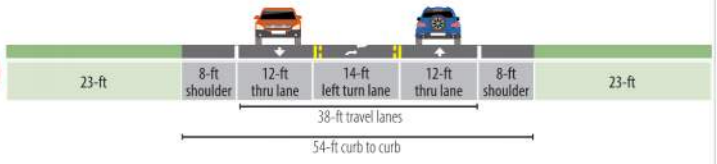


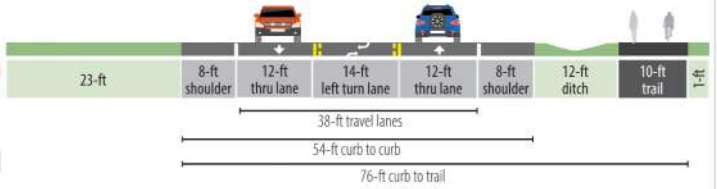
B E **Rural with trail**

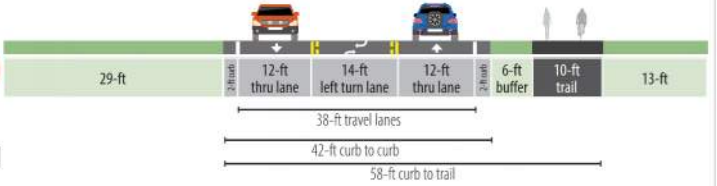


C F **Urban with trail**

Three-lane roadway*

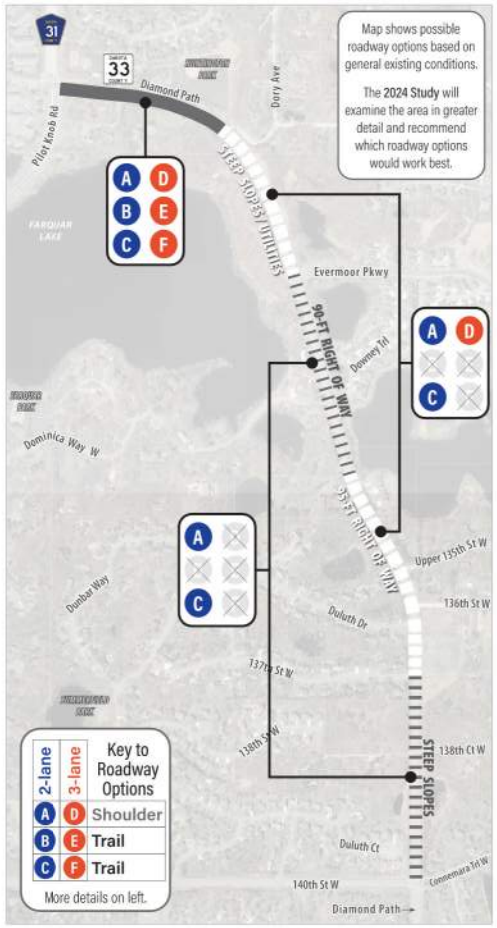






Possible Options by Location

Trails and other roadway options appropriate along this stretch of road will depend upon right-of-way width, slope, and other conditions.



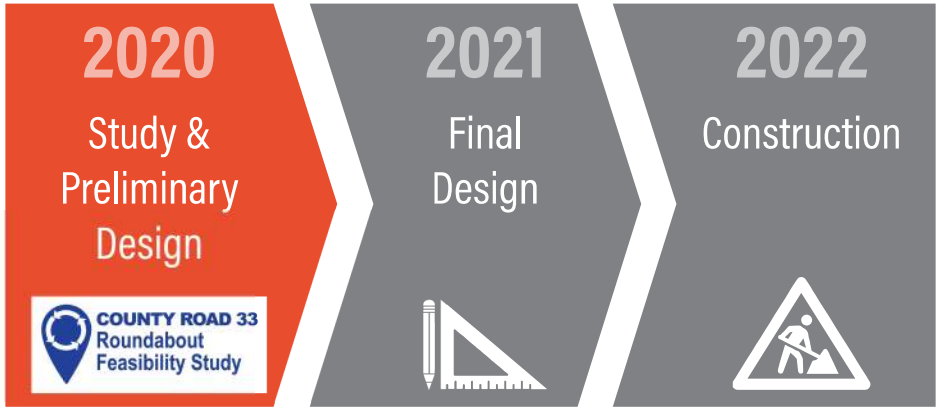
www.dakotacounty.us (*search* "County Road 33")

NEXT STEPS

The project team will:

- Review additional input received through Spring 2020.
- Refine recommended concept.
- Write final report for study.

Long Term Plan



After completion of the feasibility study, preliminary design will occur. Next year the design will be finalized with construction currently planned for 2022.

COUNTY ROAD 33
Roundabout Feasibility Study

Online Open House Feedback

Summary of comments received May 15-31, 2020

69 comments submitted

- 39 respondents generally in support of roundabout concept
- 8 respondents did not indicate support or opposition of concept
- 22 respondents opposed roundabout concept

Reasons why people **support the concept**

- Improved safety at intersection for all users
- Better traffic flow
- Traffic calming benefit
- Improved safety for pedestrians
- Provides trail to existing shoulders north of roundabout
- Likes the re-striping of 140th Street to three lanes
- Would feel comfortable using intersection again
- Confusion at existing four-way stop

Reasons why people **oppose the concept**

- Dislike of roundabouts
- Preference for traffic signals
- Concern that it may be more difficult to turn left into neighborhoods west of Diamond Path
- Concern about private property/property value impacts
- Concern about pedestrian safety
- Feels that traffic volumes & crashes don't justify change
- Feels that money should be spent elsewhere

Ideas and Concerns

- Consider adding a marked pedestrian crossing at Summerfield Park/Savanick Trail
- Consider building a roundabout as soon as possible
- Concern how long it would take to build a roundabout
- Concern about pedestrian safety at roundabout
- Consider adding a right turn lane into Delta Avenue
- Concern that raised center island of roundabout would obstruct sight lines

Frequently Asked Questions

Why change the existing all-way stop intersection?

Safety is the primary concern at this intersection. The crash rate is more than double that of a typical all-way stop intersection. Also, the risk of a fatal or serious injury crash is double the statewide average. Preliminary analysis suggested a roundabout would be a good long-term solution to achieve these goals:

- Improve safety for all users
- Enhance pedestrian usability
- Maintain mobility
- Encourage lower speeds

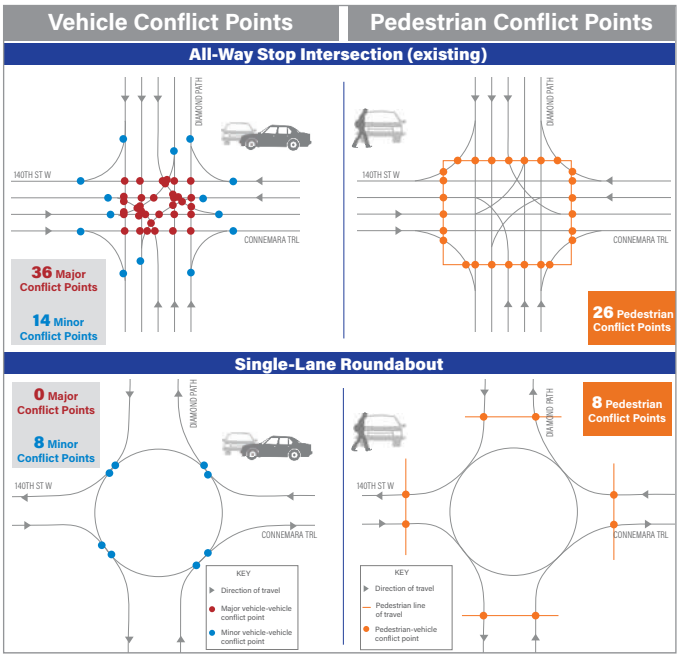
Continued on back.

Frequently Asked Questions (continued)

Why a roundabout instead of a traffic signal?

We've seen an increase in crossing-type or angle crashes at this intersection. These types of crashes are the most severe with the highest risk of severe injury or fatality. Signals have proven to be ineffective in reducing the number of angle crashes. Roundabouts remove major conflict points, reducing the severity of crashes.

Also, traffic signals allow for high speeds through intersections, increasing the risk of severe crashes, serious injuries, and fatalities. A roundabout will slow all drivers while minimizing stopping and delay.



Why a single-lane instead of double-lane roundabout?

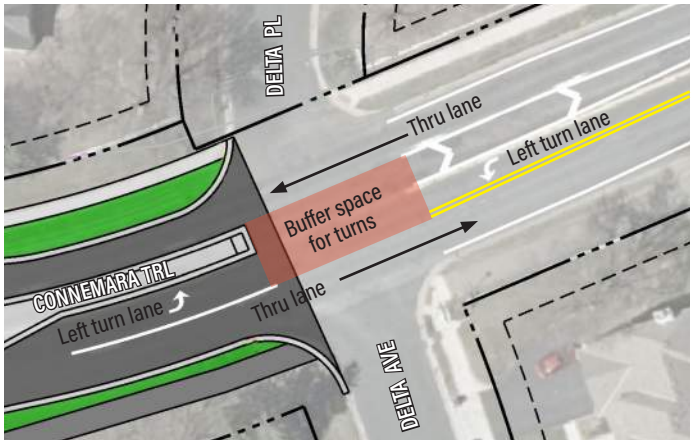
A roundabout is a good solution at this location because the average number of vehicles entering the intersection is similar from all directions. A single-lane roundabout is preferred over a double-lane roundabout because a single-lane minimizes property impacts while still accommodating current and future traffic volumes.

Will a roundabout create gaps in traffic so I can exit my neighborhood?

