Hwy 10 Corridor Study

HIGHWAY 10 CORRIDOR STUDY

CHAPTER 1: EXECUTIVE SUMMARY

September 2023

DEPARTMENT OF TRANSPORTATION

Prepared by KLJ

Hwy 10 Corridor Study

Table of Contents

List of Figures

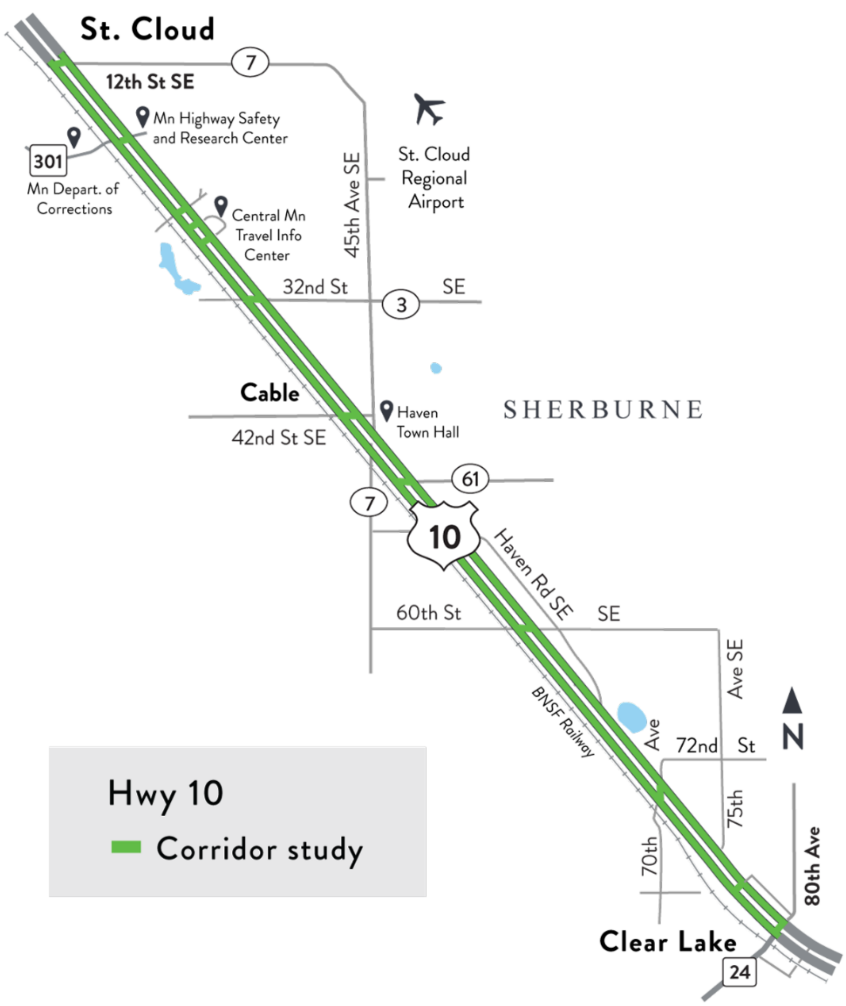
List of Tables

Hwy 10 Corridor Study

Introduction

U.S. Highway 10 between Clear Lake and St. Cloud was constructed before MnDOT implemented Construction Log records. The corridor was improved through the first half of the 20th Century and expanded to a four-lane divided highway in the early 1950s. The highway design has changed little since, and earlier construction of the eastbound lanes is still evident. The study area for this report on Highway 10 is an important corridor that serves commuters, freight, recreational, local, and regional trips. This 10-mile section of U.S. Highway 10 from 15th Avenue SE in the City of St. Cloud, through Haven Township to Highway 24 in Clear Lake has a mix of commercial, industrial, aggregate mining, residential, and agricultural land use. While the overall design of Highway 10 has remained consistent for nearly 70 years, the use and surrounding area has continued to develop. Growth along the corridor has resulted in an increase in the number of access management issues, crashes, heavy truck traffic, and commercial development. **Figure 1** shows the study corridor.

Figure 1: Highway 10 Study Corridor



Project Need

The need for safety improvements along Highway 10 is clear with six fatal crashes over the last 10 years, and risk factors pointing to the likelihood of more in the future. These fatal crashes included both intersection and non-intersection crashes, as would be expected with high speeds, substandard roadside design, no median barrier, and full-access intersections. With traffic volume playing a key role in calculation of crash rates, often high-volume corridors, like Highway 10, can have significant crash problems that go overlooked through traditional analysis.

Total delay at signalized intersections with 15th Avenue SE and Highway 24, and side-street and access delay at the stop-controlled locations, are the largest hindrances to mobility along the corridor. Directional Highway 10 volumes show yearly and daily seasonal peaks on the Highway 10 corridor for regional traffic. These seasonal peak surges are consistent on the Highway 10 corridor between Elk River and Little Falls, connecting recreational traffic from the Twin-Cities to northern destinations.

There are many accesses and uses along the corridor, ranging from aggregate mining and other industrial uses to large recreational retailers, commercial uses, agriculture, and residences. Multiple county and local roads cross and intersect Highway 10, providing access to the St. Cloud Correctional Facility, the St. Cloud Regional Airport, and many other locations. MnDOT has already identified and categorized the extensive access along the corridor. The diverse users of access along the corridor mean that multiple solutions may need to be implemented. Providing access is often a balance of convenience and safety, with the balance currently tilted toward convenience. Currently, the high volumes, high speeds, and skewed intersections often cause access to be both inconvenient and unsafe.

Corridor Study Steps

The purpose of this report is to establish the baseline and forecasted conditions of the corridor to which future recommendations for improvements will be based upon, develop and analyze several alternatives, and provide an ultimate recommendation for implementation based on different levels of available funding. The report is structured into the following detailed sections to support the findings outlined in this Executive Summary.

- Public Engagement
- Existing and Future Conditions
- Alternatives Analysis
- Implementation Plan

Technical Advisory Committee (TAC)

The TAC consisted of technical staff from various agencies and organizations and was responsible for reviewing technical material and providing input throughout the study process. For this corridor report, the TAC consisted of staff from the Minnesota Department of Transportation (MnDOT), Sherburne County, Haven Township, Clear Lake Township, City of St. Cloud, and the St. Cloud Area Planning Organization (APO). The TAC met a total of nine times throughout the corridor study to review the developments during each phase.

Prior Studies and Planned Projects

Currently, a study is underway by the St. Cloud Area Planning Organization (APO) on a Mississippi River crossing on the southern side of the city. The studied crossing is proposed to cross Highway 10 on or around 32nd Street SE in Haven Township. An Interregional River Crossing study between I-94 and Highway 10 south of Clear Lake was conducted by MnDOT several decades ago, but there are no plans at this time to construct it. The interchange at Highway 23, just west of the study area, is scheduled to be reconstructed with an overpass between the interchange, with 15th Avenue SE to also be included. A significant safety improvement is scheduled for 2023, when cable median barriers will be installed along most of the study area.

Public Engagement Summary

Today Highway 10 serves many purposes to many people. To travelers bound to places north and west, it is an interregional corridor, to be driven at speeds exceeding the 65-mph limit. To commuters in and around the St. Cloud area, Highway 10 is an important connection to businesses, schools, universities, and homes. To businesses and residents along the corridor, it provides customers, access, and challenges. To anyone that must cross Highway 10, it is a serious barrier, and to pedestrians and bicyclists it is a safety hazard to be avoided. Supporting those many uses poses a challenge to any future projects, and public engagement and detailed and accurate technical analysis was completed to find workable solutions that are acceptable to the broad group of stakeholders. Goals of the public engagement include the following:

- Discuss and inform the public by providing key project information, gather input, and respond to comments and concerns.
- Conduct a public involvement process that is inclusive, flexible, and responds to project needs and developments.
- Provide ongoing and timely communication with public participants and key stakeholders.

Throughout the study, the project team hosted and organized four different public input opportunities.

Public Input Opportunity #1: Information Gathering (April 2022)

The goal of the first public input opportunity was to understand the public's issues and concerns that are of utmost importance when beginning this corridor study. The team utilized in-person meetings, virtual materials, mapping and survey tools to gather input on needs, issues, barriers, and opportunities to help develop the corridor vision. The results of this public engagement identified a series of key issues based on information collected directly from stakeholders, the public, and through the online MetroQuest Survey. Information collected as part of this first phase of public engagement supported a corridor vision, goals, and objectives to drive development of project alternatives for the Highway 10 corridor between St. Cloud and Clear Lake.

Public Input Opportunity 1 Feedback Summary

Based on the results of the first public input opportunity efforts, the following lists a summary of public concerns and observations for the corridor:

Safety & Operations

- Intersection safety, merging and diverging, travel speeds
- Lack of room in the median to safely make a two-stage crossing
- Overflow of left turn lanes into through lanes related to trucks and school buses
- Pedestrian concerns and crashes at the 15th Avenue SE signal

Access

- Opportunities to revise and consolidate access are present in a few strategic locations along the corridor

Coordination & Planning

- Concerns about the pending project proposed by Sherburne County at 42nd Street SE (CR 65) and 45th Avenue SE
- Ensure short term projects match the mid- to long-range strategy for the corridor
- Coordination with the APO's 33rd Street river crossing study, which includes the preservation for future grade separation between 47th Street SE (CR 61) and 32nd Street SE (CSAH 3)
- Desire for grade separation at the Highway 24 intersection

Growth & Development

- Significant existing and projected aggregate and agriculture trucking movements, specifically at 47th Street SE (CR 61)
- Existing uses north of 32nd Street SE (CSAH 3) present challenges, including the Traveler Information Center, Minnesota Highway Research Center, several truck-dependent businesses, school bus operators, and several existing large industrial uses
- Significant issues identified for large truck traffic, including school buses, for areas from 12th Street SE (CSAH 7) through 32nd Street SE (CSAH 3)
- Concern about crossing with agricultural equipment, specifically at 70th Street and Highway 24

Public Input Opportunity #2: Confirm Corridor Vision (August 2022)

The purpose of the second round of engagement was to share what was learned during the first phase of engagement and how the input helped informed the corridor vision. A comment form on the project website gave visitors a chance to submit additional feedback. A Facebook ad was run from Monday, July 11th to Monday, July 18th. Total reach (the amount of people who saw the ad at least once) was 52,000. Website activity from June 28th to July 25th garnered 843 page views. Sixty-three people clicked on the issues graphic. Eight comments were received during this second round of engagement.

Public Input Opportunity #3: Corridor Alternatives Review (November 2022)

The goal of this engagement was to have the public and stakeholders evaluate the six alternatives (two Lower-Cost, two Medium-Cost, and two Higher-Cost alternatives). The team held focus group meetings and conducted a hybrid public meeting. The virtual component consisted of a series of videos, maps, and a survey. The in-person meeting had additional large plot maps on display, posterboards, and a looping video. The results of the survey showed a public preference for the Higher-Cost alternatives, but still showed confidence that all alternatives would improve the corridor goals of safety, mobility, and access. All businesses along the corridor were invited to focus group meetings, which were grouped by industry. A focus group with aggregate companies identified support for the Higher-Cost options. There was also support for the Lower-Cost alternatives, which could provide a more immediate remedy for the needs on the corridor.

Public Input Opportunity #4: Implementation Plan (March 2023)

This fourth round of engagement was focused on information sharing rather than soliciting for feedback. The goal was to close the loop on communication by sharing the results of the survey and the next steps for the project. The comment form was kept active on the project website to allow people to provide additional feedback.

Information was shared in March 2023 with a summarized survey results infographic. The website was also updated to explain the final recommendations and next steps. A social media post was created as a notification that the results are finalized, and as a thank you for previous participation.

Existing and Future Conditions Summary

The next step in the corridor report included an assessment of existing infrastructure and traffic conditions, followed by an analysis of a future growth scenario and how traffic operations and safety are impacted throughout the corridor. Topics explored in this step included demographics, land use, multimodal topics related to pedestrians, bicyclist, and transit, access management, traffic trends, traffic volumes, traffic operations, and safety. This analysis laid the foundation for identification of mitigation measures and proper intersection control for the Alternatives Analysis.

Corridor Issues and Opportunities

The report identifies issues and opportunities sorted by motorized and non-motorized traffic into the three primary corridor needs of safety, mobility, and access. In general, the corridor issues and related opportunities centered around the following conditions unique to the Highway 10 corridor:

- High density of unrestricted and uncontrolled access to Highway 10 with a limited supporting roadway network to facilitate mobility
- High traffic volumes and speeds on Highway 10 impacting side-street delay and safety, as well as pedestrian experience
- Large volume of heavy vehicles using the corridor creating unique challenges for operations and safety
- High-volume twin railroad tracks running parallel to Highway 10 on the west side, impacting operations and safety on the side-streets
- Mix of traffic along the corridor with competing needs

Corridor Vision Statement and Goals

The corridor vision is to develop a safe, efficient, and accessible highway for all users with destinations along, across, or through Highway 10 between Highway 24 in Clear Lake and 15th Avenue SE in St. Cloud. The corridor goals include:

- Improve safety for all users of Highway 10, which has an ongoing history of high severity vehicle crashes and many risk factors for both motorized and non-motorized users.

- Reduce overall delay for all users on Highway 10, which currently experience excessive intersection delay at the Highway 24 and 15th Avenue SE intersections, and significant delay for side road users entering, crossing, or turning left off of Highway 10.
- Modernize access along and across the corridor to industrial, commercial, agricultural, institutional, and residential properties for all users and vehicle types, as appropriate for a high-speed, high-volume interregional corridor.

The guiding principles include:

- Improve safety and operations
- Facilitate interregional mobility
- Better manage access, with long-term goals and short-term/interim improvements
- Accommodate existing and projected business development, agricultural operations, and residential growth along the corridor
- Respond to large truck traffic and the recreational and seasonal peaks
- Improve network connectivity and functionality
- Support long-range transportation investments, such as the 33rd Street corridor across the Mississippi River, the St. Cloud Beltline alternative, and potential realignment of Highway 24 in Clear Lake.

Alternatives Analysis Summary

Alternative Refinement

The project scope included intent to develop alternative options into three cost-based levels: Lower-Cost, Medium-Cost, and Higher-Cost to allow flexibility with funding outcomes. Due to high speeds and high volumes along the corridor, no full-access intersections or driveways are included in any alternative. The project was originally considering alternatives in terms of at short-/mid-/long-term projects, but in recognition of the likely funding and implementation, the project evolved into alternatives based on lower-, medium-, and higher-cost.

The Higher-Cost alternatives focused on a freeway concept with grade-separated interchanges. Specific interchange options were significantly restricted, due to the corridor's proximity to the BNSF railroad and clearance requirements. The Lower-Cost and Medium-Cost alternatives were developed through individual intersection assessment, beginning with Lower-Cost. Development focused on how different options affected mainline mobility and travel time, upstream and downstream intersections, and adjacent railroad crossings. Construction of new traditional signalized intersections were ruled out from all alternatives, due to negative impact to mainline mobility, as well as historic rear-end crash trends at the existing signals at Highway 24 and 15th Avenue SE. All-way stop control was also ruled out due to mainline mobility impacts. Roundabout concepts were removed from further analysis due to high mainline volume and high speeds along the corridor. This left the design team to consider unique alternative intersections that modify access. The alternatives were developed with careful consideration for how the intersection reconstruction would interact with nearby intersections and re-routing of local trips.

The Lower-Cost alternatives focused on improvements within existing mainline right-of-way. The Medium-Cost alternatives built on the Lower-Cost alternatives and included more off right-of-way work and further restrictions to access points. These alternatives incorporated more total access closure to encourage the usage of service roads and alleviate side-street interaction with the high volume on Highway 10. Initial development began with one alternative in each cost-based category. These alternatives were presented to the TAC, who then helped to develop a second version of each alternative category.

After early screening with a fatal flaw analysis and a review of the corridor goals and vision, the alternatives were refined to six alternatives, with two Lower-Cost, two Medium-Cost, and two Higher-Cost alternatives.

Lower-Cost alternatives were focused on intersection improvements that could be completed primarily within the existing right-of-way. Lower-Cost alternatives include:

- Lower-Cost Alternative A: Acceleration Lane Corridor
  - This alternative includes the implementation of several modified continuous-T intersections. This intersection design restricts left turns off of Highway 10 and instead allows left turns onto Highway 10 with an acceleration lane. This alternative will remove crossings and access points along the corridor, as well as reduce left turn movements at existing intersections. This alternative will keep 19 of the existing intersections along the 10-mile corridor. A new service road will be included parallel to Highway 10 from 32nd Street SE to the Traveler Information Center. Local trips will be directed to local roads with this alternative.
- Lower-Cost Alternative B: Reduced Conflict Intersection (RCI)[1] Corridor
  - This alternative includes the implementation of several RCIs along the corridor. RCIs feature the restriction of left turn and minor through movements at an intersection and reroute these movements to U-turns located downstream of the intersection. RCIs are designed to reduce the number and severity of angle crashes. This alternative will also remove crossings and access points, reduce left turn movements, and include a new service road from 32nd Street SE to the Traveler Information Center. This alternative will keep 15 intersections. Local traffic will be directed to make U-turns along the corridor.

Medium-Cost alternatives were focused on the consolidation of intersections and the development of more local connections. Medium-Cost alternatives include:

- Medium-Cost Alternative A: Greater Consolidation
  - This alternative was developed to reduce the amount of turns at the intersections along the corridor. The number of intersections will be reduced to five. This alternative adds a signalized RCI in the middle of the corridor to accommodate consolidated traffic. Local roads will be built as well to divert trips from Highway 10. This alternative includes five miles of service roads to the east of Highway 10 and 3.5 miles to the west. The intersections of 32nd Street SE and Minnesota Boulevard will be closed.

---

[1] Reduced Conflict Intersections (RCIs) include J-turns, 3/4 intersections, median U-turn (MUT) intersections, restricted crossing U-turn (RCUT) intersections, etc.

- Medium-Cost Alternative B: Lesser Consolidation
  - This alternative includes two miles of service roads to the east of Highway 10. This alternative will close all but seven intersections along the corridor. Local traffic will be diverted to local roads, but less so than Medium-Cost alternative A.

Higher-Cost alternatives involved a full grade-separated freeway design to accommodate the future APO Beltway.