During peak traffic in roundabouts, vehicles tend to cycle through in groups with some groups flowing through while others wait for the cycle to shift. The result are gaps between vehicles that are similar or even longer than from four-way stop intersections. That said, we understand that drivers today experience some delay while waiting to turn left onto County Road 33 (Diamond Path). The proposed roundabout will not add to this problem and may help. Further improvement will have to be addressed by other projects.

How would turns occur at Delta Avenue/Delta Place and Connemara Trail?

Left turns can be a complex issue in roadway design. The simplest traffic solution for the Delta Avenue/Delta Place intersection with Connemara Trail would be to prohibit all left turns and make the intersection right-in/right-out only. We propose instead to leave the Delta intersection open to all turning movements. A buffer provides space for lefts from Delta Avenue and Delta Place onto Connemara Trail. Dedicated left turns lanes on Connemara Trail provide access to Delta Avenue and Delta Place.



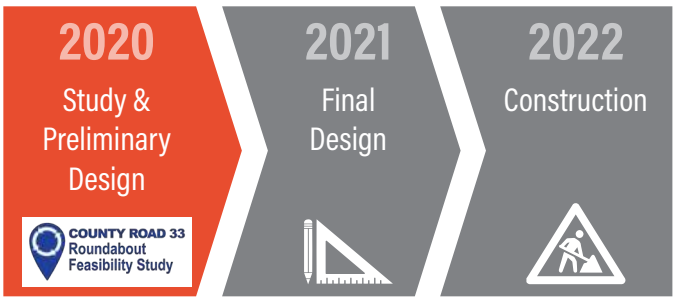
What other changes may occur?

The City of Apple Valley is proposing to convert 140th Street W. from four-lanes to three-lanes by re-striping, similar to what was done with Connemara Trail. Benefits include shorter crossings for pedestrians, wider shoulders, and dedicated left turns.

Recommendations to improve safety within school zones may result from a county-wide assessment currently underway. In addition, a study in 2024 to the north of 140th Street/Connemara Trail area will identify potential trail and roadway improvements.

What are the next steps?

After this feasibility study, the next step is preliminary design of the roundabout. Construction of the roundabout is tentatively planned for 2022.



Appendix C: 140th Street Traffic Analysis

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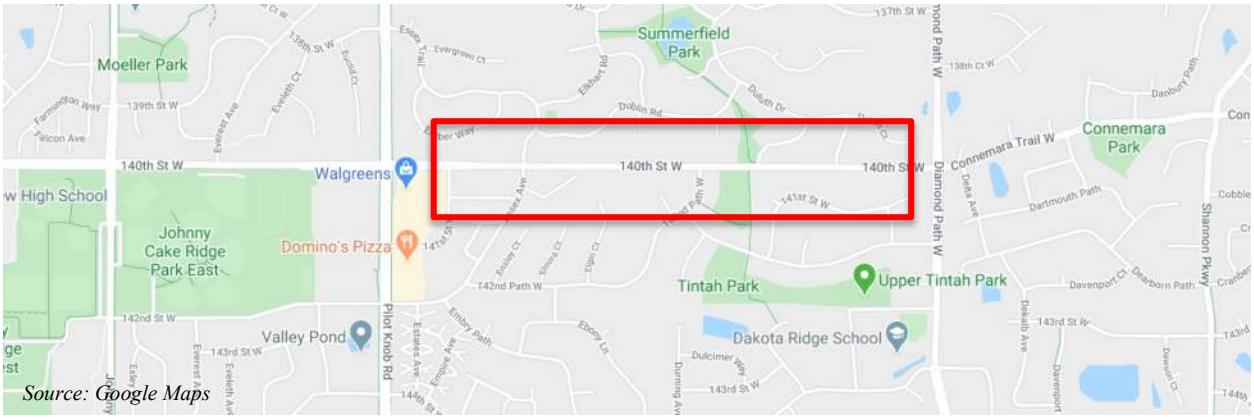
MEMORANDUM

Date: June 29, 2020

Subject: CSAH 33 at 140th St/Connemara Trail Roundabout Feasibility Study
140th Street Three-Lane Section Analysis

An analysis of the traffic operations of 140th Street, between CSAH 33 (Diamond Path) and CSAH 31 (Pilot Knob Road), in Apple Valley, was conducted and considered the existing four-lane section and a proposed three-lane section. The corridor features five side street stop-controlled intersections the commercial and residential areas. The is one pedestrian crossing located at Drummond Trail that connects to city parks. The proposed three-lane section consists of the restriping of the existing roadway to feature a 12' two-way left turn lane, two 11' lanes and 5' shoulders, see **Appendix C** for concept. Connemara Trail, east of CSAH 33, has recently been restriped to a three-lane section and has received positive feedback from the community.

Figure 1: Project Location Map



Source: Google Maps

Data Collection

The intersection analysis utilized traffic data collected in September 2019. 13-hour turning movement counts were collected. The peak hours were used to analyze traffic operations at the study location. The AM peak hour was found to be from 7:00 to 8:00 AM and the PM peak hour was found to be from 4:00 to 5:00 PM. Existing ADT was estimated below from the counts collected. Traffic volume details can be found in **Appendix A**.

Operations

The intersection analysis utilized traffic data collected in September 2019. 13-hour turning movement counts were collected. The peak hours were used to analyze traffic operations at the study location. The AM peak hour was found to be from 7:00 to 8:00 AM and the PM peak hour was found to be from 4:00 to 5:00 PM. Existing ADT was estimated below from the counts collected. Traffic volume details can be found in **Appendix A**.

The four- and three-lane scenarios were modeled using Synchro/SimTraffic and methods within the Highway Capacity Manual to determine Level of Service (LOS), average vehicle delays, and queue lengths. The AM and PM peak hour operations under 2019 traffic volumes and the existing four-lane section is summarized in **Table 1**, below. Full traffic modeling results can be found in **Appendix B.**

Table 1: 2019 Four-Lane Operations Summary

Intersection	Peak Hour	Intersection Delay (1.)		Maximum Delay-LOS (2.)		Limiting Movement (3.)	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
141st Street W & 140th Street W	AM	3	A	9	A	NBL	NBL/R	50	100
Sidestreet Stop Controlled	PM	4	A	13	B	NBL	NBL/R	50	125
Essex Ave/Essex Trl & 140th Street W	AM	2	A	8	A	NBL	SBL/T/R	50	75
Sidestreet Stop Controlled	PM	2	A	10	B	SBT	NBL/T/R	50	75
142nd Path W & 140th Street W	AM	1	A	6	A	NBL	NBL/R	25	75
Sidestreet Stop Controlled	PM	1	A	7	A	NBL	NBL/R	25	50
140th Street W & Drommond Trl	AM	0	A	6	A	SBL	SBL/R	25	75
Sidestreet Stop Controlled	PM	1	A	7	A	SBL	SBL/R	25	75
140th Street W & Driftwood Ln	AM	2	A	7	A	SBL	SBL/R	25	50
Sidestreet Stop Controlled	PM	1	A	7	A	SBL	SBL/R	25	50

1. Delay in seconds per vehicle
2. Maximum delay and LOS on any approach and/or movement
3. Limiting Movement is the highest delay movement.

Analysis of the existing conditions reveals than all intersections and side street movements experience acceptable levels of delay during the peak hours. **Table 2**, below, summarizes the anticipated operations under a three-lane section and existing volumes.

Table 2: 2019 Three-Lane Operations Summary

Intersection	Peak Hour	Intersection Delay (1.)		Maximum Delay-LOS (2.)		Limiting Movement (3.)	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
141st Street W & 140th Street W	AM	3	A	9	A	NBL	NBL	NBL	NBL
Sidestreet Stop Controlled	PM	4	A	13	B	NBL	NBL/R	50	100
Essex Ave/Essex Trl & 140th Street W	AM	2	A	9	A	SBT	SBT	SBT	SBT
Sidestreet Stop Controlled	PM	3	A	13	B	SBT	SBL/T/R	50	75
142nd Path W & 140th Street W	AM	1	A	7	A	NBL	NBL	NBL	NBL
Sidestreet Stop Controlled	PM	1	A	10	B	NBL	NBL/R	25	50
140th Street W & Drommond Trl	AM	1	A	6	A	SBL	SBL	SBL	SBL
Sidestreet Stop Controlled	PM	1	A	7	A	SBL	SBL/R	25	75
140th Street W & Driftwood Ln	AM	1	A	6	A	SBL	SBL	SBL	SBL
Sidestreet Stop Controlled	PM	1	A	6	A	SBL	SBL/R	25	50

1. Delay in seconds per vehicle
2. Maximum delay and LOS on any approach and/or movement
3. Limiting Movement is the highest delay movement.

Analysis of the three-lane section shows little operational difference from the existing conditions, indicated that a four-lane section is not needed to carry the existing traffic using this segment of 140th Street. All intersections and movements are anticipated to operate at acceptable levels under a three-lane section.

A three-lane section also provides notable vehicle and pedestrian safety improvements when compared to the existing four-lane section as there are fewer lanes of traffic for pedestrians to navigate and fewer conflict points at intersections.

Note, traffic forecasts on this segment of roadway, obtained from Dakota County, show little to no growth in volumes over the next 20 years. Unless unexpected levels of development and traffic growth occur in the area, a three-lane section can be expected to provide adequate capacity now and in years to come.

140th Street Appendix A

Turning Movement Data

Dakota COUNTY

140th Street 3-Lane Conversion Study

Dakota County, MN

Existing Turning Movements

December 2019

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Legend

Turning Movement Counts

AM (PM)

XXXX 2019 Average Daily Traffic (ADT) Volumes

0 400 Feet

Source: Dakota County, MnDOT

Map Document: \\arcserver1\GIS\DACO\T43\120065\ESRI\Maps\120065_Existing_TMC_11x17L.mxd | Date Saved: 12/9/2019 4:34:06 PM

140th Street Appendix B

Operations Analysis Summary Tables

Table 1: 4 Lane Traffic Operations Analysis - 140th St 3-Lane Analysis

Intersection ID	Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																						Maximum Delay-LOS (2.)		Limiting Movement (3.)	Max Approach Queue		
					NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR					Direction	Average Queue (ft)	Max Queue (ft)
1	CSAH 33 & 140th Street W/Connemara Trl	AM	11	B	9	A	14	B	7	A	7	A	12	B	4	A	8	A	11	B	5	A	10	B	11	B	6	A	14	B	NBT	NBT	75	175
	Stop Controlled	PM	14	B	13	B	14	B	7	A	11	B	18	C	9	A	10	B	15	C	12	B	16	C	14	B	5	A	18	C	SBT	SBT	100	175
2	CSAH 31 & 140th Street W	AM	28	C	27	C	22	C	5	A	30	C	30	C	6	A	44	D	45	D	28	C	37	D	47	D	36	D	47	D	WBT	NBT	250	550
	Signalized Intersection	PM	65	E	38	D	20	C	3	A	25	C	34	C	7	A	70	E	114	F	195	F	37	D	44	D	30	C	195	F	EBR	EBT/R	750	875
3	141st Street W & 140th Street W	AM	3	A	9	A	-		6	A	-		-		-		-		4	A	3	A	3	A	1	A	-		9	A	NBL	NBL/R	50	100
	Stop Controlled	PM	4	A	13	B	-		6	A	-		-		-		-		4	A	4	A	6	A	1	A	-		13	B	NBL	NBL/R	50	125
4	Essex Ave/Essex Trl & 140th Street W	AM	2	A	8	A	8	A	3	A	7	A	8	A	4	A	2	A	1	A	1	A	2	A	1	A	0	A	8	A	NBL	SBL/T/R	50	75
	Stop Controlled	PM	2	A	9	A	9	A	5	A	8	A	10	B	4	A	2	A	2	A	2	A	2	A	1	A	0	A	10	B	SBT	NBL/T/R	50	75
5	142nd Path W & 140th Street W	AM	1	A	6	A	-		3	A	-		-		-		-		1	A	1	A	2	A	0	A	-		6	A	NBL	NBL/R	25	75
	Stop Controlled	PM	1	A	7	A	-		3	A	-		-		-		-		1	A	2	A	2	A	0	A	-		7	A	NBL	NBL/R	25	50
6	140th Street W & Drommond Trl	AM	0	A	-		-		-		6	A	-		3	A	2	A	0	A	-		-		0	A	0	A	6	A	SBL	SBL/R	25	75
	Stop Controlled	PM	1	A	-		-		-		7	A	-		3	A	2	A	0	A	-		-		0	A	0	A	7	A	SBL	SBL/R	25	75
7	140th Street W & Driftwood Ln	AM	2	A	-		-		-		7	A	-		3	A	2	A	0	A	-		-		3	A	3	A	7	A	SBL	SBL/R	25	50
	Stop Controlled	PM	1	A	-		-		-		7	A	-		3	A	2	A	1	A	-		-		3	A	2	A	7	A	SBL	SBL/R	25	50

1. Delay in seconds per vehicle
2. Maximum delay and LOS on any approach and/or movement
3. Limiting Movement is the highest delay movement.

Table 2: Peak Hour Queues By Movement - 4 Lane Geometry

Intersection ID	Intersection	Peak Hour	Queue Lengths																																					
			EBL		EBL/T		EBT		EBT/R		WBL		WBL/T		WBT		WBT/R		NBL		NBL/R		NBL/T/R		NBT 1		NBT 2		NBT/R		NBR		SBL		SBL/R		SBL/T/R		SBT 1		SBT 2		SBT/R		SBR	
			Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
1	CSAH 33 & 140th Street W/Connemara Tr	AM	-	-	50	75	-	-	50	100	-	-	50	100	-	-	50	100	50	100	-	-	-	-	75	175	-	-	75	150	-	-	25	50	-	-	-	-	50	100	-	-	50	75	-	-
	Stop Controlled	PM	-	-	50	100	-	-	100	175	-	-	75	150	-	-	50	100	75	125	-	-	-	-	75	100	-	-	50	125	-	-	50	100	-	-	-	-	100	175	-	-	75	150	-	-
2	CSAH 31 & 140th Street W	AM	100	250	-	-	100	250	150	300	50	150	-	-	125	225	125	225	200	375	-	-	-	-	250	550	250	450	-	-	25	75	25	75	-	-	-	-	150	275	100	225	-	-	50	100
	Signalized Intersection	PM	150	400	-	-	700	875	750	875	50	150	-	-	100	175	125	225	125	275	-	-	-	-	125	300	100	250	-	-	25	75	50	150	-	-	-	-	275	475	250	450	-	-	25	125
3	141st Street W & 140th Street W	AM	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	-	-	50	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	-	-	-	-	-	-	25	25	-	-	25	125	-	-	-	-	-	-	50	125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Essex Ave/Essex Trl & 140th Street W	AM	-	-	25	50	-	-	0	25	-	-	25	50	-	-	-	-	-	-	-	-	50	75	-	-	-	-	-	-	-	-	-	-	-	-	50	75	-	-	-	-	-	-	-	-
	Stop Controlled	PM	-	-	25	75	-	-	0	25	-	-	25	50	-	-	-	-	-	-	-	-	50	75	-	-	-	-	-	-	-	-	-	-	-	-	50	75	-	-	-	-	-	-	-	-
5	142nd Path W & 140th Street W	AM	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	-	-	25	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	-	-	-	-	-	-	-	-	-	-	25	25	-	-	-	-	-	-	25	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	140th Street W & Drommond Trl	AM	-	-	25	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	75	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	-	-	25	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	75	-	-	-	-	-	-	-	-	-	-
7	140th Street W & Driftwood Ln	AM	-	-	25	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	-	-	25	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	-	-	-	-	-	-

Table 1: 3 Lane Traffic Operations Analysis - 140th St 3-Lane Analysis

Intersection ID	Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																						Maximum Delay-LOS (2.)		Limiting Movement (3.)	Max Approach Queue		
					NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR				Direction	Average Queue (ft)	Max Queue (ft)
1	CSAH 33 & 140th Street W/Connemara Trl	AM	18	C	26	D	30	D	29	D	5	A	8	A	5	A	5	A	8	A	6	A	12	B	13	B	11	B	30	D	NBT	NBT	NBT	NBT
	Stop Controlled	PM	24	C	10	B	12	B	10	B	45	E	47	E	47	E	16	C	18	C	16	C	6	A	8	A	6	A	47	E	SBT	SBL/T/R	300	725
2	CSAH 31 & 140th Street W	AM	27	C	26	C	20	C	4	A	32	C	29	C	6	A	45	D	43	D	27	C	35	D	48	D	35	D	48	D	WBT	WBT	WBT	WBT
	Signalized Intersection	PM	59	E	38	D	19	B	3	A	21	C	33	C	6	A	62	E	105	F	173	F	37	D	41	D	28	C	173	F	EBR	EBT/R	700	875
3	141st Street W & 140th Street W	AM	3	A	9	A	-		4	A	-		-		-		-		4	A	3	A	2	A	0	A	-		9	A	NBL	NBL	NBL	NBL
	Stop Controlled	PM	4	A	13	B	-		8	A	-		-		-		-		5	A	4	A	6	A	1	A	-		13	B	NBL	NBL/R	50	100
4	Essex Ave/Essex Trl & 140th Street W	AM	2	A	8	A	7	A	4	A	7	A	9	A	4	A	2	A	2	A	0	A	2	A	1	A	1	A	9	A	SBT	SBT	SBT	SBT
	Stop Controlled	PM	3	A	12	B	9	A	5	A	9	A	13	B	5	A	4	A	3	A	2	A	4	A	1	A	1	A	13	B	SBT	SBL/T/R	50	75
5	142nd Path W & 140th Street W	AM	1	A	7	A	-		4	A	-		-		-		-		2	A	1	A	1	A	0	A	-		7	A	NBL	NBL	NBL	NBL
	Stop Controlled	PM	1	A	10	B	-		4	A	-		-		-		-		2	A	1	A	2	A	0	A	-		10	B	NBL	NBL/R	25	50
6	140th Street W & Drommond Trl	AM	1	A	-		-		-		6	A	-		4	A	2	A	1	A	-		-		0	A	0	A	6	A	SBL	SBL	SBL	SBL
	Stop Controlled	PM	1	A	-		-		-		7	A	-		4	A	2	A	1	A	-		-		1	A	0	A	7	A	SBL	SBL/R	25	75
7	140th Street W & Driftwood Ln	AM	1	A	-		-		-		6	A	-		3	A	2	A	1	A	-		-		2	A	1	A	6	A	SBL	SBL	SBL	SBL
	Stop Controlled	PM	1	A	-		-		-		6	A	-		3	A	2	A	1	A	-		-		2	A	2	A	6	A	SBL	SBL/R	25	50