- Higher-Cost Alternative A: Existing Interchange Locations
  - This alternative includes three grade-separated interchanges and an overpass. The number of intersections along the corridor will be reduced to five. The intersections of Highway 10 and Highway 24 in Clear Lake and Highway 10 and 15th Avenue SE in St. Cloud will be converted to an interchange at their existing locations. An interchange is proposed north of 42nd Street SE (CR 65), and an overpass is proposed at 60th Street (CSAH 16).
- Higher-Cost Alternative B: Displaced Interchange Locations
  - This alternative also includes three grade-separated interchanges and an overpass, and the number of intersections will be reduced to five. The intersection located at Highway 24 in Clear Lake will be moved approximately one mile north, and the intersection at 15th Avenue SE in St. Cloud will be moved approximately one half-mile south. Both intersections will also be converted to a grade-separated interchange. An interchange is proposed north of 42nd Street SE (CR 65) and an overpass is proposed at 60th Street (CSAH 16).

Results

Each of the alternatives in each cost grouping were reviewed to determine their value and effectiveness for addressing the needs along the corridor and goals for the study. Results of the methodology are summarized in **Table 1**. In terms of safety, both Higher-Cost alternatives scored the best since converting highway to freeway is expected to have significant benefit with reduction of conflict points, providing safer interactions between mainline and side-street traffic at interchange ramp intersections instead of direct access to Highway 10. Both Lower-Cost alternatives and Medium-Cost alternative B are expected to have the next highest safety benefit due largely to access restrictions and modifications that help reduce conflict points on the corridor. Medium-Cost alternative A is still expected to have safety benefit but has the least of all the alternatives due to the need for an additional traffic signal on Highway 10.

In terms of mobility, only the Higher-Cost alternatives are expected to provide improvement on the corridor for both mainline and side-street operations. Both the Lower-Cost and Medium-Cost alternatives are expected to have a negative impact on mobility, as they are modifying access and diverting trips to and from local roads. Medium-Cost alternative A is expected to negatively impact traffic operations with the addition of a traffic signal in the middle of the corridor, creating delay for mainline traffic. Medium-Cost alternative B is expected to have less impact to mobility than Medium-Cost alternative A, but more than either of the Lower-Cost alternatives. While there are small mobility differences between the Lower-Cost alternatives, they generally have the same impact to corridor mobility.

Access for this corridor report mainly focused on local connectivity, which refers to how accessible key locations and routes are from local networks. Results for this category showed both the Higher-Cost alternatives and

Medium-Cost alternative A scoring the highest. The Higher-Cost alternatives scored well due to the overpass located in the center of the corridor providing a vital connection for local trips to cross Highway 10. Medium-Cost alternative A scored well due to the eight and a half miles of service roads included in the alternative that would improve the local network, as well as providing a traffic signal in the middle of the corridor to help with local trips attempting to cross Highway 10. Medium-Cost alternative B scored better than the Lower-Cost alternatives because it adds two miles of service roads to improve the local network. It should be noted that while the Lower-Cost alternatives scored the lowest in the access category, they are still expected to provide benefit by consolidating accesses and improving intersection control. The access modifications increase trip length but improve the quality of access with RCIs and the modified continuous-T intersection designs.

Cost and impacts increase as named with the alternatives, with Lower-Cost alternatives having the smallest cost an impacts, Higher-Cost alternatives have the largest cost and impacts, and Medium-Cost alternatives falling in the middle. One item of note is that all alternatives have generally acceptable environmental impacts. The primary area of concern is that the Higher-Cost alternatives and Medium-Cost alternative A were identified to have impacts to the Sand Prairie Wildlife Management Area. The table is meant to show a generalized comparison of the alternatives. The more plus signs and darker green colors represent a more favorable score in the alternatives analysis, and conversely more minus signs and a darker red color represent a less favorable score. The plus signs, minus signs, and dollar signs in this summary table do not have any units associated with them. More details on the methodology and scale of the analysis are available in Chapter 4 of the corridor study, with more detailed results and units of measure.

Table 1: Summary of Alternatives Analysis Results

Metric Category	Lower-Cost A	Lower-Cost B	Medium-Cost A	Medium-Cost B	Higher-Cost A	Higher-Cost B
Safety	++	++	+	++	+++	+++
Mobility	-	-	- - -	- -	++	++
Access	+	+	+++	++	+++	+++
Cost and Impacts	$	$	$$	$$	$$$	$$$

Benefit-Cost Analysis

A Benefit-Cost Analysis (BCA) was performed for each alternative. **Table 2** summarizes all benefit and cost amounts, with construction costs assuming 30% contingency in recognition of the corridor study level of engineering. Right-of-Way, engineering, and environmental costs are not included in the BCA, as the study is at the planning level. These costs will be identified once a preferred alternative is selected, funded, and moved into project development. Any benefit-cost ratio greater than 1.0 is considered economically justified (as the benefits will outweigh the costs), and alternatives with greater benefits will have a higher benefit-cost ratio. The BCA analysis was completed for a 20-year time frame. Vehicle Hours Traveled (VHT) and Vehicle Miles Traveled (VMT) dollar benefits represent a combined number for all vehicles expected to travel the study area over the entire 20-year period. Crash Reduction Savings are also represented as a sum of expected savings over the 20-year period based on the existing crash history and expected safety benefits of the alternatives.

Table 2: Benefit-Cost Analysis (BCA) Results

Benefit-Cost Total for Project Life	Lower-Cost A	Lower-Cost B	Medium-Cost A	Medium-Cost B	Higher-Cost A	Higher-Cost B
VHT Benefits	***$ -445 M***	***$ -52 M***	***$ -108 M***	***$ -68 M***	$ 35 M	$ 35 M
VMT Benefits	***$ -13 M***	***$ -17 M***	***$ -71 M***	***$ -51 M***	***$ -71 M***	***$ -71 M***
Crash Reduction Savings	$ 148 M	$ 147 M	$ 118 M	$ 150 M	$ 217 M	$ 216 M
TOTAL BENEFITS	$ 91 M	$ 78 M	***$ -61 M***	$ 32 M	$ 181 M	$ 180 M
TOTAL COSTS	$ 21 M	$ 21 M	$ 37 M	$ 30 M	$ 80 M	$ 95 M
Benefit-Cost Ratio	**4.24**	**3.76**	**-1.66**	**1.04**	**2.25**	**1.89**

In the case of Medium-Cost alternative A, the savings in crash reduction is not enough to offset the negative benefits from additional vehicle-hours traveled (VHT) and vehicle-miles traveled (VMT). Thus, the total benefits are negative, and the benefit-cost ratio is also negative. Medium-Cost alternative B has a benefit-cost ratio just greater than 1.0, meaning that the benefits barely outweigh the costs. The Higher-Cost alternatives have the next-best benefit-cost ratios, as their crash reduction savings are the highest, and these alternatives do not experience negative vehicle-hours traveled benefits. However, freeway conversion and grade-separated interchanges included in the Higher-Cost alternatives have much higher construction costs, which ultimately lower the benefit-cost ratio. Both Lower-Cost alternatives have the highest benefit-cost ratio, with the lowest construction and maintenance costs, and relatively high crash reduction savings.

Recommendation

Following the Alternatives Analysis results and TAC feedback, **both Medium-Cost alternatives were removed from further consideration**. Benefit-cost analysis results showed that both Medium-Cost alternatives would have negative mobility impacts, with increases in both vehicle-miles traveled and vehicle-hours traveled. Safety benefits for the Medium-Cost alternatives were not enough to offset these increases, resulting in unfavorable BCA ratios.

All Lower-Cost and Higher-Cost alternatives were found to have significant benefits that would overcome the cost and impacts of construction. Through the evaluation process, **Lower-Cost alternatives A and B were combined for a recommended hybrid Lower-Cost alternative C**, shown in **Figure 2.** In the technical analysis, both Lower-Cost alternative A and B scored similar to one another in terms of benefits. The alternatives were combined in a way that addresses concerns for heavy truck turning movements at specific locations as well as providing full access at county road locations. The preliminary cost estimate for the recommended Lower-Cost alternative C is approximately $28 - $30 million.

Similarly, the **Higher-Cost alternatives were also combined into a hybrid Higher-Cost alternative C** represented in **Figure 3.** The technical analysis results were also very similar for both Higher-Cost alternatives A and B because they are very similar in design. It should be noted that the types of interchanges shown in the figures may be subject to change through preliminary design if the Higher-Cost alternative is selected for construction and funded. The preliminary cost estimate for the recommended Higher-Cost alternative C is approximately $140 - $160 million.

Figure 2: Recommended Lower-Cost Alternative C

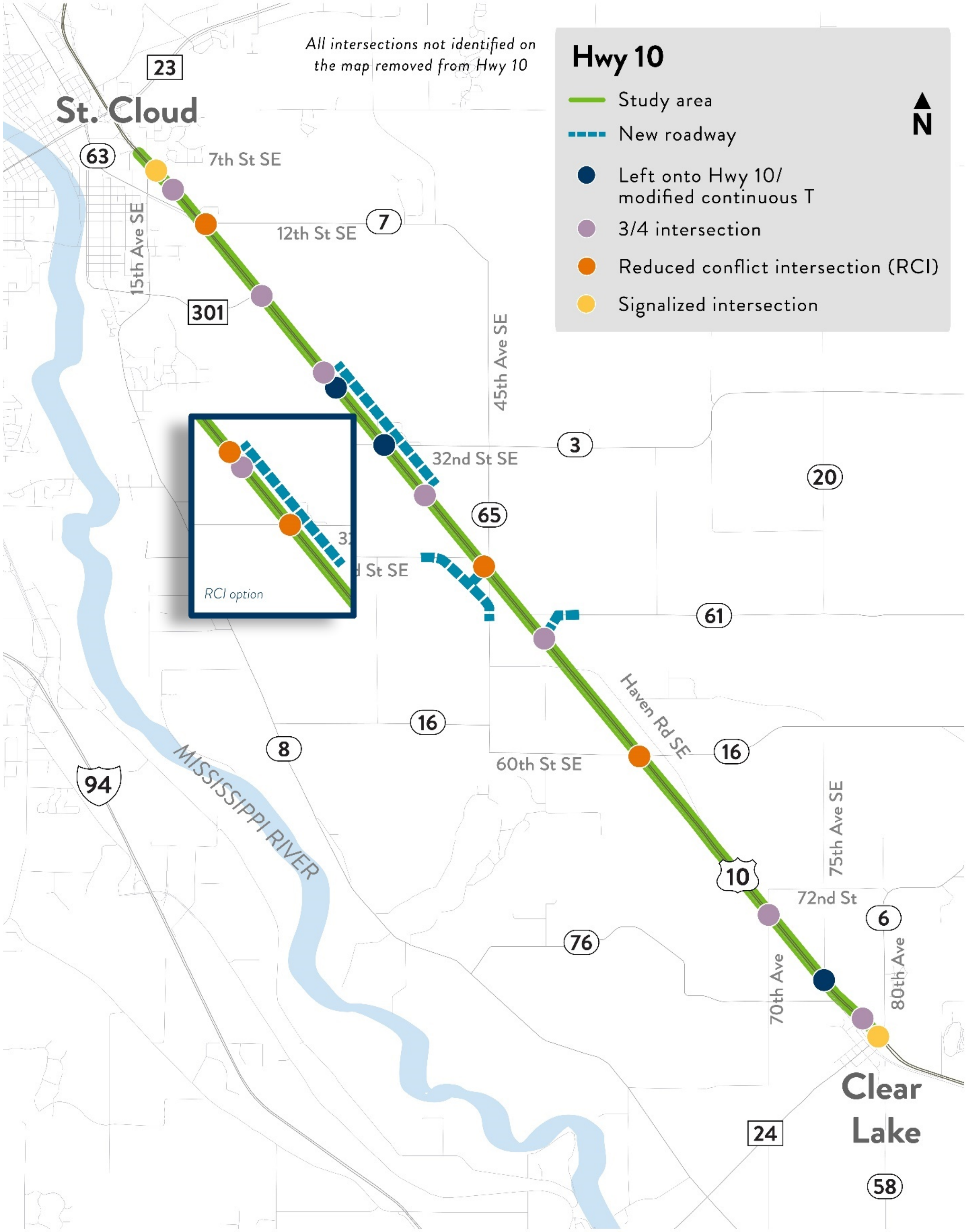


Figure 3: Recommended Higher-Cost Alternative C

Implementation Plan Summary

Because corridors are rarely funded in one large project, the two recommended corridor alternatives were split into segments and analyzed as separate buildable pieces to determine immediacy of need based on safety analysis. The purpose of this work was to document phasing and funding strategies for the project improvements and ensuring standalone and independent utility. A construction order for the proposed alternatives was explored, as well as independent improvements with the goal to bring immediate benefits and value to communities, while building toward the ultimate corridor vision.

Funding for the project is not currently available and not in any planning programs to get funded in the short term. Funding would need to be sourced at least partially through avenues outside of the more traditional avenues like the Capital Highway Investment Plan (CHIP) and State Transportation Improvement Plan (STIP). These non-traditional sources could include special programs, bonds, and grants like the Corridors of Commerce program. More information is available in Chapter 5 of the corridor study.

The Implementation Plan defines up to seven independent buildable segments for Lower-Cost alternative C and up to four independent buildable segments for Higher-Cost alternative C. These divisions are shown in **Figure 4** and **Figure 5**. Based on analysis that utilized expected safety benefit (immediacy of need), recommended build order for the segments are shown in **Table 3** for Lower-Cost alternative C, and **Table 4** for Higher-Cost alternative C. **All crashes at 45th Avenue SE and 42nd Street SE (CR 65) were not included in the expected safety benefit as they will be addressed by the 2024 Sherburne County RCI project. The cost of the county project is also excluded.**

Figure 4: Recommended Lower-Cost Alternative C Independent Buildable Segments

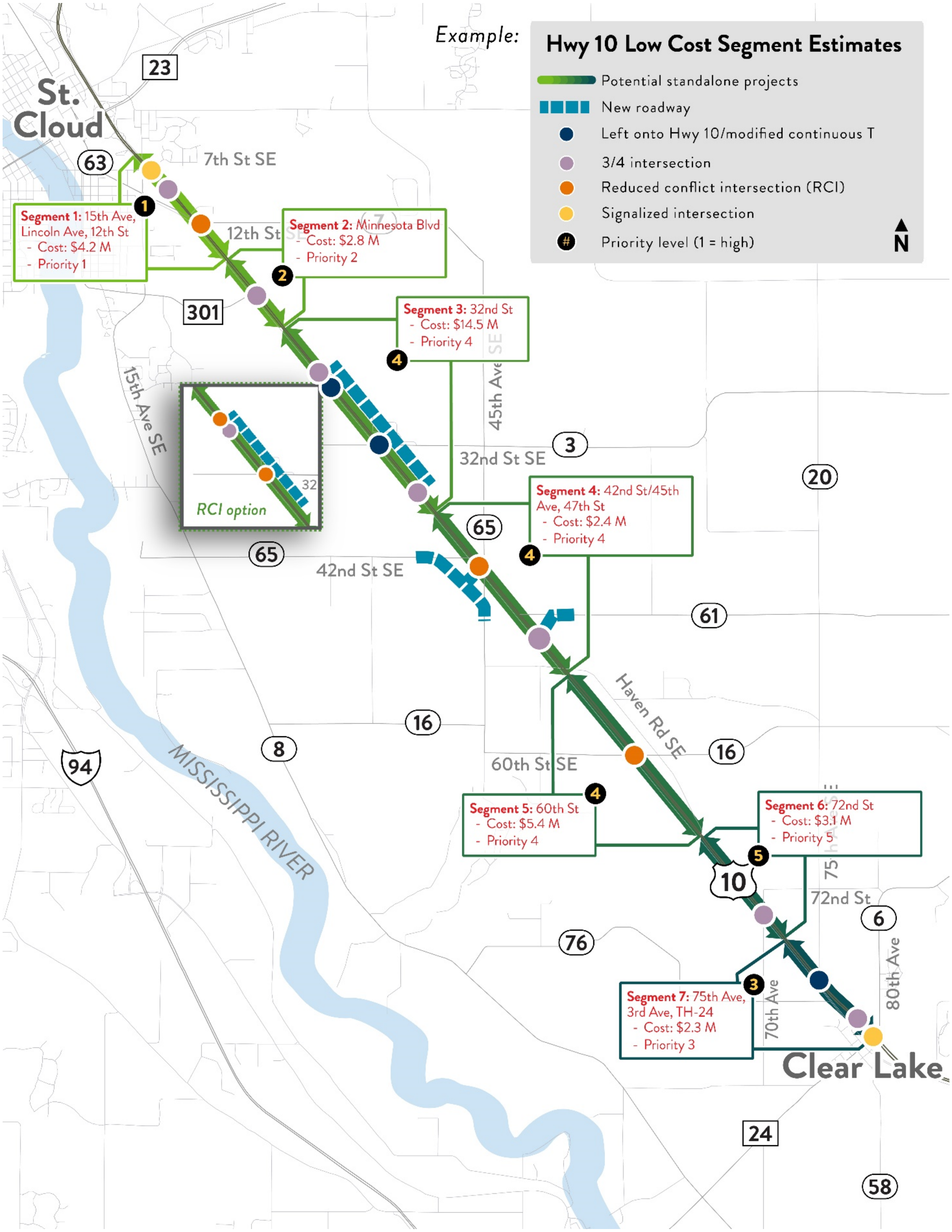


Figure 5: Recommended Higher-Cost Alternative C Independent Buildable Segments

Table 3: Lower-Cost Alternative C Phasing Safety Technical Ranking

Segment	Recommended Construction Order	Expected Safety Yearly Benefit	Construction Cost
1 (15th Ave, Lincoln Ave, 12th St) St. Cloud Corridor End	1st	$165,000 16% reduction	$4.2M
2 (Minnesota Blvd)	2nd	$153,000 49% reduction	$2.8M
7 (75th Ave, 3rd Ave, TH 24) Clear Lake Corridor End	3rd	$93,000 9% reduction	$2.3M
3 (32nd St)	4th /5th/ or 6th	$69,000 12% reduction	$14.5M
4 (42nd St/45th Ave, 47th St)	4th /5th/ or 6th	$0 N/A	$2.4M
5 (60th St)	4th /5th/ or 6th	$72,000 11% reduction	$5.4M
6 (72nd St)	7th	$43,000 46% reduction	$3.1M

Table 4: Higher-Cost Alternative C Phasing Safety Technical Ranking

Segment	Recommended Construction Order	Expected Safety Yearly Benefit	Construction Cost
1 (15th Ave Interchange Area) St. Cloud Corridor End	1st	$625,000 57% reduction	$34.1M
4 (TH 24 Interchange Area) Clear Lake Corridor End	2nd	$509,000 43% reduction	$33.6M
2 (New Interchange location and 42nd St Interchange Area)	3rd	$369,000 29% reduction	$83.6M
3 (60th St Overpass Area)	4th	$52,000 8% reduction	$9.5M

Technical Advisory Committee (TAC) Meetings Summary

The TAC consisted of technical staff from various agencies and organizations and was responsible for reviewing technical material and providing input throughout the study process. For this corridor report the TAC consisted of staff from the Minnesota Department of Transportation (MnDOT), Sherburne County, Haven Township, Clear Lake Township, the City of St. Cloud, and the St. Cloud Area Planning Organization (APO). The TAC met a total of nine times throughout the corridor report to review the developments during each phase of the study. The purpose of the TAC was to provide guidance and advice on different topics that ranged from defining the corridor issues to public engagement suggestions and layout review.