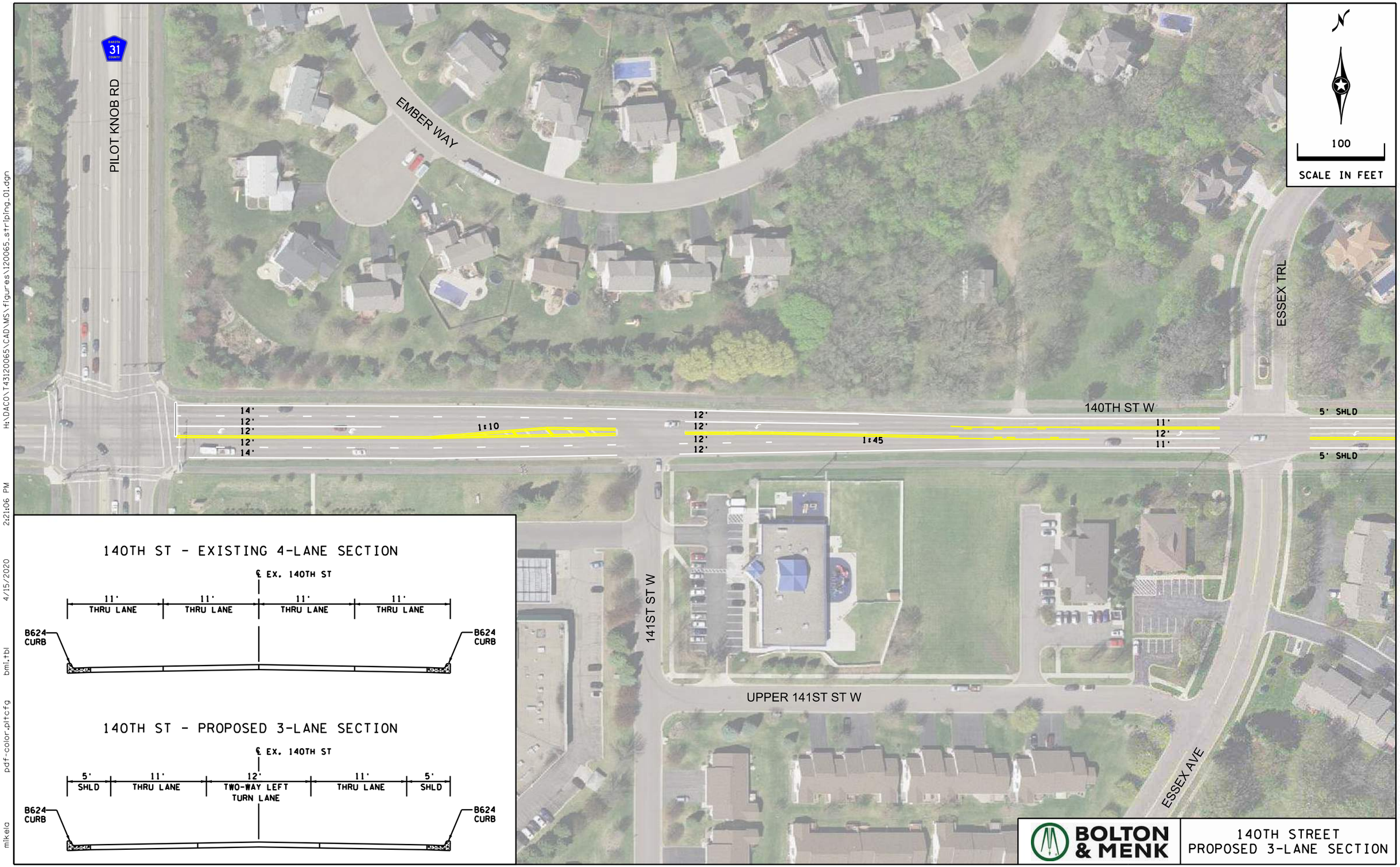
1. Delay in seconds per vehicle
2. Maximum delay and LOS on any approach and/or movement
3. Limiting Movement is the highest delay movement.

Table 2: Peak Hour Queues By Movement - 3 Lane Geometry

Intersection ID	Intersection	Peak Hour	Queue Lengths																																	
			EBL		EBL/T/R		EBT		EBT/R		WBL		WBL/T/R		WBT		WBT/R		NBL		NBL/R		NBL/T/R		NBT 1		NBT 2		NBR		SBL		SBL/R		SBL/T/R		SBT 1		SBT 2		SBR	
			Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
1	CSAH 33 & 140th Street W/Connemara Tl	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	-	-	125	225	-	-	-	-	-	-	50	125	-	-	-	-	-	-	-	-	75	225	-	-	-	-	-	-	-	-	-	-	300	725	-	-	-	-	-	-
2	CSAH 31 & 140th Street W	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Signalized Intersection	PM	125	375	-	-	650	850	700	875	50	150	-	-	100	175	100	225	125	275	-	-	-	-	125	200	75	175	25	75	50	175	-	-	-	-	275	450	225	425	25	75
3	141st Street W & 140th Street W	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	-	-	-	-	25	25	25	25	25	75	-	-	-	-	-	-	-	-	50	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Essex Ave/Essex Trl & 140th Street W	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	25	50	-	-	-	-	0	25	25	50	-	-	-	-	-	-	-	-	-	-	50	75	-	-	-	-	-	-	-	-	-	-	50	75	-	-	-	-	-	-
5	142nd Path W & 140th Street W	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	-	-	-	-	-	-	-	-	25	25	-	-	-	-	-	-	-	-	25	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	140th Street W & Drommond Trl	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	25	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	75	-	-	-	-	-	-
7	140th Street W & Driftwood Ln	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Controlled	PM	25	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	50	-	-	-	-	-	-

140th Street Appendix C

Three-Lane Section Concept



140TH ST - EXISTING 4-LANE SECTION

140TH ST - PROPOSED 3-LANE SECTION

BOLTON & MENK

140TH STREET PROPOSED 3-LANE SECTION

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BOLTON & MENK

140TH STREET
PROPOSED 3-LANE SECTION

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BOLTON & MENK

140TH STREET
PROPOSED 3-LANE SECTION

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Appendix D: Roundabout Concepts

BOLTON & MENK

CSAH 33/140TH STREET ROUNDABOUT FEASIBILITY STUDY

Dakota transportation we get you there

Apple Valley

ROSEMOUNT MINNESOTA

DIAMOND PATH

DAKOTA 33 COUNTY

DULUTH CT

140TH ST W

DELTA PL

CONNEMARA TRL

DELTA AVE

DARTMOUTH PT

DELTA CT

141ST ST W

DOMINICA AVE

142ND ST W

DIAMOND PATH

DAKOTA 33 COUNTY

50

SCALE IN FEET

LAYOUT LEGEND

BITUMINOUS	STORM SEWER
CONCRETE	COMMUNICATIONS
TRAIL	ELECTRIC
GRASS	WATER
RETAINING WALL	SANITARY SEWER
GAS	EXISTING RIGHT-OF-WAY
FIBER	PROPOSED RIGHT-OF-WAY

SINGLE-LANE ROUNDABOUT: CONCEPT 1

CSAH 33 (DIAMOND PATH) at 140th STREET/CONNEMARA TRAIL

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BOLTON & MENK

CSAH 33/140TH STREET ROUNDABOUT FEASIBILITY STUDY

Dakota transportation we get you there

Apple Valley

ROSEMOUNT MINNESOTA

DIAMOND PATH

DAKOTA 33 COUNTY

DULUTH CT

140TH ST W

DELTA PL

CONNEMARA TRL

DELTA AVE

DARTMOUTH PT

DELTA CT

141ST ST W

DOMINICA AVE

142ND ST W

DIAMOND PATH

DAKOTA 33 COUNTY

50

SCALE IN FEET

LAYOUT LEGEND

- BITUMINOUS
- CONCRETE
- TRAIL
- GRASS
- RETAINING WALL
- GAS
- FIBER
- STORM SEWER
- COMMUNICATIONS
- ELECTRIC
- WATER
- SANITARY SEWER
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY

SINGLE-LANE ROUNDABOUT: CONCEPT 2b

CSAH 33 (DIAMOND PATH) at 140th STREET/CONNEMARA TRAIL

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BOLTON & MENK

CSAH 33/140TH STREET ROUNDABOUT FEASIBILITY STUDY

Dakota transportation we get you there

Apple Valley

ROSEMOUNT MINNESOTA

DIAMOND PATH

DAKOTA 33 COUNTY

DULUTH CT

140TH ST W

DELTA PL

CONNEMARA TRL

DELTA AVE

DARTMOUTH PT

DELTA CT

141ST ST W

DOMINICA AVE

142ND ST W

DIAMOND PATH

DAKOTA 33 COUNTY

N

50

SCALE IN FEET

LAYOUT LEGEND

BITUMINOUS	STORM SEWER
CONCRETE	COMMUNICATIONS
TRAIL	ELECTRIC
GRASS	WATER
RETAINING WALL	SANITARY SEWER
GAS	EXISTING RIGHT-OF-WAY
FIBER	PROPOSED RIGHT-OF-WAY