The TAC provided valuable feedback throughout the study process particularly for the following items:

- Issues and opportunities identification from both local perspective and technical knowledge
- Stressing the importance of heavy vehicle challenges with acceleration and U-turns on the corridor
- Clarifying importance of full access at County Roads (12th Street and 60th Street)
- Identifying important existing connections and desired new connections
- Providing technical opinions on location of the interchanges near 15th Avenue SE and Highway 24 for Higher-Cost alternatives
- Giving feedback on public engagement materials and participating in events

Next Steps

Independent Safety Improvements

At the time of completion of this corridor study, the project has additional awarded funding that is available to use for immediate improvements separate from the full corridor alternatives. The funding available is approximately $800,000 and must be encumbered by 2025. Based on the independent improvement recommendations, the following list is the technical recommendation for how the remaining funds could be used to bring immediate benefit to the corridor, while the funding is being secured for implementation of either Lower-Cost alternative C or Higher-Cost alternative C.

- Clear Zone and Roadside Improvements (Corridor-Wide) – negotiated contracts up to $250,000 each
    - Clear vegetation
    - Slope correction and protection
    - Fix approach cross slopes with anticipation of pipe work
- 15th Avenue SE Signal Improvements – negotiated contract or maintenance forces
    - Signal re-construction and re-timing
    - High visibility crosswalk markings
- Highway 24 Signal Improvements – negotiated contract, maintenance forces, or let project
    - Remove split phasing on Highway 24 with lane reconfiguration, signal reconstruction, and re-timing with restriping and signing work.
    - High visibility crosswalk markings
    - Option: Added if ADA-compliant pedestrian crossing is added to north leg
- Minnesota Boulevard Intersection Improvements – negotiated contract or maintenance forces
    - Extend southbound right turn lane
    - Improve intersection lighting
    - Mitigate east leg intersection skew with roadway widening and re-striping as opposed to roadway re-alignment

Alternatives Implementation

The remaining steps left for the Highway 10 corridor project include securing funding, completing environmental review and design, construction, and operations and maintenance.

- Secure Funding
  - Transportation projects in Minnesota can be funded from various funding sources. The project team will need to use the technical analysis from this report to advocate for funding from applicable sources. Funding for the project is not currently available and not in any planning programs to get funded in the short term. As mentioned above, some funding, especially for the Higher-Cost improvements, will need to be advocated for through non-traditional sources like special programs, bonds, and grants. However, lower-cost improvements consistent with MnDOT's 20-year Minnesota State Highway Investment Plan (MnSHIP) may be considered as part of the District's 10-year CHIP development process. Once funding is secured, project development can occur with the steps listed below.
- Environmental and Design
  - Environmental and Design takes the concept and parameters established in the corridor study and develops a project through environmental review and detailed design, culminating in the construction plan set, designer's cost estimate, and special provisions.
- Construction
  - Construction includes the physical and administrative processes of building the transportation facility specified in the plans. The project manager must keep the construction process in mind during project development to ensure the project can be constructed safely and efficiently, while minimizing impacts to communities, natural resources, and cultural resources.
- Operations and Maintenance
  - The operations and maintenance phase is when the facility is open to travelers. During this phase, MnDOT monitors and optimizes facility performance and addresses issues. Throughout project development, the project manager must make decisions that will support safe and efficient operation and maintenance of the transportation facility.

Hwy 10 Corridor Study

HIGHWAY 10 CORRIDOR STUDY
CHAPTER 2: PUBLIC ENGAGEMENT REPORT

September 2023

DEPARTMENT OF TRANSPORTATION

Prepared by KLJ

Table of Contents

List of Figures

Appendix

Public Engagement Overview

Project background

The design of this stretch of Highway 10 has remained nearly unchanged for about the last 70 years. Today, Highway 10 serves many purposes to many people. To travelers bound to places north and west, it is a regional corridor. To commuters in and around the St. Cloud area, Highway 10 is an important connection to businesses, schools, universities, and homes. To businesses and residents along the corridor it provides customers access and challenges. Crossing Highway 10 is challenging for vehicles, and to pedestrians and bicyclists it is a significant safety hazard. To support these many needs, extensive outreach and technical analysis are vital to finding solutions with a broad consensus.

Purpose

Goals of the public engagement shown below.

- Discuss and inform the public by providing key project information, gather input, and respond to comments and concerns.
- Conduct a public involvement process that is inclusive, flexible, and responds to project needs and developments.
- Provide ongoing and timely communication with public participants and key stakeholders.

Key Stakeholders

Five key stakeholder groups were identified, preliminarily, for the Highway 10 Corridor Study.

- **Agency partners.** Due to the length of the study area, there are multiple agency partners that played a key role. These agencies include the City of St. Cloud, City of Clear Lake, Clear Lake Township, Haven Township, Sherburne County and the St. Cloud Area Planning Organization (APO). Agencies were involved in the monthly technical advisory committee (TAC) meetings and helped to guide and provide feedback for all public engagement activities throughout the project. Subsequently, agency partners played a role for their respective city and county councils and committees.
- **General public.** The general public included residents, traveling public, recreational users, and other interested parties. Pedestrians and bicyclists were particularly observed as key user groups in the area. Depending on the user, these key groups had opinions on alternatives, design, and future corridor impacts. Offering a wide variety of opportunities for the interested groups to be involved was included in the plan and included in-person meetings and virtual opportunities.
- **Local businesses.** The corridor has a variety of businesses and segments such as commercial and rural. In addition to those that live along or travel the highway, the roadway provides access to numerous businesses. Therefore, ensuring owners and employees could provide input, have their concerns heard, and be in the know was an important aspect. Tailored and direct coordination, such as public meetings and virtual opportunities, were needed with business industry.
- **Freight and agricultural industry.** There are a variety of freight, rail, aggregate mining, and agricultural businesses that utilize the Highway 10 corridor. Whether they are traveling through or their destination

is within the project limits, special attention was needed to ensure representation from these pertinent stakeholders.

- **Emergency services.** This group may entail fire, ambulance, and local police officers and/or state patrol. Involving these services in the project helped the project team understand their perspectives on traffic operations and informed key decisions moving forward.

Public Involvement Activities and Actions

Throughout the study, the project team hosted and organized four different public input opportunities.

Public input opportunity #1: Information gathering (April 2022)

Understanding the public's issues and concerns were of utmost importance when beginning this corridor study. The team utilized in-person meetings, virtual materials, mapping, and survey tools to gather input on needs, issues, barriers, and opportunities to help develop the corridor vision.

Public input opportunity #2: Confirm corridor vision (August 2022)

The purpose of the second round of engagement was to share what was learned during the first phase of engagement and how the input helped informed the corridor vision. A comment form on the website gave visitors a chance to submit additional feedback.

Public input opportunity #3: Corridor alternatives review (November 2022)

During the third round of public input, the draft corridor alternatives were presented to the public and key stakeholders. The purpose of the engagement was to share the alternatives and gather feedback, and to provide the opportunity for the public to prioritize the alternatives.

Public input opportunity #4: Implementation plan (March 2023)

The purpose of the final opportunity was to show how the public's input was used to help inform the specific strategies, share the recommendations, and highlight next steps in the process.

Public Engagement Opportunity #1 Summary

Overview

Two types of events were held in April 2022 to learn from the public and stakeholders: focus group meetings with stakeholders and pop-up events for the public. An online survey hosted by MetroQuest opened on the same day as the pop-up event and stayed live through May 18th.

The survey questions were developed between KLJ's and MnDOT's technical teams and public involvement teams. This collaborative effort focused on asking questions such that the answers would become useful tools in developing design alternatives. The survey was open from April 28th to May 18th. The total number of participants was 1,063.

Event Structure

Focus groups

The focus groups were smaller meetings held between KLJ, MnDOT and agency-level stakeholders. Five one-hour meetings were held over April 26th to 28th, 2022. Sixteen stakeholders attended these meetings.

Public pop-up events

Two pop-up events were held in public spaces on Thursday, April 28th, 2022. One pop-up event occurred at the Travel Information Center (TIC) from 1:00 p.m. to 3:00 p.m. The second event occurred at the Haven Town Hall from 4:00 p.m. to 6:00 p.m. Twenty-eight people signed in at the pop-up events. The true attendance is most likely higher, as some participants did not sign in.

At the TIC, posterboards were placed around the main room. A table at the front had the sign in sheet, study information, and survey cards, comment forms, bottled water, and chocolates. Guests were greeted when they arrived, and MnDOT and KLJ staff members were present to answer questions.

At the Haven Town Hall, large plats of the study area were on tables in the middle of the room and posterboards were placed around the edges. Similar to the first pop up event, an entry table held sign in sheets, refreshments, comment forms, and survey cards, and guests were greeted as they arrived. Guests typically found themselves around the large plats and joining conversations with MnDOT and KLJ staff.

Promotion

To spread the word, a variety of methods were used. These included social media posts, social ads, mailed letters, news releases, and coordination with the cities and county. Social ads were run by MnDOT, and a Facebook event was created and shared across several pages, including the Briggs Lake Chain Association. MnDOT also issued a press release on April 12th. One earned media news article was published on April 12th by the KNSI radio station. The events were picked up by various event-focused websites. The events were also promoted during the focus group meetings with the cities and county.

- **Social media**: Two social media ads were created, each for $20 per day. The first run was from April 15th to 28th, and the second run was from April 28th to May 18th. The first run focused on the public events and the second run promoted the survey. The first run had a geotargeted radius of seven miles from both St. Cloud and Clear Lake. The second run's radius was extended to fifteen miles.
- **Letter**: A letter was created and sent to 982 addresses. The mail list covered a quarter-mile radius from the study area along Highway 10. The letter notified the recipients of the study itself, promoted both public events and the study website, and described how public input would be used in the study. It listed the contact person for the study, how they could be reached, and where to find more information. A trackable QR code allowed participants to directly access the study website.
- **MnDOT study website**: A link to the public feedback survey was located at the top of the MnDOT study website for high visibility. A study overview, maps, and contact information provided a rounded source of information to the public.

- **Handout cards**: A small 3” x 6” handout card was created and distributed at both public events. The call-to-action was to visit the study website and take the survey. These cards were scattered around on tables and handed out by the team.

Figure 1: Public Involvement # 1 Photos

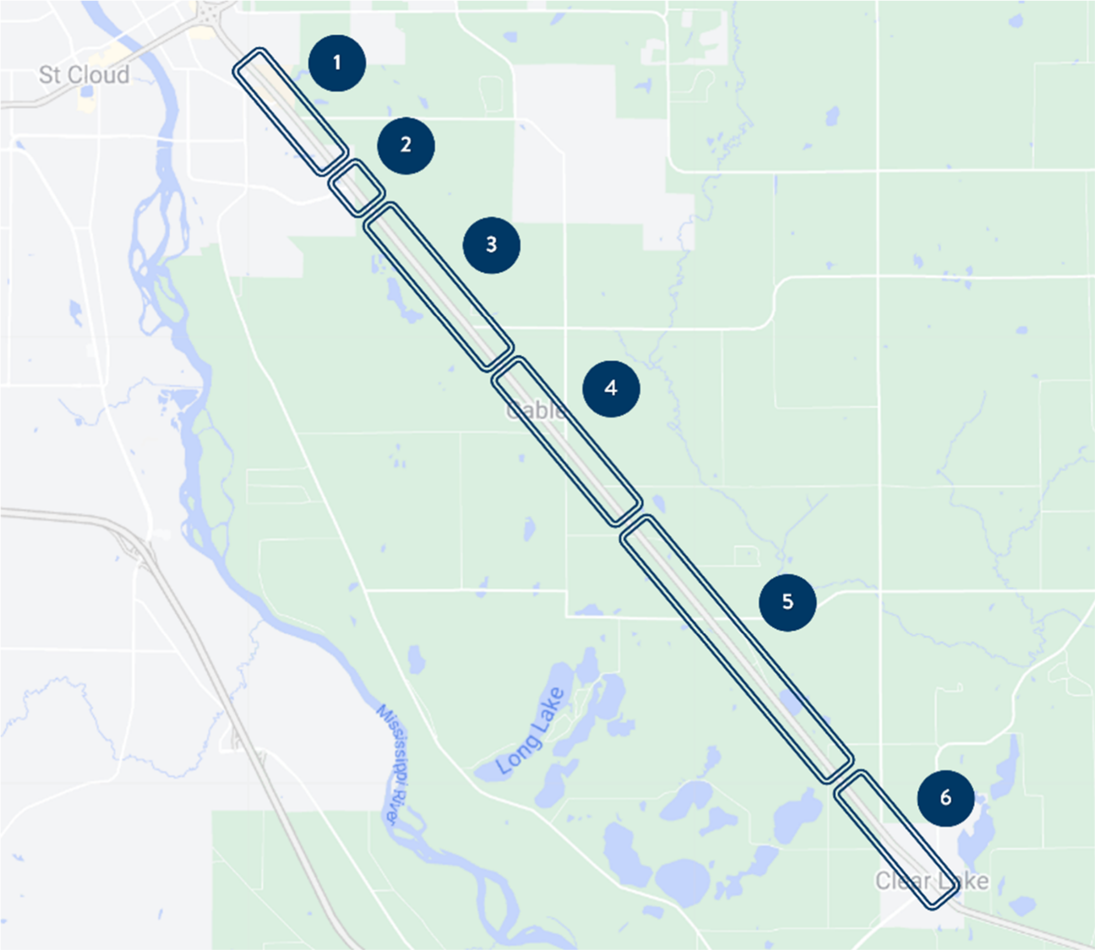
Summary of Survey Results

The survey responses on the map were grouped into six geographical areas, though most identified issues were common along the entire length of the corridor. These geographical areas were natural clusters, but also provided a way to focus on area-specific information. The six geographical areas are listed below and illustrated in **Figure 2**.

1. 15th Avenue SE
2. Minnesota Boulevard (MN 310)
3. South of Minnesota Boulevard through 32nd Street SE

4. South of 32nd Street SE through 47th Street SE (CR 61)
5. South of 47th Street SE to just south of 70th Avenue
6. South of 70th Avenue through the town of Clear Lake

Figure 2: Six Geographical Areas of Survey Responses



Corridor-wide issues

- Lack of acceleration lanes
- Turn lanes are too short
- Shoulders are too narrow
- Speeding
- Intersection angles make it hard to see
- Poor lighting
- Trains causing backups and lane blockages
- Lack of safe crosswalks and paths
- Drivers running red lights
- Stop light timing needs improvements

- Heavy traffic, especially on weekends and in the summer
- Growth and new development nearby are causing even more traffic
- Too many access points close together and could be consolidated
- Lack of animal crossings

Area-focused issues

- 15th Avenue SE
  - Lots of semi-trucks pulling off and onto Highway 10 causing dangerous situations for other drivers
  - Need better pedestrian crossings. Homeless shelter nearby so lots of pedestrians taking risks.
  - Stop lights take too long.
- Minnesota Boulevard
  - Pedestrians visiting scenic areas on either side of Highway 10 need better crossings. Specifically, the Jail Trail to the west and Wildlife Management Area to the east.
- 32nd Street SE
  - Need better signs indicating where the turn is for 32nd Street SE.
  - Black ice common.
- 60th Street SE (CR 60)
  - Eliminate train horn.
- Frontage Road SE area
  - Consolidate access points to Highway 10.
- Highway 24 (Main Avenue) intersection
  - Allow rights on red.

Expanded survey data by the geographical areas shown in **Figure 2** is available in **Appendix 2A**.

Overall Summary and Sentiment of Public Input

A series of key issues were identified based on information collected directly from stakeholders, the public and through the online MetroQuest Survey. Sentiment has been summarized into four broad category areas as shown. Information collected as part of this first phase of public engagement supported a corridor vision, goals, and objectives to drive development of project alternatives for the Highway 10 Corridor between St. Cloud and Clear Lake.

Safety & Operations

- Intersection safety, merging and diverging, travel speeds, and intersection skew
- Lack of room in the median to safely make a two-stage crossing
- Overflow of left turn lanes into through lanes related to truck and school buses
- Pedestrian concerns and crashes at the 15th Avenue SE signal

Access

- Opportunities to revise and consolidate accesses are present in a few strategic locations along the corridor. Specific topics related to access that were discussed include:

  - CR 65 RCI
  - Crossing Highway 10 with agriculture equipment
  - Business driveways
  - Private residences

Coordination & Planning

- Concerns about the pending project proposed by Sherburne County at 42nd Street SE (CR 65) and 45th Avenue SE
- Ensure short-term projects match mid- to long-range strategy for the corridor
- Coordination with the APO's 33rd Street river crossing, including the preservation for future grade separation between 47th Street SE (CR 61) and 32nd Street SE (CSAH 3)
- Refresh concepts for potential new intersection of Highway 10 and Highway 24 to support grade separation

Growth & Development

- Significant existing and projected aggregate and agriculture trucking movements, specifically at 47th Street SE (CR 61)
- Existing uses north of 32nd Street SE (CSAH 3) present challenges, including the Traveler Information Center, Minnesota Highway Research Center, several truck-dependent businesses, school bus operators, and several existing large industrial uses
- Significant issues identified for large truck traffic, including school buses, for areas from 12th Street SE (CSAH 7) through 32nd Street SE (CSAH 3)
- Concern about crossing with agricultural equipment, specifically in the middle to southeast end of the corridor

Public Engagement Opportunity #2 Summary

Overview

Two types of events were held in April 2022 to learn from the public and stakeholders: focus group meetings with stakeholders and pop-up events for the public. An online survey hosted by MetroQuest opened on the same day as the pop-up event and remained live through May 18th.

The next round of engagement was to share the responses with the public, and the issues identified by engineers. These items were displayed in a graphic and listed as bullet points on the project website. A comment form on the website gave visitors a chance to submit additional feedback.

Website Updates

A highly visual graphic was used to display the issues identified by the public. Corridor-wide issues were placed around the edges and location-specific issues were pinpointed on a map in the center. This graphic is displayed in **Figure 4**.

On the website, dropdowns and bullet points were used to organize issues into three categories: safety, mobility, and access. Each of these categories were further broken down into motorized and non-motorized issues.