SINGLE-LANE ROUNDABOUT: CONCEPT 2b

CSAH 33 (DIAMOND PATH) at 140th STREET/CONNEMARA TRAIL

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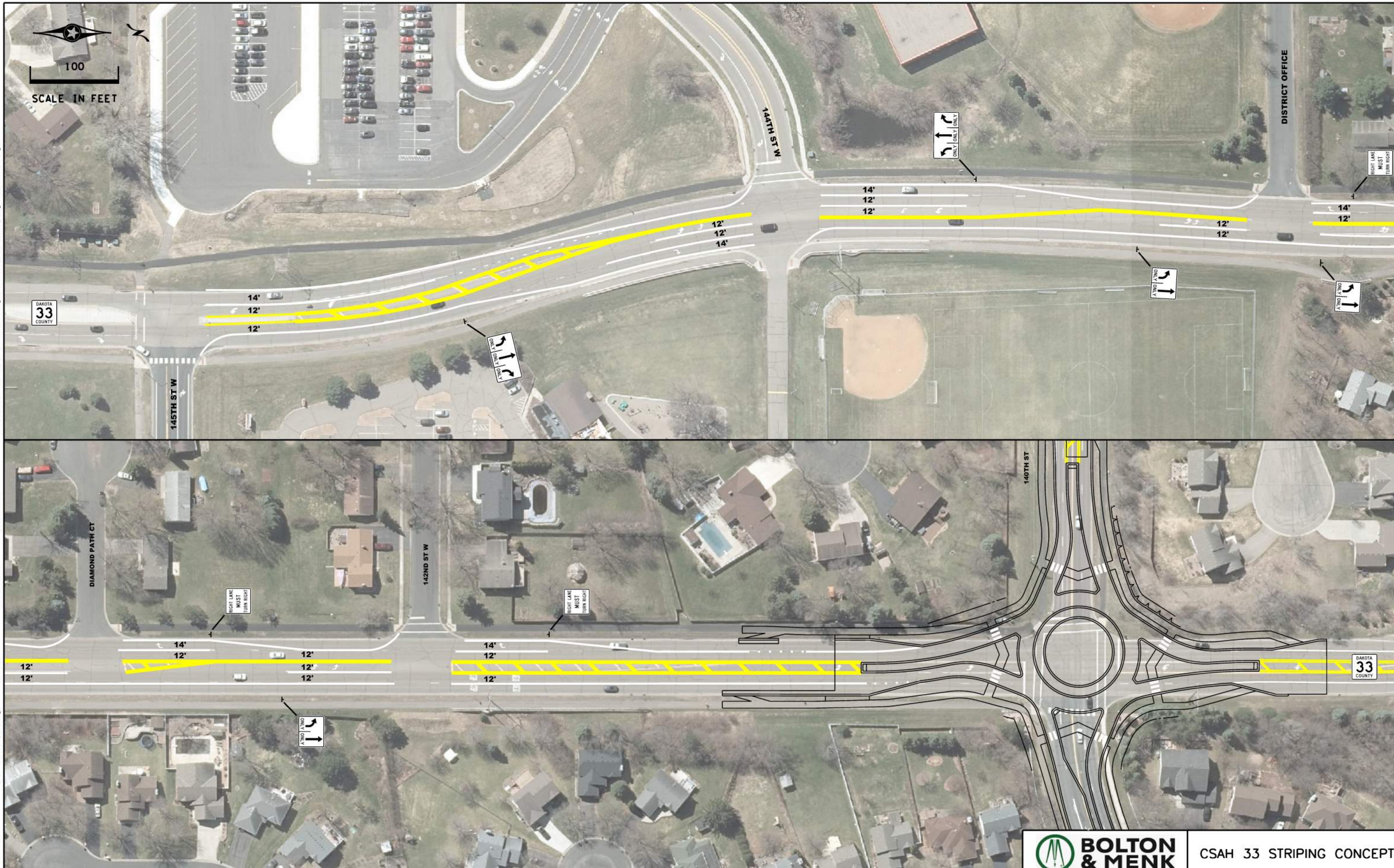
Appendix E: Diamond Path Striping



BOLTON & MENK

CSAH 33 STRIPING CONCEPT

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Appendix F: Environmental Support Documentation

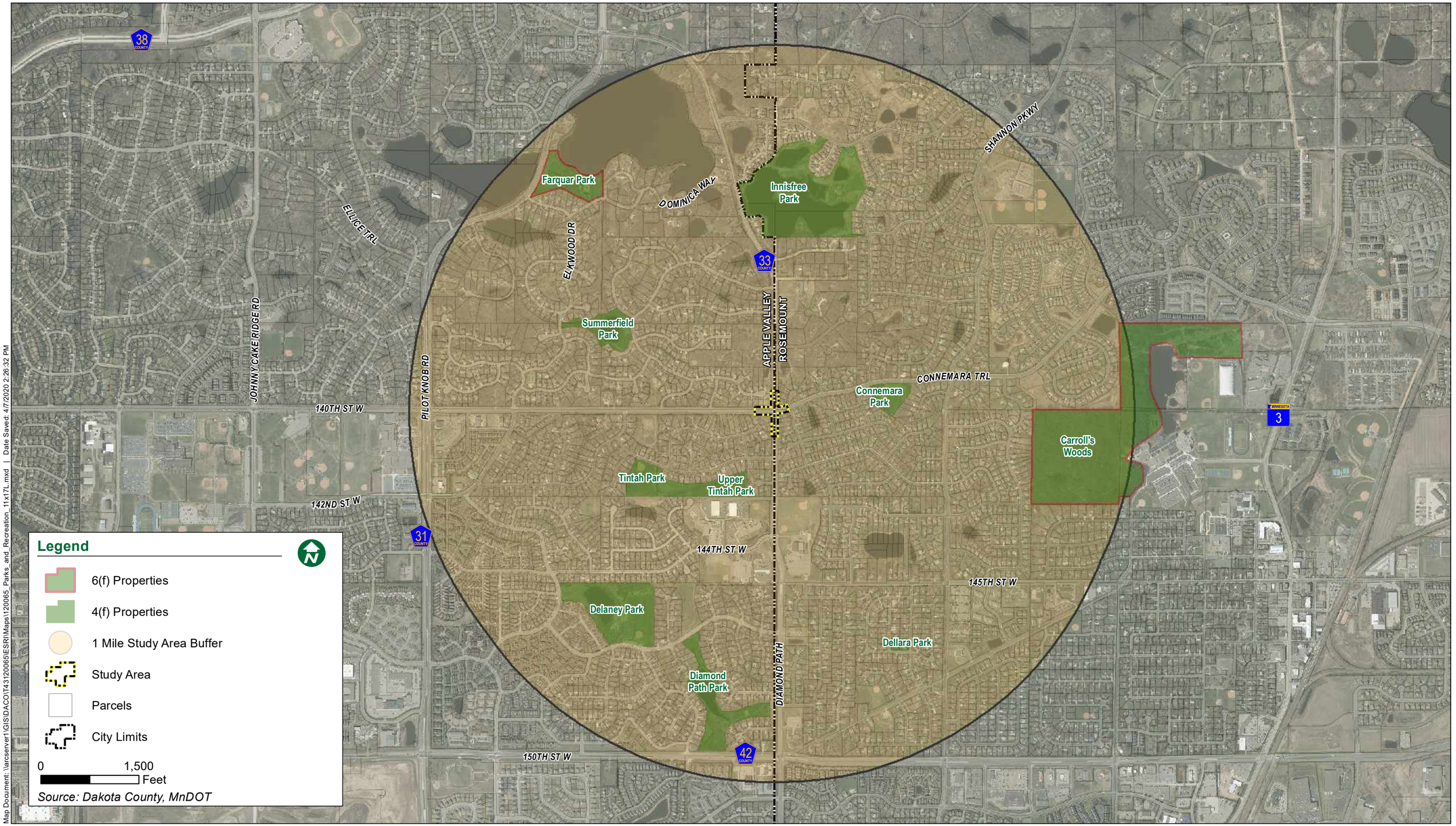
CSAH 33 (Diamond Path) at 140th Street/Connemara Trail

Dakota County, MN

Parks/Recreational Properties

April 2020

BOLTON & MENK
Real People. Real Solutions.



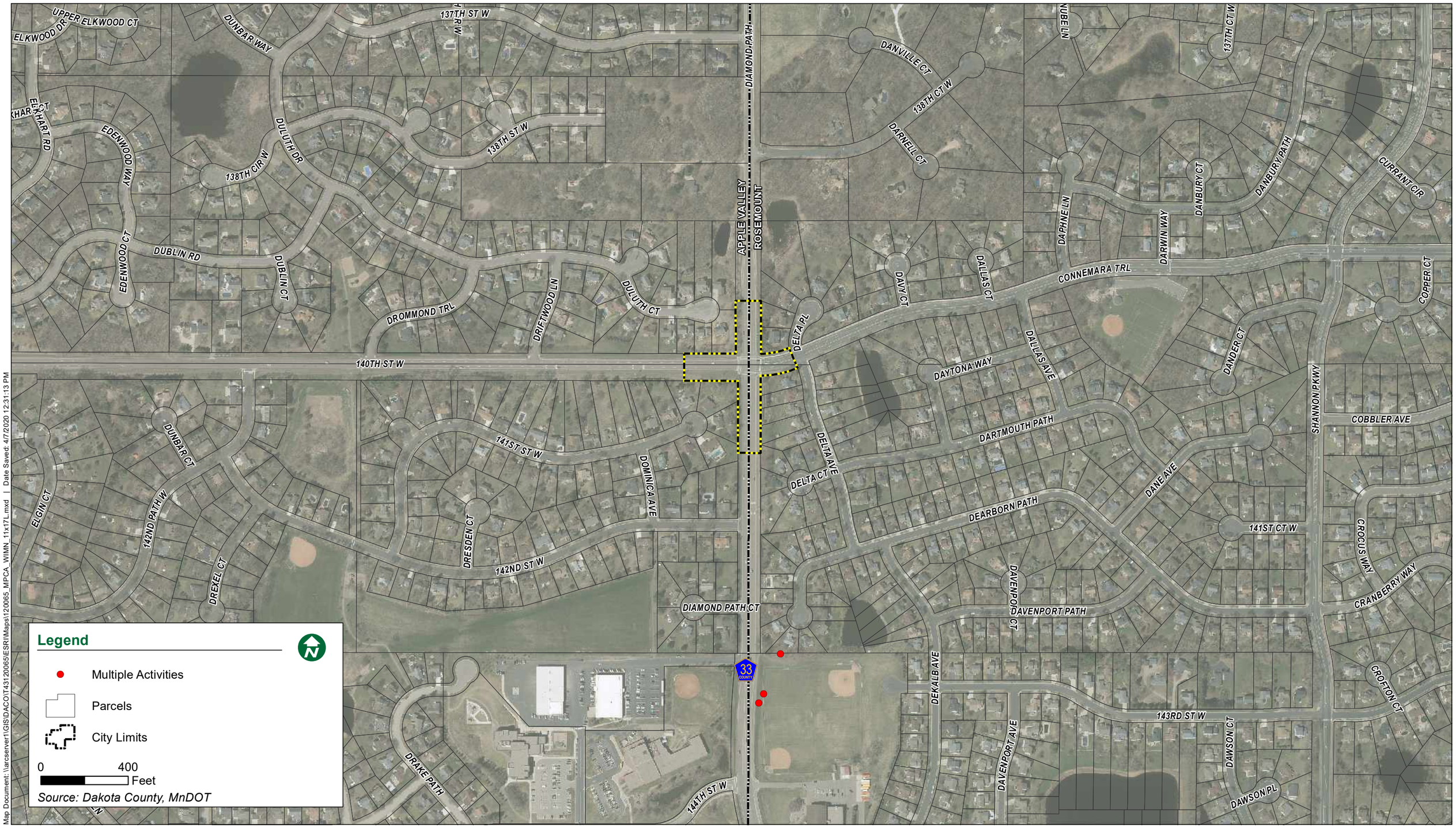
CSAH 33 (Diamond Path) at 140th Street/Connemara Trail

Dakota County, MN

Potentially Contaminated Sites

April 2020

Real People. Real Solutions.