The draft corridor vision and the three draft corridor goals were also presented on the website.

A comment form was placed at the bottom on the website as a freeform comment box. Visitors could choose to be contacted by MnDOT regarding their comment. Comments were automatically sent to Stephanie Castellanos (MnDOT) and forwarded to KLJ for tracking.

Results

Social media

An ad was run from Monday, July 11th to Monday, July 18th at a total cost of $140.00. The ad was a video transitioning between the two graphics below, shown in **Figure 3**. Total reach was 52,000. Reach is defined as the amount of people who saw the ad at least once. Cost per reach was less than $0.003.

Website activity

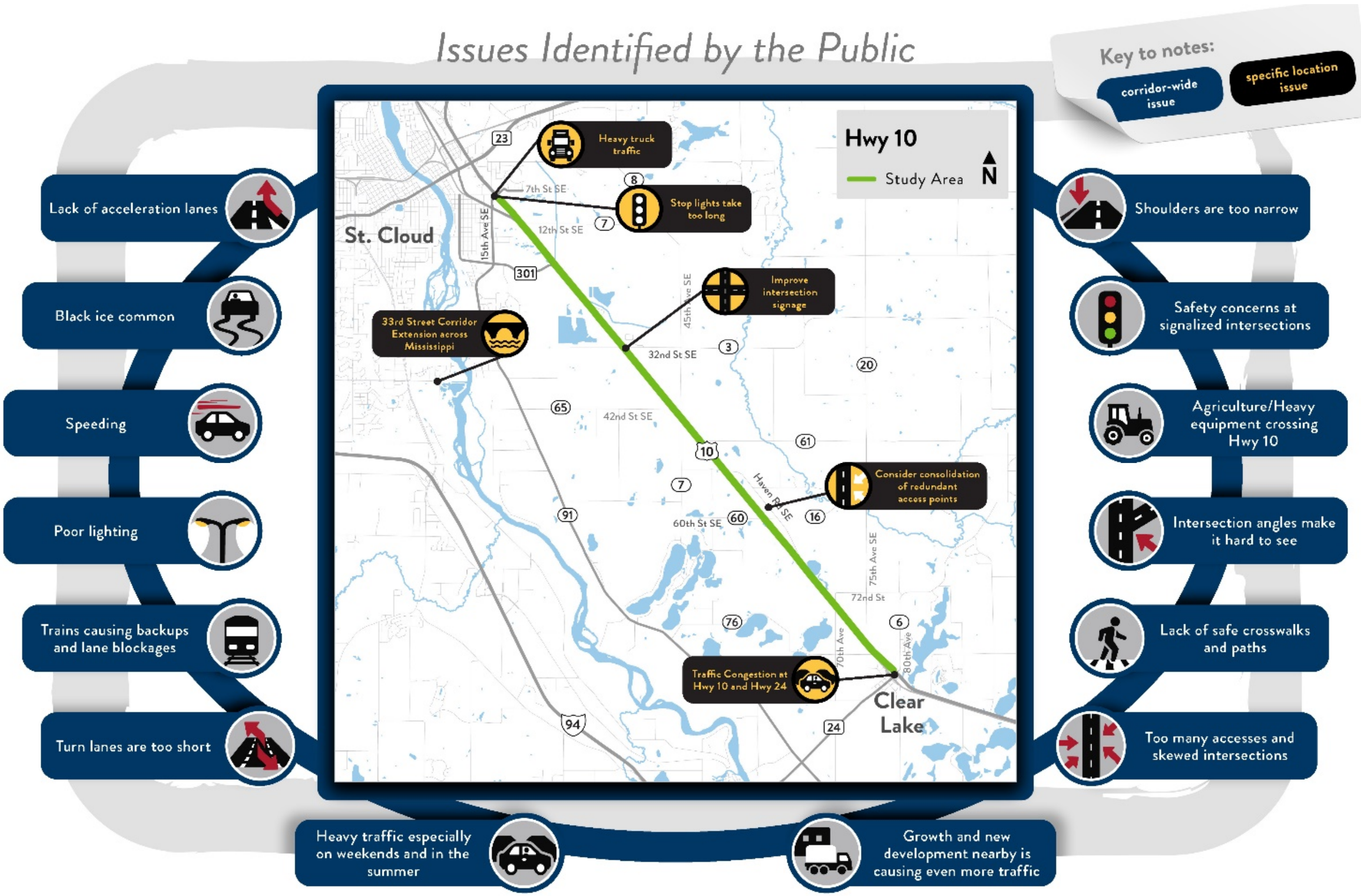
Website activity from June 28th to July 25th garnered 843 page views. Sixty-three people clicked on the issues graphic, shown in **Figure 4**.

Comments

Eight comments were received during this second round of engagement. The comments are logged in **Appendix 2B**.

Figure 3: Public Engagement Opportunity #2 – Ad Graphics

Figure 4: Public Engagement Opportunity #2 – Issues Graphic



Public Engagement Opportunity #3 Summary

Overview

The goal of this engagement was to have the public and stakeholders evaluate the six alternatives which were broken into two Low-Cost, two Mid-Cost, and two High-Cost concepts.

A third round of engagement began in November. Focus group meetings were held again, and a hybrid public meeting was conducted. The virtual component consisted of a series of videos, maps, and a survey. The in-person meeting had additional large plot maps on display, posterboards, and a looping video.

Promotion

- **Social media**: Two versions of an ad were run from Nov. 3rd to Dec. 21st. The total cost was $630.00. The ad was a video and transitioned between the graphics shown in **Figure 5**. Total reach was 48,889. Reach is defined as the amount of people who saw the ad at least once. Cost per reach was $0.013.
- **Letter**: An invitation letter was mailed to businesses and residents along the study corridor. On Oct. 27th, 838 letters were mailed.
- **Press Release**: A press release was created on Oct. 21st, 2022 and was issued by MnDOT shortly thereafter. A copy of this press release is found in **Appendix 2E**.

Figure 5: Public Engagement Opportunity #2 – Video Graphics

Engagement Tools

Focus groups

Two focus group meetings were held on Wednesday, Nov. 9th with stakeholders and businesses in the area. Members from the following groups were invited:

- Clear Lake Fire
- St. Cloud Police and Fire
- Sherburne County Police
- Stearns County Emergency Management
- State Patrol
- Sauk Rapids Fire
- Bus Services
- St. Cloud Airport
- Department of Natural Resources
- Visit St. Cloud
- St. Cloud Chamber of Commerce
- BNSF
- Minnesota Highway Safety & Research Center
- Minnesota Correctional Facility

Public meeting

A public meeting was held from 4:30 p.m. to 6:30 p.m. on Wednesday, Nov. 9th, 2022, at the Haven Town Hall. Forty-seven people signed in. Seven people provided written comment at the meeting. Large layout plots of the alternatives were posted along the walls of the room. Posterboards of the maps were on easels throughout the room. MnDOT and KLJ staff were present to greet attendees, answer questions, and explain the concepts.

Figure 6: Public Involvement #3 Public Meeting

Website

The website was updated to reintroduce the purpose of the study, what had been done, what was happening this round, and how feedback will be used in the future. The website broke down the six alternatives into Low-, Mid-, and High-Cost options and provided videos and maps for each. The survey was linked to the website, which also embedded the maps throughout the survey.

Drop down menus on the website allowed visitors to expand each cost option. Once expanded, video links and brief bullet points described the options. This allowed a large amount of content to be consolidated and organized.

Screenshots of the website are included in **Appendix 2C**.

Videos

Seven short videos were produced and included on the website to explain the concepts and the study.

1. Overview video: Briefly summarized the study, the previous efforts, the purpose of the current engagement, and next steps.
2. Comparison video: Focused on explaining the distinct differences and similarities of each option.
3. Low-Cost alternative A
4. Low-Cost alternative B
5. Mid-Cost alternative A
6. Mid-Cost alternative B
7. High-Cost alternatives A and B

Maps

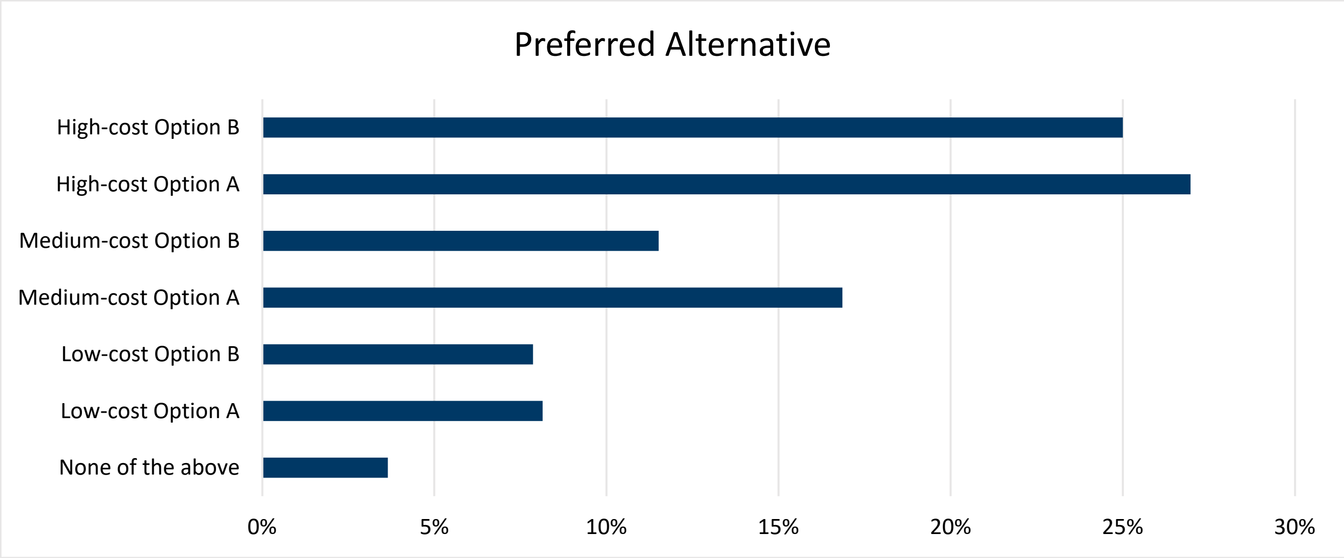
Five high-level maps were created to visually explain all six alternatives. The intersections that would remain were shown on the map and a legend was used to differentiate the types of intersections. The two High-Cost alternatives were shown on the same map, because the difference between them could easily be presented together. The other alternatives were distinct enough to warrant separate maps for each.

Survey

The online survey asked questions to evaluate each alternative independently but also against each other. An open-ended question at the end allowed for comments. A final question was added to evaluate if participants felt they had the information they needed to participate and why. Results of this survey are included in **Appendix 2D**. The survey questions are shown below:

- How best does each option address safety, mobility, and access? Rank 1-5. 1: Worst improvement 5: Best improvement
- Compared to the current conditions on Hwy 10, how well does each option improve the highway? Rank 1-5. 1: Worst improvement 5: Best improvement
- Which two options do you prefer?
- Additional feedback?
- We were hoping to convey complex data in a simplified way. Did you have the information you needed to be able to participate?

Figure 7: Public Survey Results of the Preferred Alternative



Fifteen comments were received during this third round of engagement. These comments are logged in **Appendix 2F**. Various individual and groups contact the project team and were provided responses to their comments.

Public Engagement Opportunity #4 Summary

Overview

The fourth round of engagement was focused on information sharing rather than soliciting for feedback. The goal was to close the loop on communication by sharing the results of the survey and the next steps. The comment form was still active on the project website through March 2023 to allow people to provide additional feedback.

At the completion of this report, the project information remains available on the website. The survey results are summarized in an infographic and the study website has been updated to explain the final recommendations and next steps. A social media post was created as a notification that the results are in and as a thank you for previous participation.

Website

In the previous round of engagement, feedback was given on two versions for each cost level. After the survey results were reviewed and other analyses were performed, the team recommended a blended version of the two Low-Cost alternatives, and a blended version of the two High-Cost alternatives. An explanation of how this happened, why, and how the public influenced the final recommendations is on the study website.

Maps of each of the final recommendations were also shown on the website.

An infographic was created to summarize the survey results in a quick and easy-to-digest way. This infographic is shown in **Figure 8**.

Figure 8: Public Input Opportunity #4 – Graphic of Past Public Engagement Results

Social Media

No paid advertising was slated for this round of involvement. However, a social media video post was created for the District to share organically on their page, as shown in **Figure 9**.

Figure 9: Public Input Opportunity #4 – Social Media Graphics

Technical Advisory Committee (TAC) Meetings Summary

The TAC consisted of technical staff from various agencies and organizations and was responsible for reviewing technical material and providing input throughout the study process. For this corridor report, the TAC consisted of staff from the Minnesota Department of Transportation (MnDOT), Sherburne County, Haven Township, Clear Lake Township, City of St. Cloud, and the St. Cloud Area Planning Organization (APO). The City of Clear Lake was invited to be a member of the TAC but was not a participant. The TAC met a total of nine times throughout the corridor study to review the developments during each phase. Presentation slides for each TAC meeting are included in **Appendix 2G**. The following topics were discussed at each TAC meeting:

- TAC 1: April 5th, 2022
    - Project background and purpose
    - Project overview
    - Public input opportunity #1 plan
    - Project schedule
- TAC 2: May 24th, 2022
    - Review results of existing and future conditions
    - Review results of public input opportunity #1
    - Project schedule
- TAC 3: June 22nd, 2022
    - Define Corridor Issues
    - Safety
    - Mobility
    - Access

    - Establish study purpose, need, and guiding principles
    - Establish corridor vision and goal statements
    - Public input opportunity #2 plan
- TAC 4: July 12th, 2022
    - TAC value profile survey
    - Environmental scan results
    - Propose evaluation criteria and methodology for alternatives analysis
    - Show initial alternative layouts
- TAC 5: August 9th, 2022
    - Review results of TAC value profile survey
    - Review evaluation criteria and methodology for alternatives analysis
    - Show alternative layout updates
    - Discuss bike and pedestrian field walk and assessment results
- TAC 6: September 11th, 2022
    - General review of all work done up to date on the corridor report
- TAC 7: October 11th, 2022
    - Show alternative layout updates
    - Give update on status of alternatives analysis
    - Public input opportunity #3 plan
- TAC 8: December 13th, 2022
    - Show final alternative layouts
    - Review alternatives analysis results
    - Review benefit-cost analysis
    - Discuss recommendation to remove Mid-Cost alternatives from further analysis
- TAC 9: February 14th, 2023
    - Review alternatives analysis results
    - Review public engagement #3 results
    - Discuss implementation plan
    - Discuss merging of Low-Cost alternative A and B into Low-Cost Alternative C, and High-Cost alternative A and B into High-Cost alternative C
    - Give legislative update on funding efforts

The TAC provided valuable feedback throughout the study process particularly for the following items:

- Issues and opportunities identification from both local perspective and technical knowledge
- Stressing the importance of heavy vehicle challenges with acceleration and U-turns on the corridor
- Clarifying importance of full access at County Roads (12th Street SE and 60th Street SE)
- Identifying important existing connections and desired new connections
- Providing technical opinions on location of the interchanges near 15th Avenue SE and Highway 24 for High-Cost alternatives
- Giving feedback on public engagement materials and participating in events

Hwy 10 Corridor Study

HIGHWAY 10 CORRIDOR STUDY
CHAPTER 3: EXISTING AND FUTURE CONDITIONS REPORT

September 2023

DEPARTMENT OF TRANSPORTATION

Prepared by KLJ

Table of Contents

List of Figures

List of Tables

Appendix

Introduction

This report details the existing and forecasted future conditions of Trunk Highway (TH) 10 in Sherburne County, MN. The project extents are from the intersection of Highway 24 in Clear Lake, MN to the intersection of 15th Avenue SE in St. Cloud, MN. The purpose of this report is to establish the baseline and forecasted conditions of the corridor to which future recommendations for improvements will be based upon.

Prior Studies and Planned Projects

Currently, a study is underway by the St. Cloud Area Planning Organization (APO) on a Mississippi River crossing on the southern side of the city. The studied crossing is proposed to connect to Highway 10 on or around 32nd Street (CSAH 3) in Haven Township. No preferred alignment has been selected and the project does not have an anticipated construction year. The St. Cloud APO will be completing additional environmental analysis in the area, and this Highway 10 corridor study will be referenced in future analyses. A Mississippi River crossing study south of Clear Lake was conducted by MnDOT in the past, but there are no plans at this time to construct it. The interchange at Highway 23, just west of the study area, is scheduled to be reconstructed, with an overpass between the interchange and 15th Avenue SE also to be included.

Study Area Characteristics

Demographics

The demographics analysis seeks to explore the characteristics of residents living adjacent to the Highway 10 corridor and provide a comparison between this population and that of Sherburne County as a whole. The analysis is intended to aid in identifying the unique needs, issues, and opportunities present along the corridor, with a focus on corridor residents. The Demographic section of this report began with analysis of the Sherburne County Demographic Profile which can be found in **Appendix 3A**. Then the analysis focused on the Highway 10 Corridor Demographic Profile to explore the unique characteristics of corridor residents with respect to population, race, and income.

Highway 10 Corridor Demographic Profile

The study team developed a demographic profile for residents living adjacent to the Highway 10 corridor. Comparing this profile to the demographic characteristics of the County as a whole provided important context to understand the unique issues, needs, and opportunities of the study area. To complete the profile, the team reviewed the 2020 decennial census and American Community Survey (ACS) data available for block groups adjacent to the corridor. A total of four adjacent block groups were considered relevant to the corridor as they were located within 30 feet of the roadway. More information about the block groups can be found in **Appendix 3A**.

The Highway 10 Project Area had a population of 6,662 in 2020, which comprises 7% of the County's total 2020 population. The population living adjacent to the corridor is more diverse than the countywide population, with nearly 28% of residents within the Highway 10 Project Area identifying as a race other than white, while the County's nonwhite population is 12%. The largest minority group living within the Highway 10 Project Area is African American (19.1% of residents). This compares to the 3.8% of total Sherburne County residents that identify as African American.

The Minnesota Correctional Facility-St. Cloud is located to the east of the corridor; as such, it is important to note the effect that prison inmate populations can have on U.S. Census statistics. Specifically, while prisoners are not included in household income statistics, they are included in per-capita income statistics. Additionally, prisoners are included within population statistics (race, age, etc.). Thus, areas hosting concentrations of inmates might, for example, appear poorer as a result of the inclusion of the prisoners as local residents (by the per-capita income measure). **Table 1** summarizes the racial composition of the Highway 10 Project Area.

Table 1: Racial Composition of the Highway 10 Project Area

Demographic Group	Sherburne County 2020 Population	Sherburne County 2020 % of Total	Hwy 10 Project Area 2020 Population	Hwy 10 Project Area 2020 % of Total
Population	97,183	100.00%	6,662	100.00%
White	85,504	87.98%	4,810	72.20%
Residents of Color	11,679	12.02%	1,852	27.80%
African American	3,666	3.77%	1,273	19.11%
American Indian and Alaska Native	444	0.46%	74	1.11%
Asian	1,295	1.33%	154	2.31%
Native Hawaiian and Other Pacific Islander	22	0.02%	3	0.05%
Other Race	1,189	1.22%	51	0.77%
Two or more races	5,063	5.21%	297	4.46%

In general, the population living adjacent to the corridor experiences higher poverty and lower incomes than the County's population. The 2020 share of households within the Highway 10 Project Area with annual income below the poverty level was 23.9%, compared to 5.9% of countywide households. Per-capita income within the Highway 10 Project Area ranged from $16,628 - $53,749, while per-capita income countywide is $36,022. Economic indicators for the Highway 10 Project Area are summarized in **Table 2.**

Table 2: Economic Indicators for the Highway 10 Project Area

Indicator	Sherburne County 2020	Sherburne County 2020 % of Total	Hwy 10 Project Area 2020	Hwy 10 Project Area 2020 % of Total
No. of households	32,791	N/A	2,523	N/A
No. of households below poverty line	1,945	5.93%	602	23.86%
No. of families	24,373	N/A	1,370	N/A
No. of families below poverty line	783	3.21%	132	9.64%
Median household income	$88,671	N/A	$87,917 - $46,000	N/A
Median family income	$97,655	N/A	$109,886 - $68,304	N/A
Per capita income	$36,022	N/A	$16,628 - $34,368	N/A

By examining the data for individual block groups, it is possible to distinguish the characteristics of specific areas along the corridor. A summary of demographic and economic indicators by block group within the Highway 10 Project Area is provided in **Appendix 3A.**

Land Use

Land use has important implications for the efficiency of highway corridors. For example, a primarily industrial corridor will have peak traffic flows often associated with shift work and must accommodate heavy truck movements. A residential corridor will have strong peaking and directional characteristics as people go to-and-from work and may see a larger share of bicycle and pedestrian travel. The Highway 10 study corridor presents a unique land use context given its location between St. Cloud and the Twin-Cities metropolitan area. This has assigned Highway 10 special importance as a route serving commuter, freight, and recreational travel between the Twin-Cities and destinations throughout north central Minnesota. Locally, extractive operations rely on the corridor for both short and regional freight transport. Additionally, the corridor will continue to serve as a local route for residents as development continues in and around St. Cloud, Clear Lake, and Clearwater. This section discusses existing land use and jurisdiction within the study area.

Jurisdiction

The study corridor traverses several jurisdictions within Sherburne County, including two cities and two unincorporated townships. Portions of this corridor are also within the St. Cloud APO's designated 20-year metro planning area. Beginning on the north, the corridor begins within the City of St. Cloud's eastern boundary and extends southwest, crossing both Haven Township and Clear Lake Township before ending within the City of Clear Lake. The County Board of Commissioners generally retains zoning authority over the townships, with a few exceptions.

One such exception exists on the north end of the corridor, where the City of St. Cloud and Haven Township entered into an Orderly Annexation Agreement in 2010. The agreement, laid out in the Joint Resolution as to Orderly Annexation, is intended to encourage development contiguous to exiting City boundaries and to "limit non-farm rural development." The agreement assigns land use control to Haven Township within the orderly annexation area, and Haven Township agrees to adopt land use controls consistent with the Sherburne County Land Use Plan. The current agreement expires in 2025.

Existing jurisdictional boundaries along the study corridor are shown in **Figure 1.**

Existing Land Use

Nearly eight miles of the 10-mile study corridor are contained within the unincorporated townships of Haven and Clear Lake. Land uses surrounding the corridor – between St. Cloud and Clear Lake – have remained largely rural, characterized by ample farmland, sand, and gravel extractive operations, and a few residential neighborhoods. Sherburne County contains some of the largest aggregate deposits within undeveloped areas of central Minnesota, with significant portions of these deposits located in Haven Township. Existing Sherburne County land use along the study corridor is shown in **Figure 2.**

Figure 1: Jurisdictional Boundaries along the Highway 10 Corridor

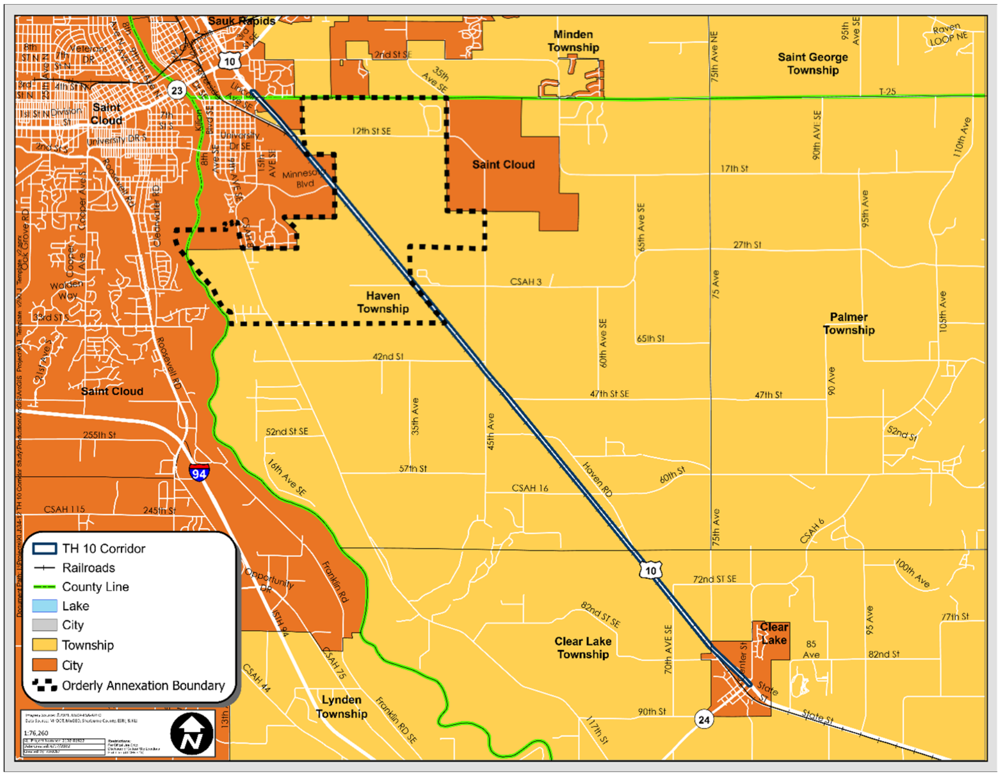
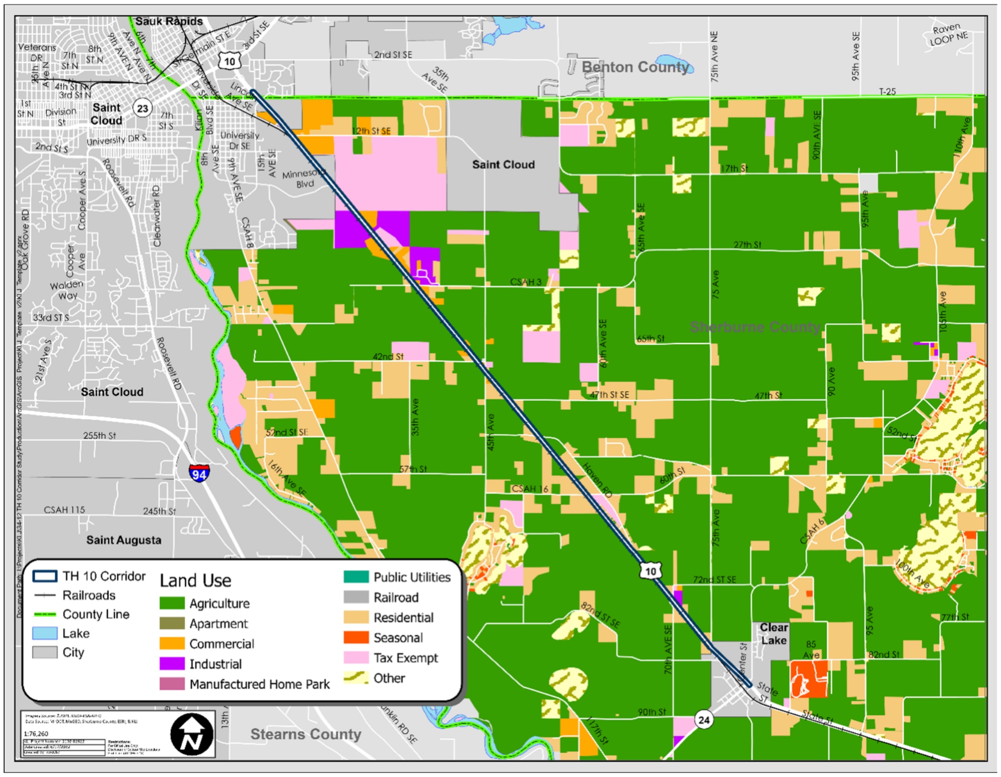
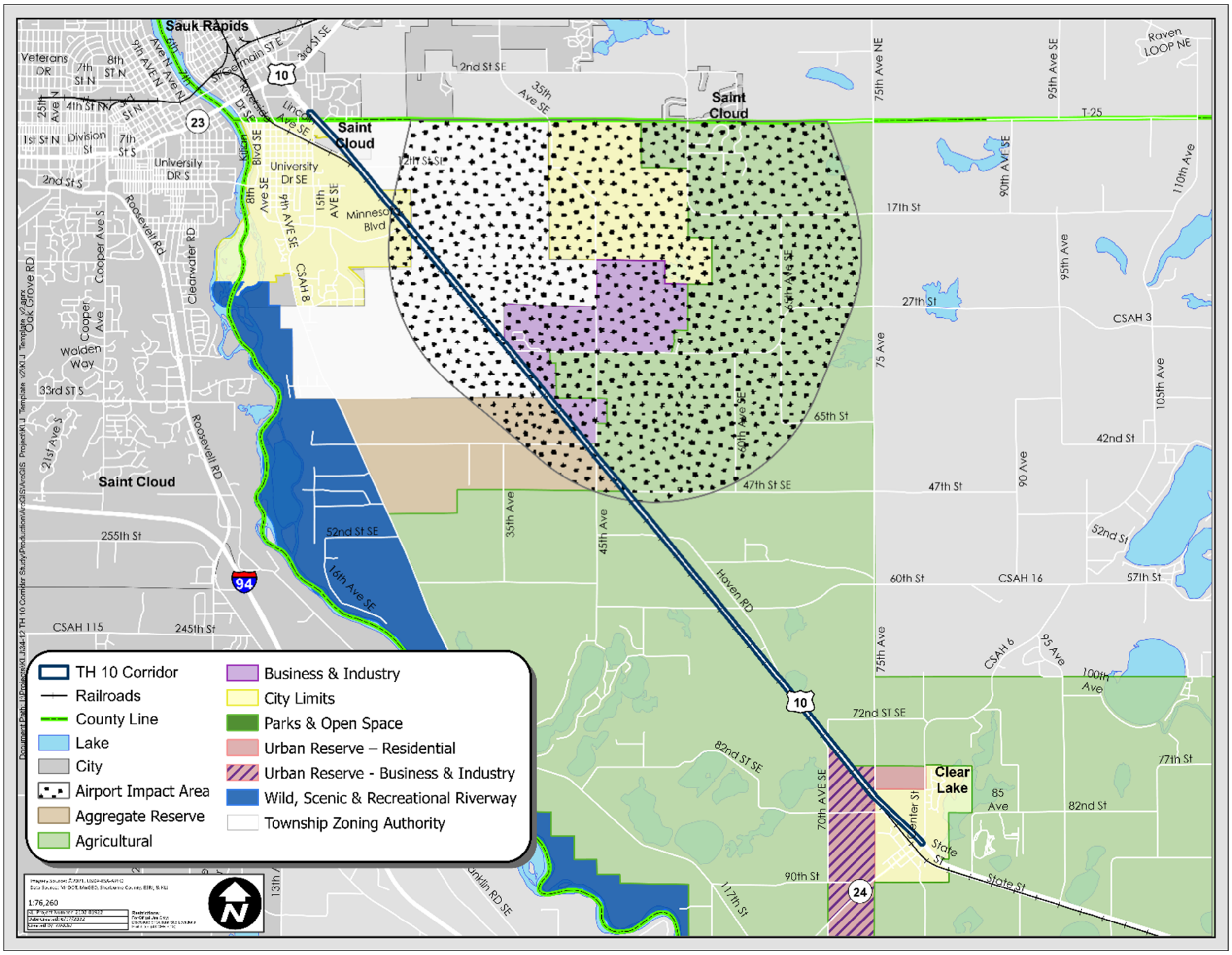


Figure 2: Existing Land Use Along the Highway 10 Study Corridor



Land uses along the corridor, between St. Cloud and Clear Lake, are expected to remain primarily rural over the next several decades. As development increases regionally, it is expected that aggregate deposits will be excavated and processed. These deposits are primarily located in west-central Haven and overlap current agricultural uses. The deposits are also contained within St. Cloud's designated growth area. Once the aggregate is removed, the land is likely to be reclaimed for urban development and parkland. Future land use along the corridor (**Figure 3**) is discussed within the Sherburne County Comprehensive Land Use Plan (2011).

Figure 3: Future Land Use along the Highway 10 Corridor (Sherburne County Comprehensive Land Use Plan 2011)



It is important to note that discrepancies exist between the future land uses contained within the Sherburne County Comprehensive Land Use Plan and those laid out within the St. Cloud Comprehensive Plan Update (2003). The St. Cloud Comprehensive Plan puts forth the Haven Township Growth Area Master Plan, an urban growth area within Haven Township which proposes concepts for future land use and alignments for a 33rd Street river crossing. Some of the planned growth area is located beyond the 2010-2025 Orderly Annexation agreement boundary and is not recognized by the Sherburne County Comprehensive Land Use Plan. As expressed in the Sherburne County Comprehensive Land Use Plan, while the City and County future land use maps conflict, the guiding land use principles for the two jurisdictions are aligned.

Multimodal: Pedestrian, Bicycle, and Transit

Pedestrian and Bicycle Existing Conditions

Facilities Along and Across Highway 10

Pedestrian and bicycle infrastructure is limited along and across Highway 10 in the study area.

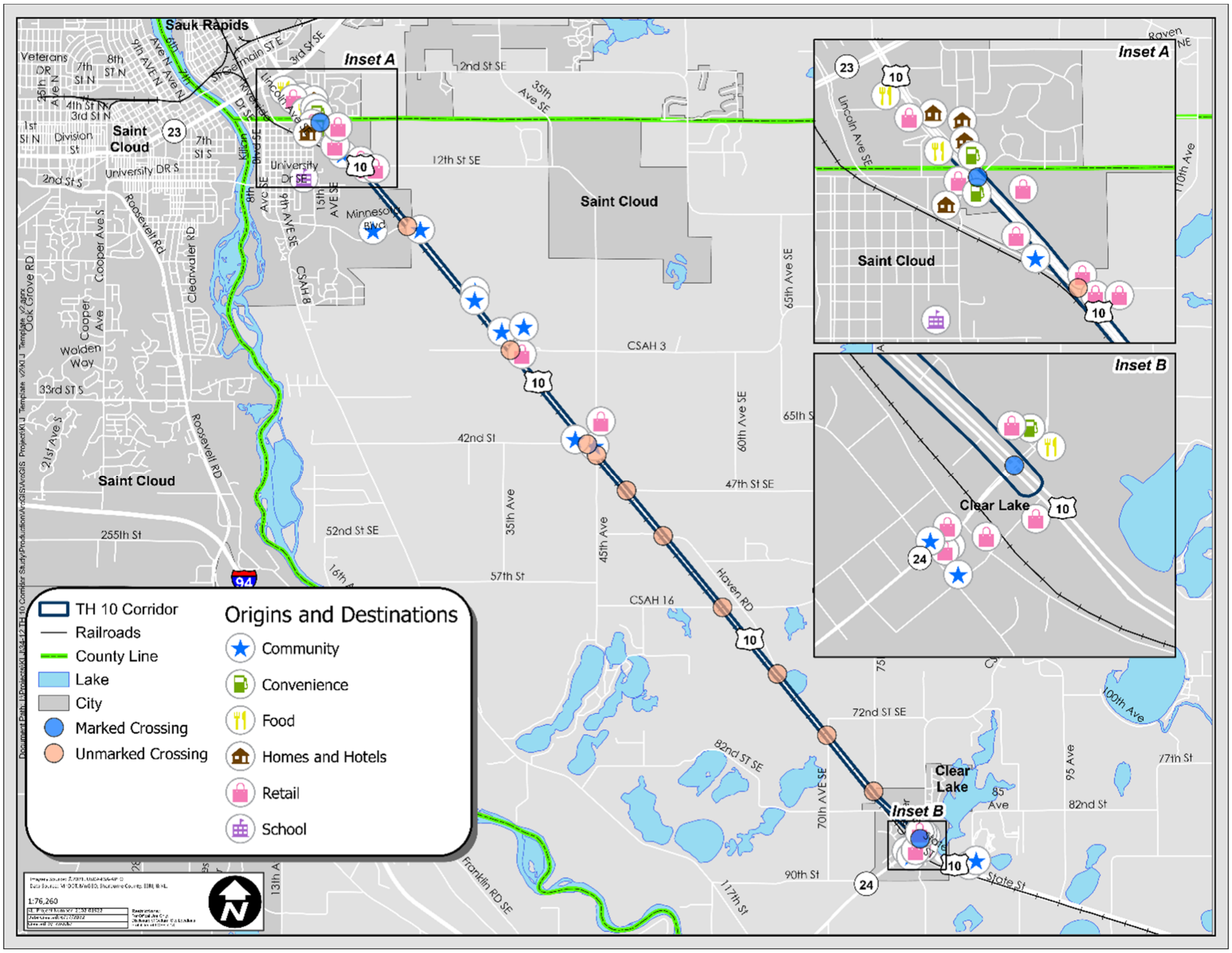
For facilities along the corridor, no trails, shared-use paths, or sidewalk exist on either side of the corridor. Multiple regional trails and United States Bike Route 45 exist west of the Mississippi River and study area, but, within the study area, facilities are limited to paved shoulders with rumble strips next to the outside lanes on Highway 10. Shoulders are approximately 5 to 10 feet wide beyond the rumble strip, which meets technical requirements for a bikeable shoulder. However, given the divided highway design, high speeds, and high volumes of large vehicles (trucks and buses), the paved shoulders would be used by only the most confident and capable pedestrians and bicyclists and does not meet current MnDOT and FHWA bicycle design policy and guidance. There are no facilities for people walking along or across Highway 10, and therefore limited ADA compliance. Public engagement results confirmed these existing condition findings and demonstrated a desire for a pedestrian and bicycle facility along the length of the Highway 10 study area from St. Cloud to Clear Lake.