Legend

- Multiple Activities
- Parcels
- City Limits

0 400 Feet

Source: Dakota County, MnDOT

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CSAH 33 (Diamond Path) at 140th Street/Connemara Trail

Dakota County, MN

Public/Impaired Waters

April 2020

BOLTON & MENK
Real People. Real Solutions.

Farquar Lake
Long Lake
ELLICE TRL
ELKWOOD DR
DOMINICA WAY
SHANNON PKWY
JOHNNY CAKE RIDGE RD
PILOT KNOB RD
APPLE VALLEY
ROSEMOUNT
CONNEMARA TRL
140TH ST W
142ND ST W
144TH ST W
145TH ST W
150TH ST W
DIAMOND PATH
38
31
33
42
3

Legend

- NWI Wetlands
- Impaired Lakes
- 1 Mile Study Area Buffer
- Study Area
- Parcels
- City Limits

0 1,500 Feet

Source: Dakota County, MnDOT

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EJSCREEN Report (Version 2019)

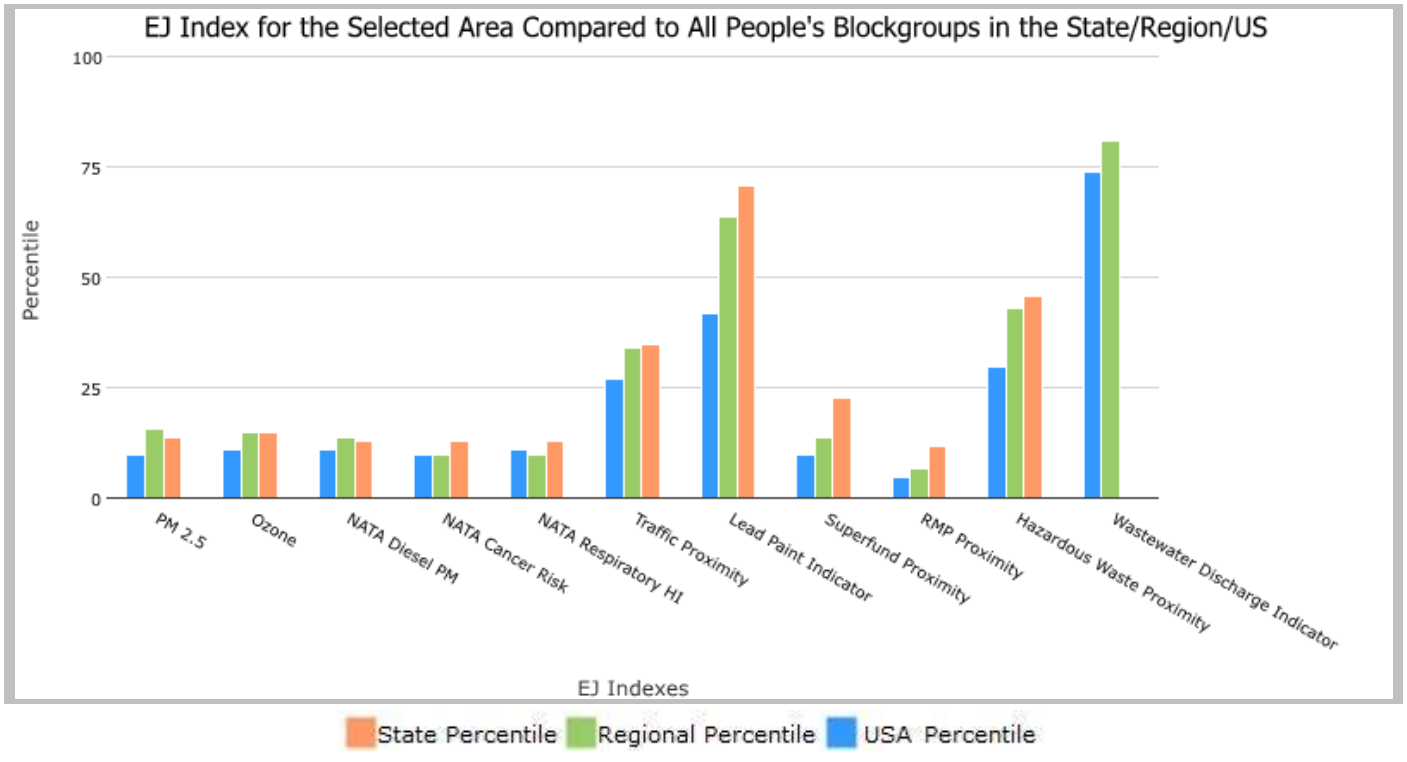
0.25 miles Ring around the Area, MINNESOTA, EPA Region 5

Approximate Population: 688

Input Area (sq. miles): 0.28

CSAH 33 at 140th St/Connemara Trl

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	14	16	10
EJ Index for Ozone	15	15	11
EJ Index for NATA* Diesel PM	13	14	11
EJ Index for NATA* Air Toxics Cancer Risk	13	10	10
EJ Index for NATA* Respiratory Hazard Index	13	10	11
EJ Index for Traffic Proximity and Volume	35	34	27
EJ Index for Lead Paint Indicator	71	64	42
EJ Index for Superfund Proximity	23	14	10
EJ Index for RMP Proximity	12	7	5
EJ Index for Hazardous Waste Proximity	46	43	30
EJ Index for Wastewater Discharge Indicator	N/A	81	74



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJSCREEN Report (Version 2019)

0.25 miles Ring around the Area, MINNESOTA, EPA Region 5

Approximate Population: 688

Input Area (sq. miles): 0.28

CSAH 33 at 140th St/Connemara Trl

Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJSCREEN Report (Version 2019)

0.25 miles Ring around the Area, MINNESOTA, EPA Region 5

Approximate Population: 688

Input Area (sq. miles): 0.28

CSAH 33 at 140th St/Connemara Trl

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m^3)	7.02	6.68	54	8.63	10	8.3	18
Ozone (ppb)	36.8	36.2	68	43.4	8	43	17
NATA* Diesel PM (µg/m^3)	0.336	0.333	55	0.446	<50th	0.479	<50th
NATA* Cancer Risk (lifetime risk per million)	25	24	56	26	<50th	32	<50th
NATA* Respiratory Hazard Index	0.33	0.31	56	0.34	50-60th	0.44	<50th
Traffic Proximity and Volume (daily traffic count/distance to road)	64	440	37	530	30	750	28
Lead Paint Indicator (% Pre-1960 Housing)	0.016	0.31	8	0.38	5	0.28	15
Superfund Proximity (site count/km distance)	0.085	0.18	51	0.13	64	0.13	60
RMP Proximity (facility count/km distance)	0.7	0.76	60	0.82	63	0.74	68
Hazardous Waste Proximity (facility count/km distance)	0.11	1.2	30	1.5	17	4	20
Wastewater Discharge Indicator (toxicity-weighted concentration/m distance)	0	0.27	N/A	0.82	28	14	37
Demographic Indicators							
Demographic Index	11%	22%	24	28%	17	36%	10
Minority Population	13%	19%	51	25%	47	39%	26
Low Income Population	9%	25%	16	31%	12	33%	11
Linguistically Isolated Population	0%	2%	55	2%	58	4%	45
Population With Less Than High School Education	1%	7%	14	10%	9	13%	8
Population Under 5 years of age	4%	6%	23	6%	29	6%	29
Population over 64 years of age	9%	15%	25	15%	21	15%	25

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0.25-miles radius
Description: CSAH 33 at 140th St/Connemara Trl

Summary of ACS Estimates	2013 - 2017
Population	688
Population Density (per sq. mile)	3,609
Minority Population	87
% Minority	13%
Households	221
Housing Units	224
Housing Units Built Before 1950	2
Per Capita Income	50,633
Land Area (sq. miles) (Source: SF1)	0.19
% Land Area	94%
Water Area (sq. miles) (Source: SF1)	0.01
% Water Area	6%

	2013 - 2017 ACS Estimates	Percent	MOE (±)
Population by Race			
Total	688	100%	357
Population Reporting One Race	660	96%	654
White	603	88%	306
Black	41	6%	224
American Indian	0	0%	9
Asian	15	2%	97
Pacific Islander	0	0%	9
Some Other Race	0	0%	9
Population Reporting Two or More Races	29	4%	123
Total Hispanic Population	2	0%	38
Total Non-Hispanic Population	687		
White Alone	602	87%	313
Black Alone	41	6%	224
American Indian Alone	0	0%	9
Non-Hispanic Asian Alone	15	2%	97
Pacific Islander Alone	0	0%	9
Other Race Alone	0	0%	9
Two or More Races Alone	29	4%	123
Population by Sex			
Male	338	49%	200
Female	350	51%	260
Population by Age			
Age 0-4	27	4%	83
Age 0-17	160	23%	195
Age 18+	529	77%	269
Age 65+	60	9%	95

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2013 - 2017 .