Figure 4 illustrates bicycle and pedestrian facilities that intersect the Highway 10 study area. The study area includes eleven intersections, with unmarked crossings, where it is legal for people to walk or bicycle across Highway 10. However, walkers and bicyclists are aware that crossing Highway 10 is a high-risk activity due to the roadway geometry, traffic speeds, traffic volumes and lack of standard facilities for people who walk and bike. The high-risk crossing is from a four-lane crossing distance, with most intersections having additional turn lanes to cross, 65 mph speeds or in excess, and AADTs above 20,000, with heavy commercial vehicles. Public engagement results confirmed these existing condition findings and demonstrated a desire for bicycle and pedestrian crossings at nine of the 11 intersections, with the exception of 75th Avenue and 70th Avenue north of Clear Lake. Of the 13 intersections within the Highway 10 study area, two include marked crossings across Highway 10. There are two signalized intersections along the corridor: Highway 24 (Main Avenue) in Clear Lake, and 15th Avenue SE in St. Cloud. The intersection in Clear Lake is signalized, has three legs for pedestrian crossings, has four medians, one leg has a refuge island, large turning radii, and turn lanes on all legs. There is receiving sidewalk on all sides. The intersection in St. Cloud is signalized, has four legs of crossings, two medians with refuges islands, large radii, and has receiving sidewalk on northwestern side of intersection.

ADA compliance will be evaluated on a project basis. Preliminary review shows ramps on each corner, with acceptable width, though slopes are unknown at this time.

Origins and Destinations (O-Ds) are shown by activity centers, with Community, Retail, Convenience, Food, School, and Hotels/Homes being the primary categories. Other than surrounding the St. Cloud 15th Avenue SE intersection and Clear Lake Main Avenue, the existing land uses and activity centers typically do not generate high demand for walking and bicycling. However, all services and places of employment can generate bicycle and pedestrian traffic. The study team completed a pedestrian and bicycle analysis using StreetLight, and no significant findings were identified. The Suitability for Pedestrian and Cycling Environment (SPACE) score was 42 out of 100. For the SPACE analysis, the entire state was divided into hexagons, each a half-mile in diameter. Each hexagon received a score based on 19 factors that indicated demand for walking or biking. A score can be calculated for any area or corridor, with a line feature or polygon shape. The score is calculated from an aggregate of 19 data categories, including concentration of bus stops, schools, and individuals who cannot drive or do not have access to a vehicle, are unemployed, or are living in poverty. These categories align with priorities and populations identified in MN Go and MN Walks. SPACE scores capture an estimate for bicycle and pedestrian demand where bicycle and pedestrian infrastructure does not currently exist. The Highway 10 score of 42 out of 100 is common for most rural Minnesota locations.

Figure 4: Pedestrian and Bicycle Marked and Unmarked Crossings and Origins and Destinations



15th Avenue SE Intersection

The MnDOT District 3 Bike Plan shows the 15th Avenue SE intersection as a County/Local Road Bicycle Investment Route in the Highway 10 study area. The Plan shows no priority bicycle investment routes along the Highway 10 corridor.

Talahi Community School is located in St. Cloud in a residential area, west of Highway 10 and the railroad, and south of the 15th Avenue SE intersection. It prepared a Safe Route to School plan with a half-mile radius "walk shed" around the school where the school encourages parents to allow children to walk or bicycle to school. The radius is need-based and does not consider if pedestrian and bicycle infrastructure exists or is safe within the travel shed. The Talahi Community School Safe Route to School travel shed does not extend across the Highway 10 study area.

Two St. Cloud Metro Bus routes cross Highway 10 at the 15th Avenue SE intersection in St. Cloud. Northstar Link or Route 887 has transit stops along the corridor, particularly at the Northstar Link Park-and-Ride or Lincoln Avenue SE (CR 63) intersection. Key results from the Demographics mapping are a higher priority population surrounding 15th Avenue SE intersection in St. Cloud.

The Pedestrian Areas for Walking Study (PAWS) from the Minnesota Statewide Pedestrian System Plan shows the St. Cloud intersection at 15th Avenue SE, as well as Minnesota Boulevard SE, within Tier 1 zones. The Auto Truck and Equipment company north of Cable, MN is also in the Tier 1 zone. It is assumed this location will be reviewed similar to all unmarked crossing locations. The PAWS analysis, similar to SPACE, integrates equity, safety, land use, health, and infrastructure considerations to identify the highest priority areas for walking on trunk highways across the state. The half-mile hexagons across the state were divided into five tiers, with the highest scoring hexagons (most need) receiving a Tier 1 ranking, and least need receiving a Tier 5 ranking. A Tier 1 ranking includes the top 0.2% of all hexagons.

Pedestrian and Bicycle Future Conditions

Highway 10 was identified in the following planning documents as a key future bike and pedestrian corridor with the following designations, classifications, or titles:

- Proposed Greenway in the City of St. Cloud Comprehensive Plan (March 2016), Chapter 7 of Transportation and Mobility and Chapter 9 of Parks, Recreation and Environmental Features
- Proposed Shared-Use Path in the Sherburne County Parks, Trails, and Active Living Plan (May 2016)
- New Regional Network Connector in the Sherburne County Regional Active Transportation Plan (Nov 2015)

Highway 10 is not listed as a Trail Corridor in the following plans:

- Sherburne County Transportation Plan (Nov 2019); CSAH 8 is a potential trail corridor, which is a parallel route
- No specific trail connections are planned for across the Highway 10 corridor: however, a potential trail crosses Highway 10 in Clear Lake in the Sherburne County Transportation Plan (Nov 2019)
- Safe Route to School Plan for Talahi Community School
- MnDOT District 3 Bicycle Plan
- St. Cloud APO Long Range Transportation Plan 2040 (Adopted Oct 2014)

New pedestrian and bicycle access is being added within the MnDOT Highway 23 and 10 interchange projects. This includes a grade-separated crossing along the new local roadway that connects 4th Street to the Service Road less than a mile from the north termini for this study (15th Avenue SE intersection).

New pedestrian and bicycle access is assumed with the future Mississippi River bridge crossing.

Larger volumes of high-speed traffic in the Highway 10 study area, including large volumes of trucks and buses, will continue to make in-lane or shoulder-running bicycling intimidating and will continue to discourage longer distance bicycle trips. Widening the shoulders for longer distance bicyclists is not planned along Highway 10.

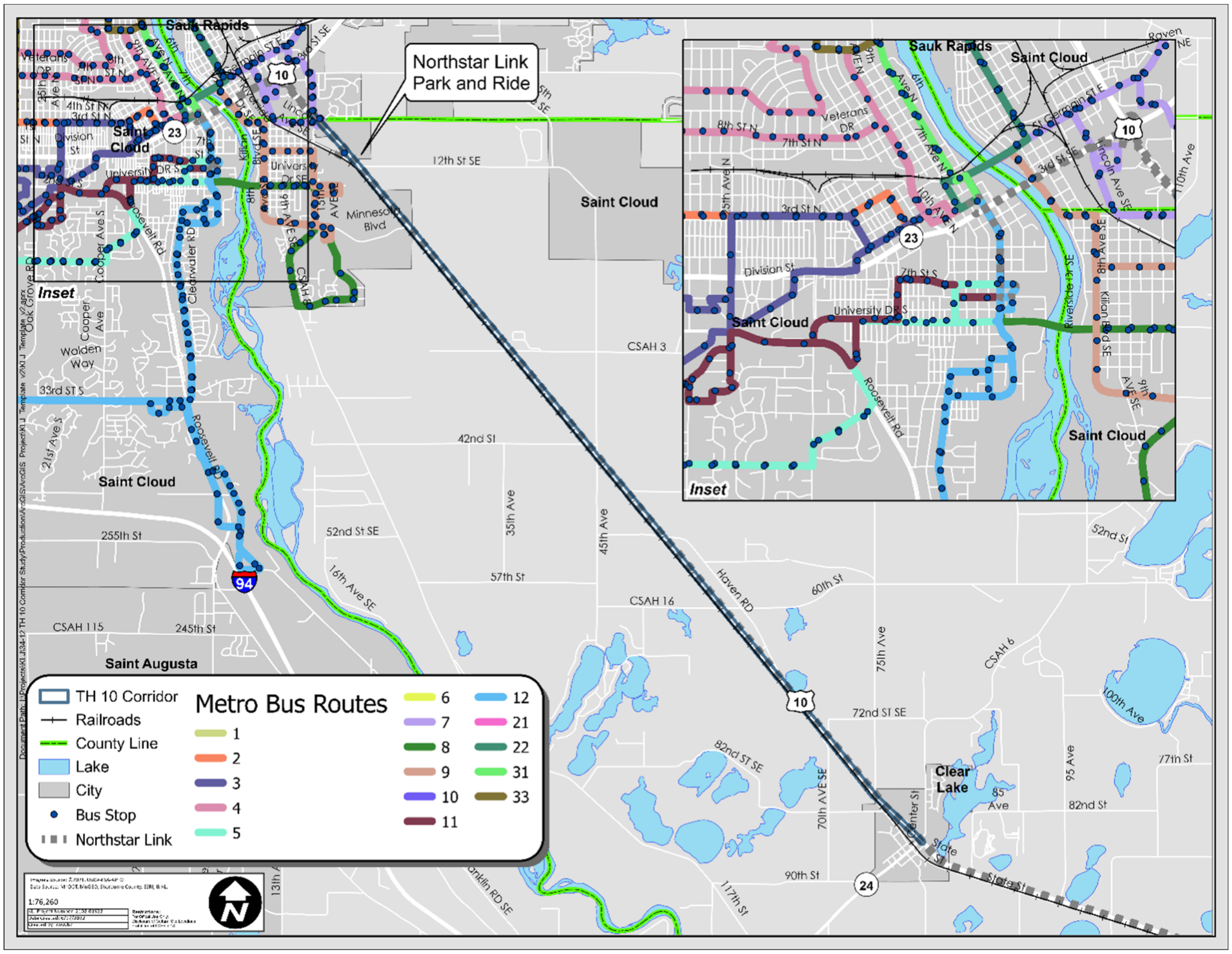
Marked crossings of Highway 10 to access the US BR 45 west of the River or the St. Cloud River Walk, Beaver Island Trail, Scenic River Trail, and Lake Wobegon Trail, (i.e., more comfortable, safer, and ADA-accessible facilities) are encouraged by the St. Cloud Long Range Transportation Plan, and Minnesota Statewide Pedestrian System Plan. Connected sidewalk facilities to existing and future marked crossings is encouraged by the St. Cloud APO Long Range Transportation Plan 2040, and Minnesota Statewide Pedestrian System Plan.

Transit Existing Conditions

Transit routes run through and along the corridor, but do not have transit stops directly on Highway 10. These routes and stops are shown in **Figure 5**. Most stops occur on the service roads adjacent to Highway 10. Bus services include Palmer, Trobec, and Voigt, who run school buses along and across Highway 10. Palmer and Voigt services run between 20 and 30 buses daily, Monday through Friday. The bus service is concentrated on students for the St. Cloud and Sherburne School Districts. The buses generally run at all times of day, with a low in the middle of the day.

St. Cloud Metro Bus has dial-a-ride service, and fixed routes along the corridor. St. Cloud Metro Bus runs Route 6 and Route 7, which both cross at the St. Cloud 15th Avenue SE intersection. St. Cloud Metro Bus Northstar Link or Route 887 has a transit stop along the corridor at the Northstar Link Park-and-Ride or Lincoln Avenue SE (CR 63) intersection. There are no pedestrian or bicycle crossings to this station, or trail connections. Northstar Commuter Rail service is currently provided from Minneapolis Target Field Station to a station in Big Lake, MN, with daily service along the BNSF railway adjacent to Highway 10. This service is adjacent to the Highway 10 study corridor. Tri-Cap runs regularly daily service surrounding and across Highway 10 for employers like Function Industries and Option.

Figure 5: Transit Routes and Stops Along and Across Highway 10



Transit Future Conditions

St. Cloud Metro Bus Northstar Link or Route 887 plans to become commuter rail service in the future. New Northstar Commuter Rail transit stations have been discussed or planned, replacing the current park-and-ride in St. Cloud at the Highway 63 intersection. Future Northstar Commuter Rail plans include using the railroad tracks adjacent to Highway 10. St. Cloud Metro Bus plans to continue the existing routes crossing Highway 10. Bus services plan to continue service to each of the school Districts, and Tri-Cap plans to expand their services, running more buses, crossing Highway 10.

Access Management

Along Highway 10 there are multiple intersections and driveways that have both public and private uses between St. Cloud and Clear Lake. When the highway was originally developed by the Minnesota Highway Department, it was a two-way local road serving farmland. Since the 1950s, the corridor function, cross-section, and access points have transformed. Based on the 1950 right-of-way maps, access points were provided along Highway 10 wherever needed to encourage development and access for local landowners to conduct agricultural business and reach the main thoroughfare. Many of these access points from 1950 are no longer in use along Highway 10, and the study team recommends MnDOT formally close these access points.

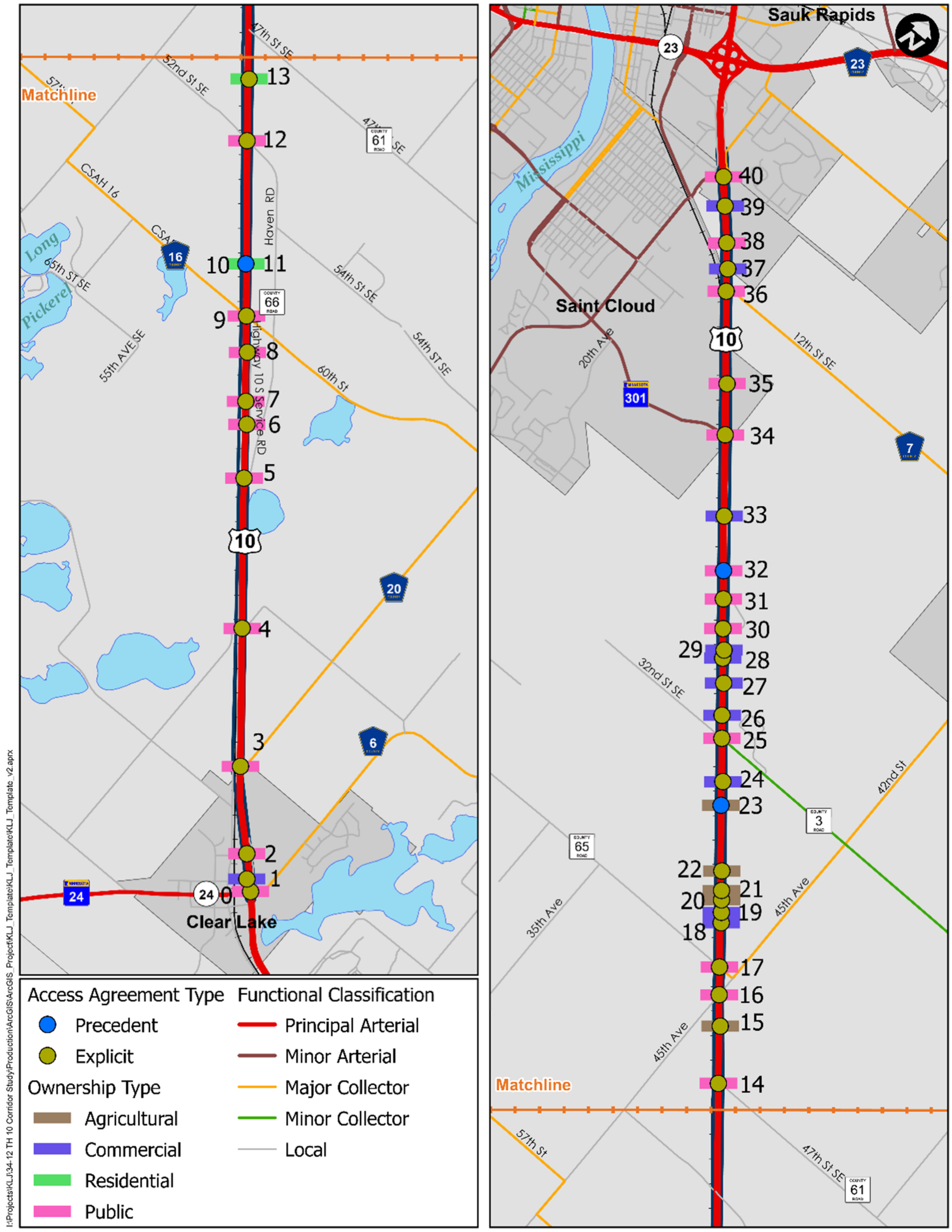
Figure 6 illustrates where these criteria are located for each driveway or intersection. **Figure 7** illustrates the access type for each private driveway, unsignalized intersection, and signalized intersection in the Highway 10 corridor study area.

The study team created a GIS-based inventory of existing accesses by location. The GIS shapefile was populated by reviewing access points from Google Earth (imagery date 5/29/2015) and Sherburne County's parcel and plat inventory, documenting their location and attributes. More information about the access inventory methodology can be found in **Appendix 3B.**

BNSF Railway right-of-way (ROW) parallels the Highway 10 corridor on the south side throughout the study area. Based on review of the MnDOT ROW maps, the study team noted railroad ROW lines do not break for driveways or intersections. The study team recommends MnDOT clarify the legal standing of these access points within BNSF ROW during future engineering design work.

Specific concern was raised for agricultural equipment access regarding the crossing of Highway 10 and the parallel BNSF railroad tracks. A quiet zone project at the Highway 24 intersection narrowed the roadway with construction of the median and outer curb on the southwest leg of the intersection. This construction made the roadway too narrow for various agriculture equipment that had previously used the traffic signal to cross Highway 10 prior to the quiet zone project. After the project, agriculture equipment was diverted to 70^{th} Avenue to cross Highway 10, which remains the current crossing location today. The public expressed dislike of crossing at 70^{th} Avenue, as it is not controlled by a traffic signal, has higher vehicle speeds, and is a longer route. It was requested that changes be made with the corridor alternatives that would enable the crossing of agriculture equipment to return to crossing at the Highway 24 intersection.

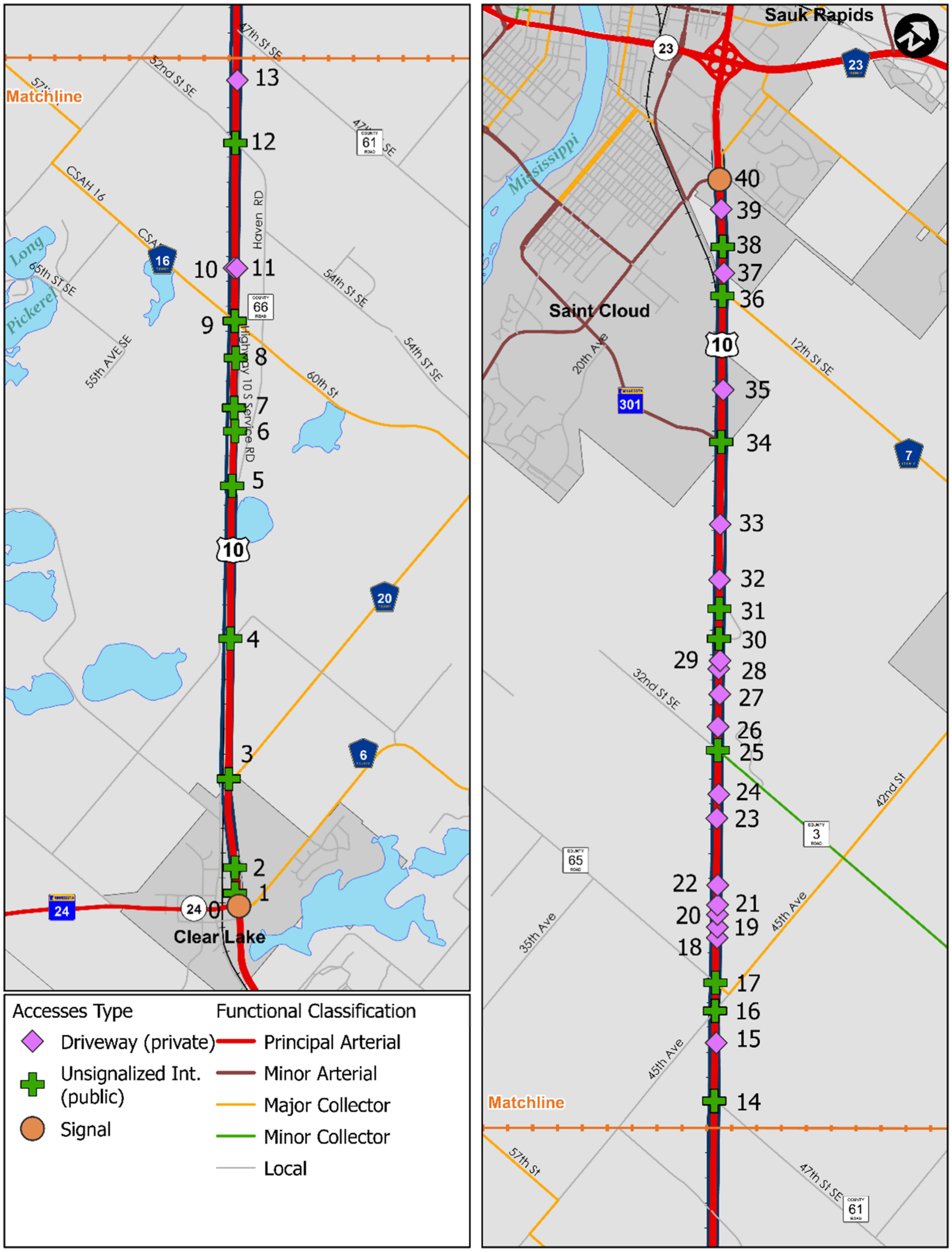
Figure 6: Access Agreement Type and Ownership Type



Source: MnDOT, MnGEO, Sherburne County, ESRI

June 2022

Figure 7: Access Type



I:\Projects\KLJ\34-12 TH 10 Corridor Study\Production\ArcGIS\ArcGIS_Project\KLJ_Template\KLJ_Template\KLJ_Template_v2.aprx

Source: MnDOT, MnGEO, Sherburne County, ESRI

June 2022

Within the MnDOT Access Management Manual, between the Sherburne and Benton County line in St. Cloud and Highway 24 (Main Avenue) in Clear Lake, Highway 10 is a non-interstate freeway or expressway, Category 1AF, with speeds between 55-65 mph. Based on MnDOT policy, this category of arterial is an access-controlled highway with recommended access "… between two at-grade, full-movement intersection spacing on an AF Highway is one mile." Within the Highway 10 study area and based on this policy, the corridor should have one full-movement intersection per mile and no more than ten full-movement intersections in the study area. The MnDOT Access Management Manual reads, "On subcategory AF highways transitioning to freeways, it is likely that both at-grade intersections and interchanges will be present. All at-grade intersections should be considered interim. The desirable spacing between an at-grade intersection and the merge point of the closest ramp should be a minimum of one-half mile. If one-half mile cannot be attained, a shorter spacing may be considered if analysis shows that the shorter distance would not create unacceptable weaving operations."

On a non-interstate freeway transitioning to full access control, Category 1AF, the MnDOT Access Management Manual states, "driveways should not be permitted if reasonable convenient and suitable alternative access is available". While MnDOT policy states driveway access should not exist within access-controlled corridors, it also acknowledges in a transitioning corridor driveway access may be needed and allowed where reasonably convenient and suitable access cannot be provided. The manual notes that driveways and new driveways may be allowed based on an understanding that alternative access will be required in the future.

All existing intersections are spaced closer than one mile (within 5280 feet). **Appendix 3B** lists the intersections and driveways that are recommended to change in the future to meet access management guidelines.

Corridor Function and Connecting Roadways

The study team developed street and highway network options for the study area. These are developed based on review of:

- Existing access and recommendations
- MnDOT access policy, including interchange spacing
- Existing functional classification, including spacing guidelines
- Existing roadway connectivity
- Existing adjacent land uses and potential future uses
- Opportunity to add service / local access roads to service existing access point / land use
- Mississippi River Bridge Planning Study Area

The goal of street and highway network is to balance access to land with transportation safety and mobility. To deliver this balance, planners have implemented a system called "Functional Classification" with each roadway receiving a designation of urban or rural:

- Principal Arterial (Interstate, Non-Interstate Freeway or Expressway, or Other Principal Arterial)
- Minor Arterial
- Collector (Major or Minor)
- Local Road

Weekly and Seasonal Analysis

Ratios of directional traffic vary considerably throughout the week, with directional splits being generally equal during the work week but diverging over the weekend. Specifically, the directional split on Friday demonstrates considerably more northbound/eastbound traffic than southbound/westbound, with the split being approximately 60%/40% for all Highway 10 locations on this day. This trend reverses on Sunday, with an approximately 40%/60% split for northbound/eastbound and southbound/westbound traffic for all Highway 10 locations.

Various trends were noticeable when volumes were averaged across different time periods. In general, average total volumes were higher during summer than throughout the year, reflecting the role that the Highway 10 corridor serves as an access route for summer activities. Traffic volumes are highest during the weekend for all seasons, with Sunday volumes on the corridor increasing by as much as 10,000 over weekday (Monday-Thursday) volumes during summer. In the north end of the corridor, which is highest in volume for the study area, the ADT increases from 25,000 ADT to 35,000 vehicles per day (40% increase). More information is available in **Appendix 3D**.

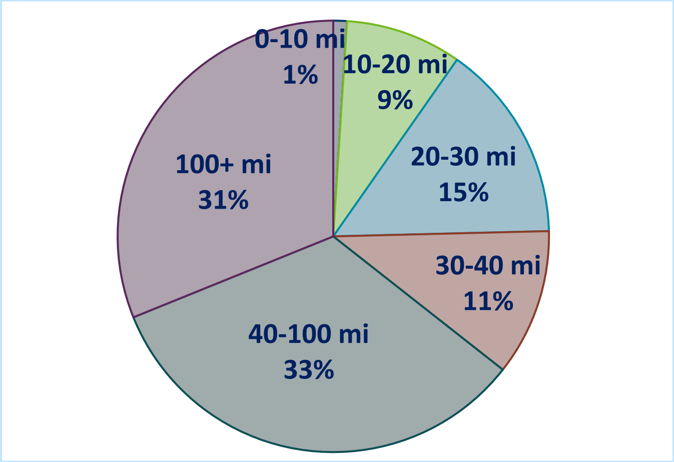
Trip Types (Regional vs. Local)

The travel behavior analysis for the corridor demonstrates that approximately 9,627 daily northbound trips are regional, while approximately 2,975 northbound trips are local. For daily southbound trips, approximately 9,935 are regional with 2,404 being local. In total, approximately 19,562 (78%) regional trips and 5,379 (22%) local trips use the corridor daily.

Trip Lengths

Examining the length of trips provides another tool for exploring the regional and local use of the corridor. To complete the trip lengths analysis, StreetLight zones were placed throughout the Highway 10 corridor (mainline), and the portion of total trips by length range was documented. The analysis was conducted for 2021. **Figure 8** shows the percentage of trips by length range that interacted with the corridor. Ninety percent of trips are 20 miles in length or longer, indicating they are coming or going (or both) from somewhere outside of the metro areas of St. Cloud, Clear Lake, and areas adjacent to the corridor. Ten percent of trips have a length between 0 and 20 miles, a geographic range that includes St. Cloud, Clear Lake, and neighboring municipalities such as Monticello, Becker, Zimmerman, and St. Joseph. Nearly one third of trips have a length of 100 miles or more.

Figure 8: Average Trip Lengths in 2021



Parallel Routes Analysis

A parallel routes analysis was conducted to explore travel patterns between the Highway 10 corridor and other major regional corridors. The analysis was conducted using a StreetLight Top Routes between Origins and Destinations analysis type to observe trips that passed through parallel corridors before using the Highway 10 corridor.

A central observation of the analysis is the lack of continuous east-west routes throughout the study area. The lack of connectivity forces motorists to travel north-south on Highway 10 and other arterials to complete their east-west trips. This manner of travel creates longer travel times, increases traffic volumes through cities, and contributes to congestion and operational issues on Highway 10.

Natural barriers in this area of Sherburne County present challenges to roadway connectivity. There is currently a lack of river crossings between St. Cloud and Clear Lake. This issue is being explored by the St. Cloud APO Mississippi River Bridge Planning Study (2022), which is evaluating options to extend 33rd Street across the river to connect with Highway 10. This and other options have the potential to relieve pressure on Highway 10. North-south travel is necessary to complete an east-west trip across the study area.

Freight Traffic

StreetLight was used to explore how freight traffic accesses and uses the Highway 10 corridor. The analysis examined freight travel patterns and volume distributions to, from, and along the corridor.

Analysis

Several patterns were observed for freight traffic traveling to, from, and along the Highway 10 corridor. These patterns are summarized below.

Northbound Freight Traffic on the Corridor:

- For freight trips accessing the study area from the south, about 60% of trips enter from Highway 10 on the north of the Mississippi River. Roughly 40% access the corridor from the south of the river on I-94 and Highway 24 through Clear Lake. Northbound trips often originate from within the Twin-Cities region, with notable volumes traveling from as far as Mason City, IA and Mauston, WI.
- About 80% of northbound freight trips travel the entire corridor, with a small portion (approximately 5%) exiting on Minnesota Boulevard to cross the Mississippi River at University Drive SE and roughly 15% reaching their destinations or exiting on minor approaches along the corridor. Roughly 50% of northbound freight traffic travels through Little Falls, where it continues north on Highway 10 and Highway 371.
- Frequent destinations for northbound freight traffic along the corridor are the UPS Customer Center and industrial land uses at 32nd Street SE, as well as the rest area immediately to the north. Freight traffic also frequently exits left at 15th Avenue SE to access the Kwik Trip and dining options located adjacent to the corridor.

Southbound Freight Traffic on the Corridor:

- About 65% of southbound traffic enters the corridor on Highway 10, 15% enters from Highway 23 east and west of the Highway 10 corridor, and a small portion (2%) enters from Minnesota Boulevard. High volumes of southbound freight trips run south from Little Falls, with notable volumes originating from Bemidji and Detroit Lakes.
- The majority of southbound freight trips travel the entire corridor, with a small portion (approximately 2%) exiting on Minnesota Boulevard. South of the corridor, freight traffic continues on Highway 10 and I-94 to destinations throughout the Twin-Cities region and beyond.
- A small portion of southbound freight traffic (roughly 3%) turns left at 32nd Street SE to access the UPS Customer Center and adjacent industrial land uses.

Figure 9 and **Figure 10** show traffic distributions for daily freight trips interacting with the corridor. Distributions are shown for trips traveling north and south from 47th Street SE to their various locations indicated on the map. The percentage of total trips is indicated for routes that carry significant volumes of freight traffic to and from the corridor.

Figure 9: Distribution of Freight Traffic Traveling North from 47th Street SE

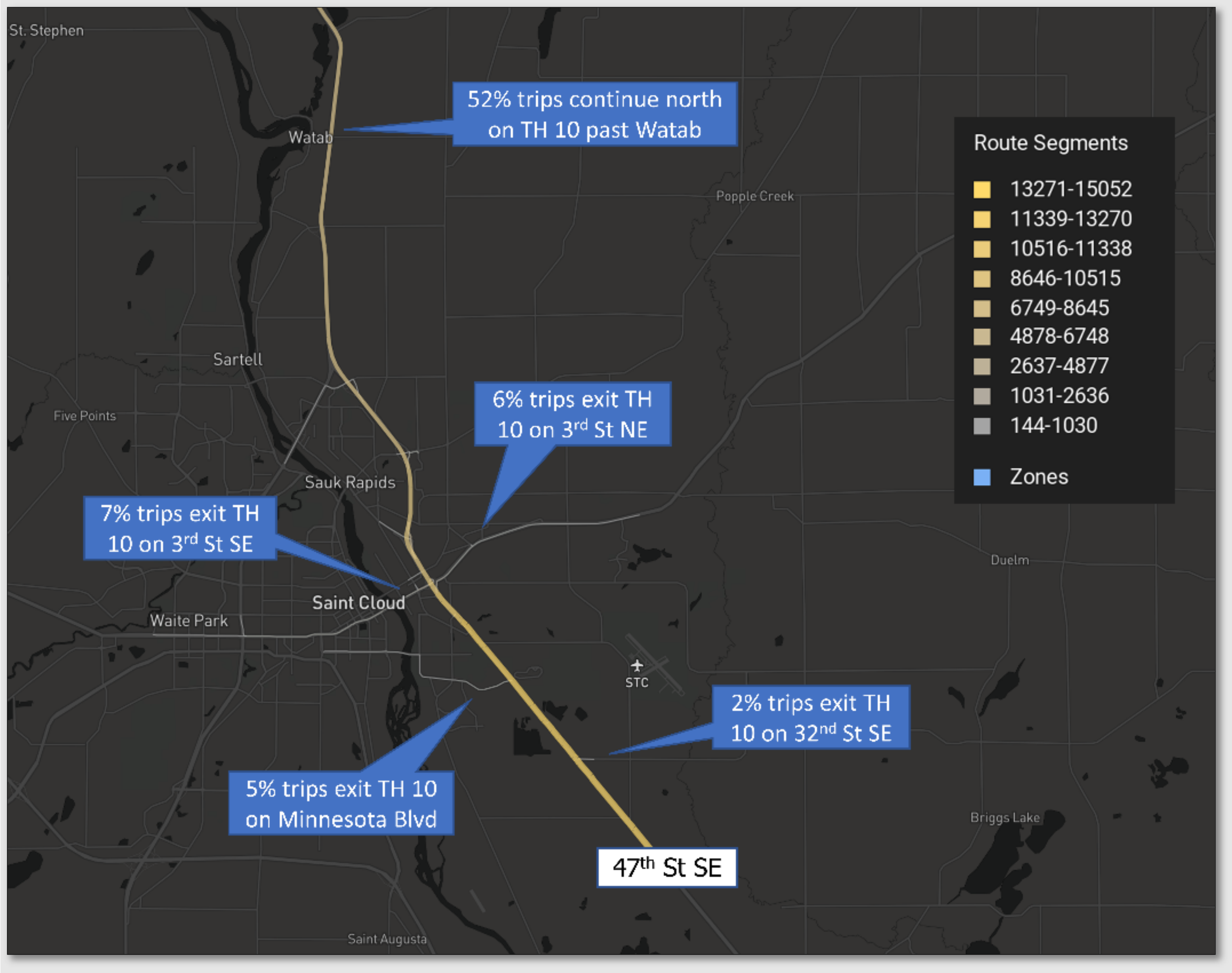
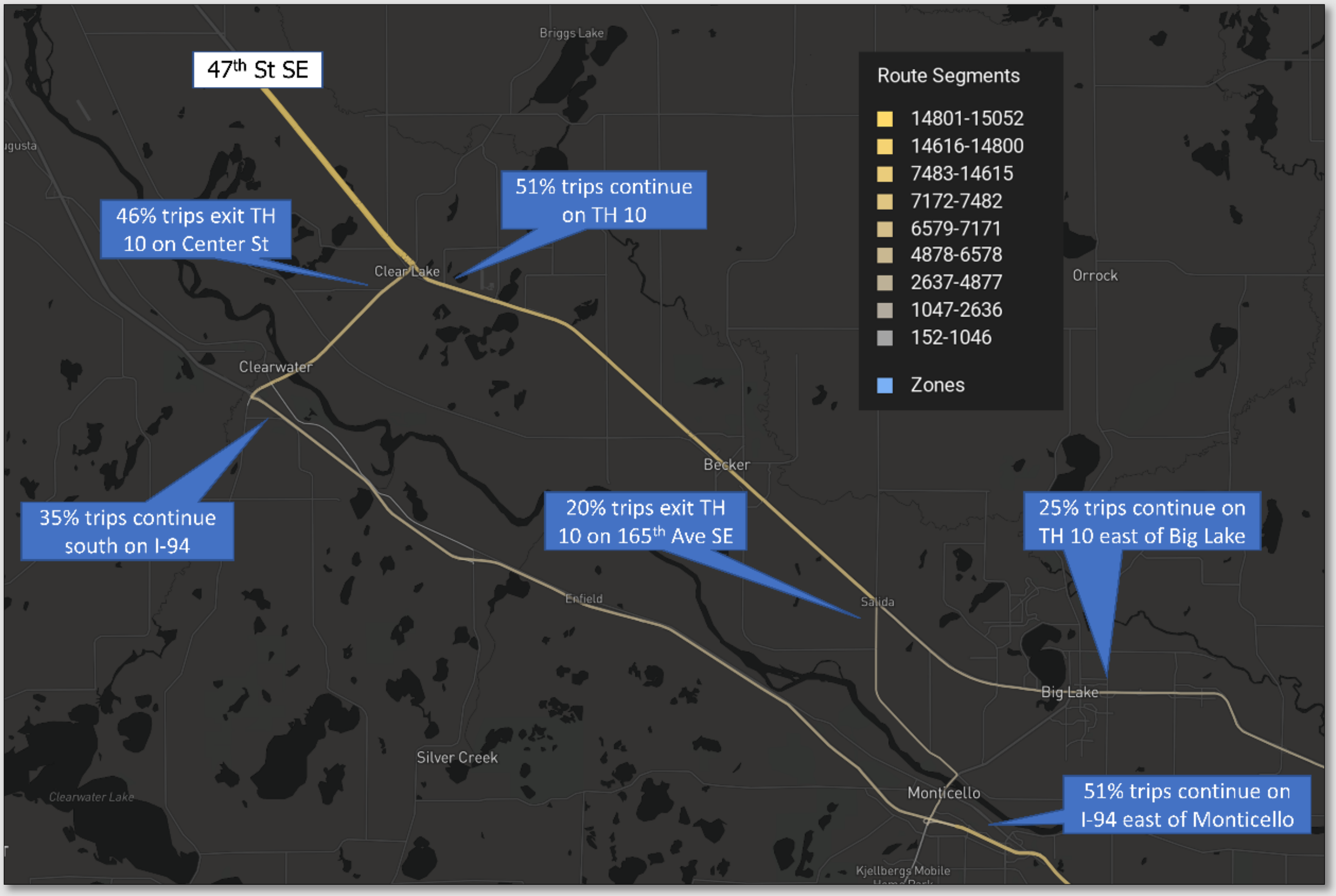


Figure 10: Distribution of Freight Traffic Traveling South from 47th Street SE



Intelligent Transportation Systems (ITS)

Intelligent Transportation System – Existing Conditions

Currently the Highway 10 corridor has minimal ITS equipment that was installed under various projects since 2009. The existing equipment is integrated to the Intelligent Roadway Information System (IRIS) software and is managed out of the Regional Traffic Management Center (RTMC) in Roseville, MN. **Figure 11** represents the current equipment deployments along the study corridor.