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0.25-miles radius
Description: CSAH 33 at 140th St/Connemara Trl

	2013 - 2017 ACS Estimates	Percent	MOE (±)
Population 25+ by Educational Attainment			
Total	465	100%	196
Less than 9th Grade	3	1%	28
9th - 12th Grade, No Diploma	3	1%	29
High School Graduate	55	12%	97
Some College, No Degree	152	33%	167
Associate Degree	62	13%	112
Bachelor's Degree or more	251	54%	186
Population Age 5+ Years by Ability to Speak English			
Total	661	100%	320
Speak only English	635	96%	313
Non-English at Home[1+2+3+4]	26	4%	82
[1]Speak English "very well"	21	3%	81
[2]Speak English "well"	5	1%	45
[3]Speak English "not well"	0	0%	9
[4]Speak English "not at all"	1	0%	16
[3+4]Speak English "less than well"	1	0%	16
[2+3+4]Speak English "less than very well"	5	1%	45
Linguistically Isolated Households*			
Total	0	0%	9
Speak Spanish	0	0%	9
Speak Other Indo-European Languages	0	0%	9
Speak Asian-Pacific Island Languages	0	0%	9
Speak Other Languages	0	0%	9
Households by Household Income			
Household Income Base	221	100%	102
< $15,000	3	1%	24
$15,000 - $25,000	1	1%	20
$25,000 - $50,000	17	8%	55
$50,000 - $75,000	27	12%	67
$75,000 +	173	78%	154
Occupied Housing Units by Tenure			
Total	221	100%	102
Owner Occupied	207	93%	103
Renter Occupied	15	7%	47
Employed Population Age 16+ Years			
Total	553	100%	259
In Labor Force	454	82%	246
Civilian Unemployed in Labor Force	10	2%	36
Not In Labor Force	99	18%	139

Data Note: Datail may not sum to totals due to rounding. Hispanic population can be of anyrace.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS)
*Households in which no one 14 and over speaks English "very well" or speaks English only.

EJSCREEN ACS Summary Report

Location: User-specified polygonal location
Ring (buffer): 0.25-miles radius
Description: CSAH 33 at 140th St/Connemara Trl

	2013 - 2017 ACS Estimates	Percent	MOE (±)
Population by Language Spoken at Home*			
Total (persons age 5 and above)	N/A	N/A	N/A
English	N/A	N/A	N/A
Spanish	N/A	N/A	N/A
French	N/A	N/A	N/A
French Creole	N/A	N/A	N/A
Italian	N/A	N/A	N/A
Portuguese	N/A	N/A	N/A
German	N/A	N/A	N/A
Yiddish	N/A	N/A	N/A
Other West Germanic	N/A	N/A	N/A
Scandinavian	N/A	N/A	N/A
Greek	N/A	N/A	N/A
Russian	N/A	N/A	N/A
Polish	N/A	N/A	N/A
Serbo-Croatian	N/A	N/A	N/A
Other Slavic	N/A	N/A	N/A
Armenian	N/A	N/A	N/A
Persian	N/A	N/A	N/A
Gujarathi	N/A	N/A	N/A
Hindi	N/A	N/A	N/A
Urdu	N/A	N/A	N/A
Other Indic	N/A	N/A	N/A
Other Indo-European	N/A	N/A	N/A
Chinese	N/A	N/A	N/A
Japanese	N/A	N/A	N/A
Korean	N/A	N/A	N/A
Mon-Khmer, Cambodian	N/A	N/A	N/A
Hmong	N/A	N/A	N/A
Thai	N/A	N/A	N/A
Laotian	N/A	N/A	N/A
Vietnamese	N/A	N/A	N/A
Other Asian	N/A	N/A	N/A
Tagalog	N/A	N/A	N/A
Other Pacific Island	N/A	N/A	N/A
Navajo	N/A	N/A	N/A
Other Native American	N/A	N/A	N/A
Hungarian	N/A	N/A	N/A
Arabic	N/A	N/A	N/A
Hebrew	N/A	N/A	N/A
African	N/A	N/A	N/A
Other and non-specified	N/A	N/A	N/A
Total Non-English	N/A	N/A	N/A

Data Note: Detail may not sum to totals due to rounding. Hispanic popultion can be of any race.
N/A meansnot available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2013 - 2017.
*Population by Language Spoken at Home is available at the census tract summary level and up.

Explore Reports

0.25 miles Ring around the Area, MINNESOTA, EPA Region 5 (Population: 688)

Environmental Indicators | Demographic Indicators | EJ Indexes

[Unselect All]

- Demographic Index
- Minority Population
- Low Income Population
- Linguistically Isolated
- Less Than HS Education
- Under Age 5
- Over Age 64

State Percentile | Regional Percentile | USA Percentile

Get Data Table

Explore Reports

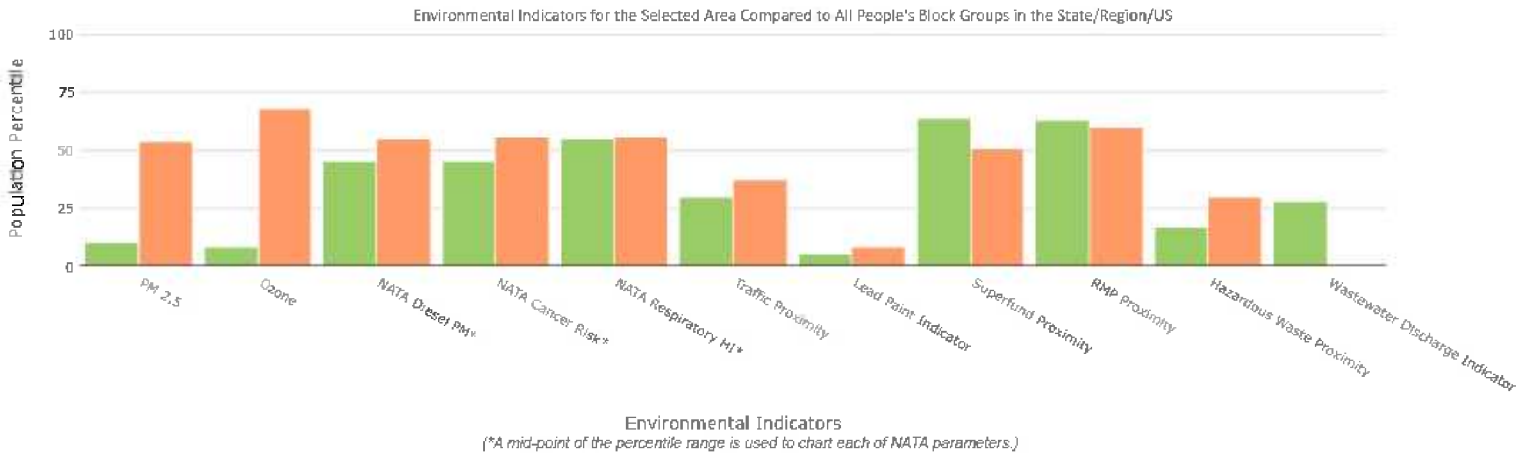
0.25 miles Ring around the Area, MINNESOTA, EPA Region 5 (Population: 688)

Environmental Indicators | Demographic Indicators | EJ Indexes

[Unselect All]

- PM 2.5
- Ozone
- NATA Diesel PM
- NATA Cancer Risk
- NATA Respiratory HI
- Traffic Proximity
- Lead Paint Indicator
- Superfund Proximity
- RMP Proximity
- Hazardous Waste Proximity
- Wastewater Discharge Indicator

State Percentile | Regional Percentile | USA Percentile



Get Data Table

Explore Reports

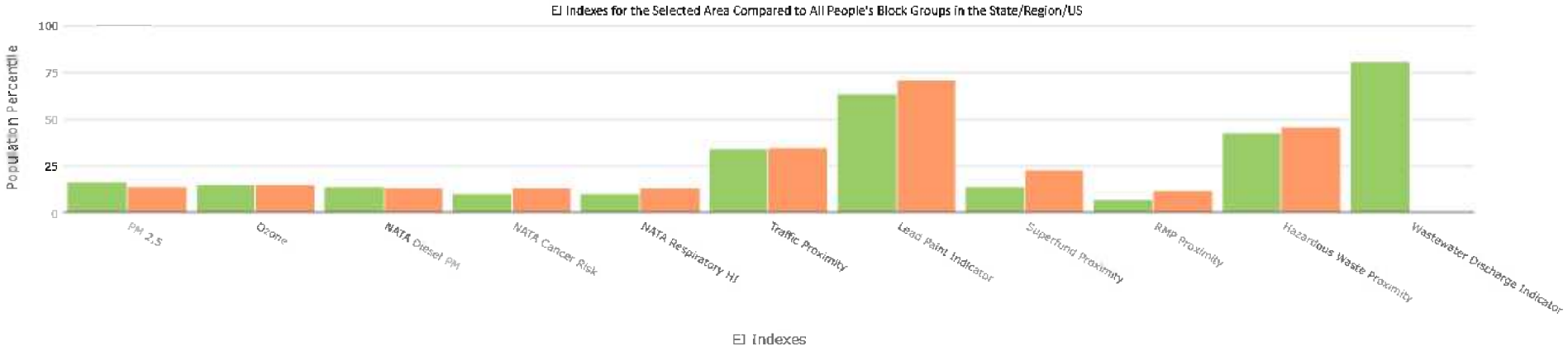
0.25 miles Ring around the Area, MINNESOTA, EPA Region 5 (Population: 688)

Environmental Indicators | Demographic Indicators | EJ Indexes

[Unselect All]

- PM 2.5
- Ozone
- NATA Diesel PM
- NATA Cancer Risk
- NATA Respiratory HI
- Traffic Proximity
- Lead Paint Indicator
- Superfund Proximity
- RMP Proximity
- Hazardous Waste Proximity
- Wastewater Discharge Indicator

State Percentile | Regional Percentile | USA Percentile



Get Data Table

Appendix G: Identified Utilities

BOLTON & MENK

CSAH 33/140TH STREET ROUNDABOUT FEASIBILITY STUDY

Dakota transportation we get you there

Apple Valley

ROSEMOUNT MINNESOTA

N

50
SCALE IN FEET

DIAMOND PATH

DAKOTA 33 COUNTY

DULUTH CT

DELTA PL

CONNEMARA TRL

476

140TH ST W

DELTA AVE

DARTMOUTH PT

DELTA CT

141ST ST W

DOMINICA AVE

142ND ST W

478

LAYOUT LEGEND

- GAS
- FIBER
- COMMUNICATIONS
- ELECTRIC
- WATER
- SANITARY SEWER
- SAN. SEWER - FORCE
- EXISTING RIGHT-OF-WAY
- STORM SEWER
- MVTA BUS ROUTE 476
- MVTA BUS ROUTE 478
- MVTA BUS STOP

EXISTING CONDITIONS

CSAH 33 (DIAMOND PATH) at 140th STREET/CONNEMARA TRAIL

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Appendix H: Cost Estimates

Opinion of Probable Cost - Preliminary Cost Estimate

CSAH 33 at 140th Street/Connemara Trail Roundabout

Dakota County

7/1/2020

BOLTON & MENK
Real People. Real Solutions.

Item		Unit	Total Qty	Unit Price	Total Cost
MAJOR ROADWAY ITEMS (NOTES 1-2)					
	REMOVE BITUMINOUS PAVEMENT	SY	7,971	$ 4.00	$ 31,900
	REMOVE CURB AND GUTTER	LF	2,233	$ 4.00	$ 9,000
	EXCAVATION - COMMON	CY	545	$ 20.00	$ 10,900
	COMMON EMBANKMENT (CV)	CY	150	$ 16.00	$ 2,400
	AGGREGATE BASE (CV) CLASS 5Q	CY	1,872	$ 22.00	$ 41,200
	SELECT GRANULAR EMBANKMENT (CV)	CY	1,971	$ 20.00	$ 39,500
	CONCRETE PAVEMENT 9.0"	SY	345	$ 85.00	$ 29,400
	TYPE SP 9.5 WEARING COURSE MIX (4,F)	TONS	240	$ 90.00	$ 21,600
	TYPE SP 12.5 WEARING COURSE MIX (4,F)	TONS	1,749	$ 123.00	$ 215,200
	PEDESTRIAN RAMP	EACH	18	$ 2,000.00	$ 36,000
	CURB AND GUTTER B424	LF	4,369	$ 35.00	$ 153,000
	4" CONCRETE WALK	SF	11,688	$ 10.00	$ 116,900
	SUBGRADE PREP	RS	22	$ 1,000.00	$ 22,000
	AGGREGATE SURFACING	TONS	120	$ 50.00	$ 6,000
	Subtotal				$ 735,000
STRUCTURAL ITEMS					
	MODULAR BLOCK RETAINING WALL	SF	640	$ 125.00	$ 80,000
	Subtotal				$ 80,000
	All Roadway Construction Subtotal				**$ 815,000**
SPECIAL LUMP SUM CONSTRUCTION ITEMS					
	LIGHTING	LS	1	$ 128,000.00	$ 128,000
	SANITARY FORCE MAIN RECONSTRUCTION & BYPASS	LS	1	$ 50,000.00	$ 50,000
	CITY UTILITY ADJUSTMENTS	LS	1	$ 10,000.00	$ 10,000
	Subtotal				$ 188,000
PRECENTAGE ITEMS					
	MOBILIZATION	20%		of all roadway	$ 163,000
	MISC REMOVALS (CURB, SIGNS, TREES, ETC.)	10%		of all roadway	$ 81,500
	SIGNING & PAVEMENT MARKINGS	6%		of all roadway	$ 48,900
	TURF ESTABLISHMENT AND EROSION CONTROL	8%		of all roadway	$ 65,200
	LANDSCAPING/STREETSCAPE	12%		of all roadway	$ 97,800
	TRAFFIC CONTROL/STAGING	10%		of all roadway	$ 81,500
	URBAN DRAINAGE	12%		of all roadway	$ 97,800
	CONTINGENCY FOR MISSING ITEMS	20%		of all roadway	$ 163,000
	Subtotal				$ 799,000
				Construction Cost (2021 Dollars)	$ 1,800,000
				Anticipated Right-of-Way Cost (2021 Dollars)	$ 130,000
				Engineering Cost (2021 Dollars)	$ 360,000
				Total Cost (2021 Dollars)	**$ 2,290,000**

Notes:

1. Pavement section assumed is 10 inch bituminous pavement, 12 inch aggregate base, and 12 inch sand.
2. Trail pavement section assumed is 2.5 inch bituminous pavement and 4 inch aggregate base.

Opinion of Probable Cost - Preliminary Cost Estimate

140th Street: 3-Lane Section Restriping

Dakota County

4/15/2020

BOLTON & MENK
Real People. Real Solutions.

Item		Unit	Total Qty	Unit Price	Total Cost
MAJOR ITEMS					
	PAVEMENT MARKING REMOVAL	LF	7,295	$ 0.80	$ 5,800
	PAVEMENT MARKING REMOVAL	SF	445	$ 6.75	$ 3,000
	SIGN TYPE C	SF	95	$ 57.75	$ 5,500
	4" SOLID LINE PAINT	LF	15,865	$ 0.15	$ 2,400
	24" SOLID LINE PAINT	LF	370	$ 3.00	$ 1,100
	4" BROKEN LINE PAINT	LF	1,440	$ 0.15	$ 200
	4" DOUBLE SOLID LINE PAINT	LF	2,450	$ 0.25	$ 600
	PAVEMENT MESSAGE PAINT	SF	250	$ 2.80	$ 700
	Subtotal				$ 19,000
	All Roadway Construction Subtotal				**$ 19,000**
PRECENTAGE ITEMS					
	MOBILIZATION	5%		of all roadway	$ 1,000
	TRAFFIC CONTROL/STAGING	5%		of all roadway	$ 1,000
	CONTINGENCY FOR MISSING ITEMS	20%		of all roadway	$ 3,800
	Subtotal				$ 6,000
				Construction Cost (2020 Dollars)	$ 25,000
				Engineering Cost (2020 Dollars)	$ 5,000
				Total Cost (2020 Dollars)	**$ 30,000**

Opinion of Probable Cost - Preliminary Cost Estimate

CSAH 33: 140th to 145th Restriping

Dakota County

6/26/2020

BOLTON & MENK
Real People. Real Solutions.

	Item	Unit	Total Qty	Unit Price	Total Cost
MAJOR ITEMS					
	PAVEMENT MARKING REMOVAL	LF	500	$ 0.80	$ 400
	PAVEMENT MARKING REMOVAL	SF		$ 6.75	$ -
	SIGN TYPE C	SF	75	$ 57.75	$ 4,300
	4" SOLID LINE PAINT	LF	5,265	$ 0.15	$ 800
	24" SOLID LINE PAINT	LF	70	$ 3.00	$ 200
	4" DOUBLE SOLID LINE PAINT	LF	270	$ 0.25	$ 100
	PAVEMENT MESSAGE PAINT	SF	75	$ 2.80	$ 200
	Subtotal				$ 6,000
	All Roadway Construction Subtotal				**$ 6,000**
PRECENTAGE ITEMS					
	MOBILIZATION	5%		of all roadway	$ 300
	TRAFFIC CONTROL/STAGING	5%		of all roadway	$ 300
	CONTINGENCY FOR MISSING ITEMS	20%		of all roadway	$ 1,200
	Subtotal				$ 2,000
				Construction Cost (2020 Dollars)	$ 8,000
				Engineering Cost (2020 Dollars)	$ 1,600
				Total Cost (2020 Dollars)	**$ 9,600**

Opinion of Probable Cost - Preliminary Cost Estimate

CSAH 33: 140th to 145th Restriping and Mill & Overlay

Dakota County

6/26/2020

BOLTON & MENK
Real People. Real Solutions.

	Item	Unit	Total Qty	Unit Price	Total Cost
MAJOR ITEMS					
	2" MILL BITUMINOUS PAVEMENT	SY	15,075	$ 5.00	$ 75,400
	TYPE SP 12.5 WEARING COURSE MIX (4,F)	TON	1,305	$ 123.00	$ 160,500
	SIGN TYPE C	SF	75	$ 57.75	$ 4,300
	4" SOLID LINE PAINT	LF	6,065	$ 0.15	$ 900
	24" SOLID LINE PAINT	LF	325	$ 3.00	$ 1,000
	4" DOUBLE SOLID LINE PAINT	LF	2,965	$ 0.25	$ 700
	PAVEMENT MESSAGE PAINT	SF	190	$ 2.80	$ 500
	Subtotal				$ 243,000
	All Roadway Construction Subtotal				**$ 243,000**
PRECENTAGE ITEMS					
	MOBILIZATION	5%		of all roadway	$ 12,200
	TRAFFIC CONTROL/STAGING	5%		of all roadway	$ 12,200
	CONTINGENCY FOR MISSING ITEMS	20%		of all roadway	$ 48,600
	Subtotal				$ 73,000
				Construction Cost (2020 Dollars)	$ 316,000
				Engineering Cost (2020 Dollars)	$ 63,200
				Total Cost (2020 Dollars)	**$ 379,200**