Fiber Optic Communications

Under the ongoing construction of State Project No. 0503-91 during 2023 and 2024, a 72 SM trunk fiber is currently being installed. This fiber runs from the existing splice vault at the junction of Highway 23 and Lincoln Avenue, extending north along Highway 23, and turning east along Highway 10. The installation ends at a splice vault situated in the southwest quadrant of Highway 10 and 15th Avenue SE. Notably, this newly established fiber optic splice vault is positioned closest to the northwestern end of the study corridor.

In the opposite direction, the nearest fiber optic splice vault to the east along Highway 10 is positioned at Upland Street in Elk River, MN. This vault was constructed in 2020 as a part of State Project No. 7102-135. It is essential to note that the location of this vault is roughly 25 miles east of the study corridor.

To the south, the nearest fiber optic splice vault is located along Highway 24, situated in the southeast quadrant of the Interstate 94 and Highway 24 interchange. This vault location was constructed under State Project No. 8680-173 and serves to connect ramp terminal signals at the interchange. The vault location is roughly two miles south of the study corridor.

Closed-Circuit Television (CCTV) Cameras

There is a Closed-Circuit Television (CCTV) camera mounted in the northwest quadrant of the intersection of Highway 10 and Highway 24 in Clear Lake. The camera is on a 40-foot tip down pole with a pole-mounted cabinet. This camera was originally installed as part of the TIGER project around the year 2009 and was most recently upgraded to a COHU HD Rise 1 in November 2019. The camera originally connected wirelessly to Enfield tower, but was switched to connect to the trunk fiber to get back to the RTMC through RTMC NET. Communications were changed to a cellular modem in May 2023. As a result of the wireless connection, the video is not identified as streamable or Visual Display Unit (VDU)-ready. The MnDOT 511mn.org system provides static images from the camera.

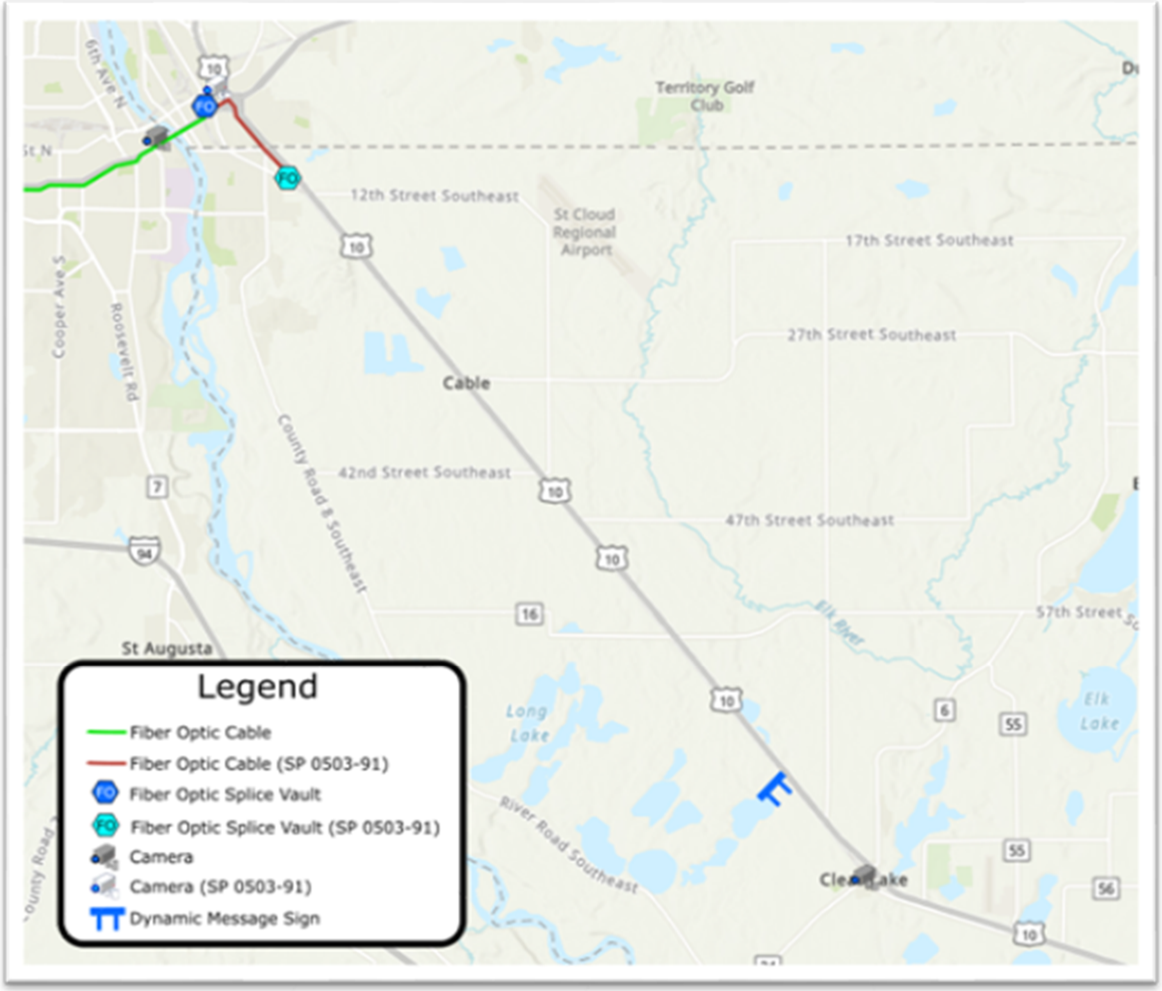
Dynamic Message Signs (DMS)

A Dynamic Message Sign (DMS) is located approximately 1.5 miles west of the Highway 10 and Highway 24 junction in Clear Lake, positioned to face eastbound traffic. This DMS was constructed in November 2020 as part of State Project No. 8816-2627. It was manufactured by LEDSTAR with model number LDC32. Its primary functions are conveying incident alerts, as well as general purpose messages.

Detection

Currently there is no detection along the corridor.

Figure 11: Existing ITS Equipment



Intelligent Transportation System – Future Conditions

As the Traffic Management System continues to grow throughout the state, MnDOT has identified Highway 10 as a corridor that requires additional ITS infrastructure instrumentation. The proposed devices will be primarily run by the IRIS software and managed out of the Regional Traffic Management Center in Roseville, MN. **Figure 12** illustrates the future ITS equipment intended for deployment along the Highway 10 study corridor.

Fiber Optic Communications

There are plans to install a fiber optic communications trunk cable along the Highway 10 corridor, stretching from Highway 25 in Big Lake on the eastern end to the existing splice vault located in the southwest quadrant of Highway 10 and 15th Avenue SE on the western end. The ultimate goal is to establish connectivity between the Highway 10 trunk fiber segment and the I-94 trunk fiber, utilizing Highway 23 and 15th Avenue SE, and Highway 24 to create the essential infrastructure for ring networks.

Closed Circuit Television (CCTV) Cameras

There are upcoming plans to install additional CCTV cameras at specified intersections along the corridor to monitor both the corridor and intersection operations. These new cameras, along with the existing camera at the Highway 10 and Highway 24 intersection, will be linked to the planned fiber infrastructure. The video captured by these cameras will be VDU-capable and will be available for streaming. These images will also be accessible to the public through the 511mn.org website and app.

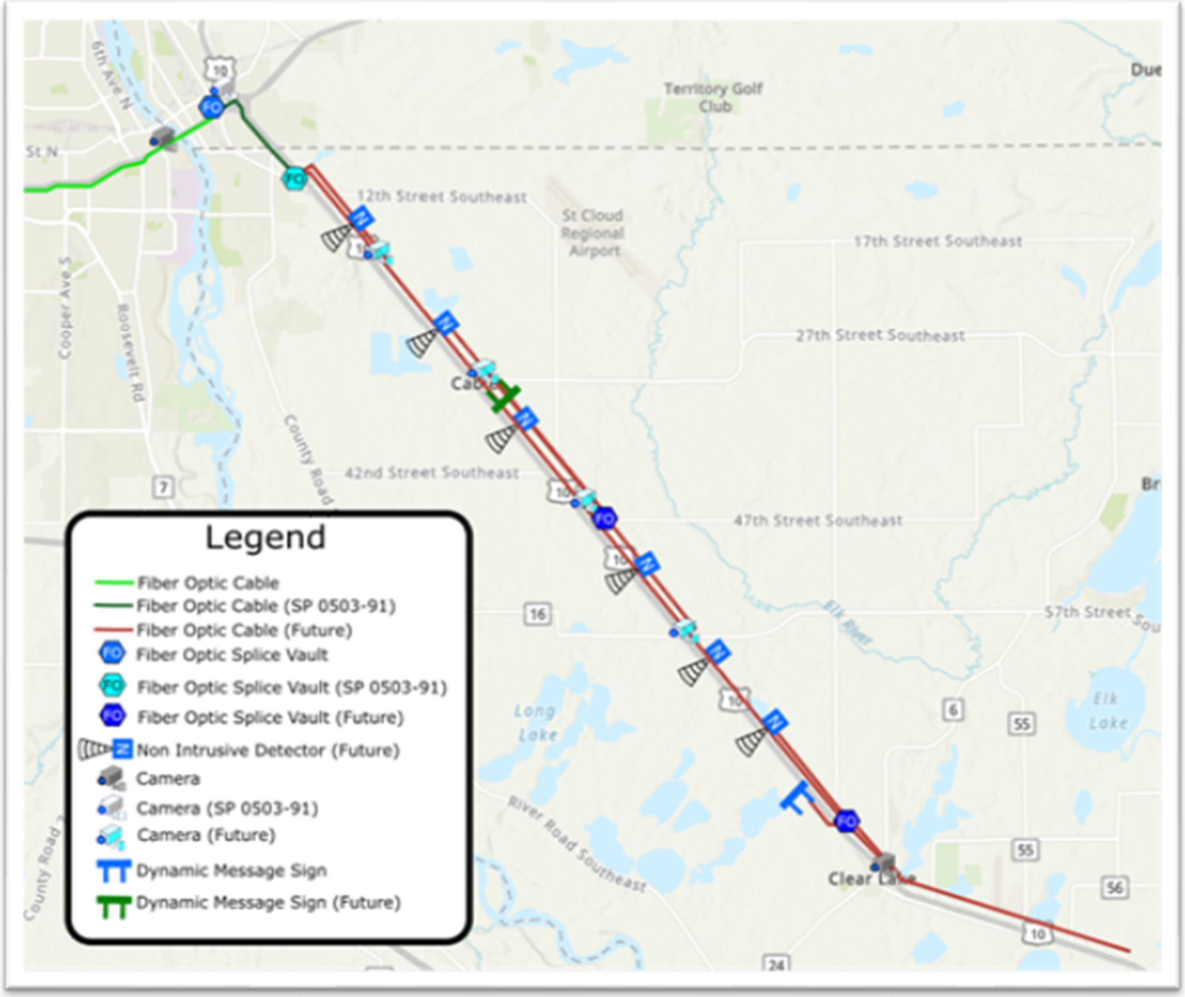
Dynamic Message Signs (DMS)

There are plans to install an additional DMS for westbound traffic, located east of 32nd Street SE. This DMS will be strategically positioned to serve as a tool for managing truck parking when it is not being used for incident management purposes. Both the new and existing DMS will be linked to the planned fiber network, integrated into the IRIS software, and managed from the RTMC in Roseville, MN. These signs will serve various purposes, including conveying incident alerts, general messages, and travel time information. The analysis of travel times will be supported by MnDOT's Clearguide subscription, which aggregates data from various sources, with HERE as its primary source.

Detection

MnDOT is planning to implement detection along the corridor to enhance traffic management capabilities. Detector stations will be strategically placed at intervals of 1.0 to 1.5 miles throughout the corridor. These detector stations will be connected to the trunk fiber network, and they will be operated using the IRIS software.

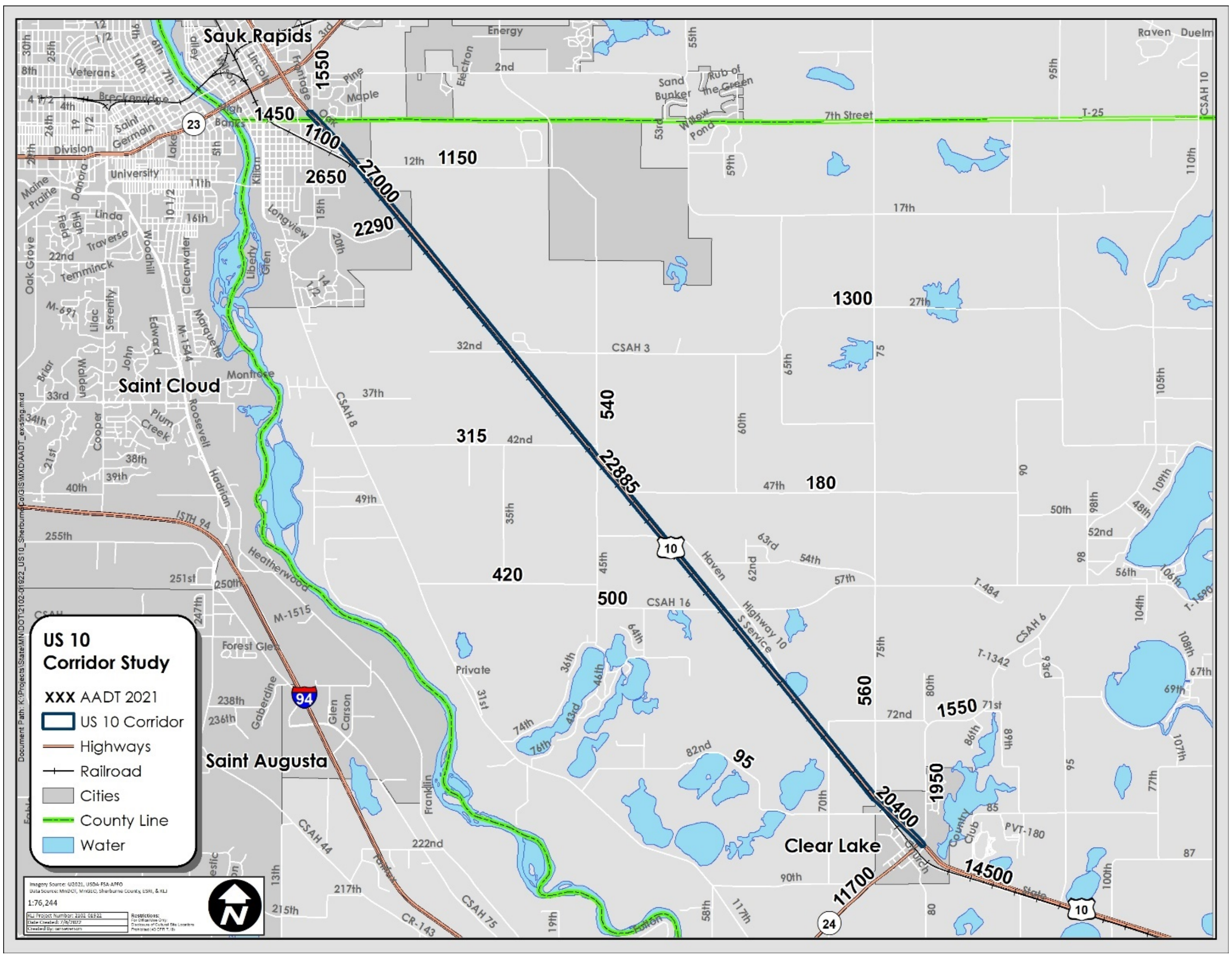
Figure 12: Future ITS Equipment



Turning Movement Counts

Twenty-four-hour turning movement counts (TMCs) were collected on April 14th and 28th, 2022 for the corridor. Cameras, tubes, and radar units were deployed to measure the daily traffic along the Highway 10 corridor on the south, middle, and north sections of the study area. The AADT's calculated from the TMC data were compared to the most recent AADT data shown on MnDOT's Traffic Mapping Application Tool (**Figure 13**). TMCs were also collected using StreetLight. The three sets of data were compared and used to determine the existing baseline conditions. Weekend TMCs were produced by applying a factor to the collected weekday TMCs. This factor was selected by reviewing a combination of Automatic Traffic Recorder (ATR) and StreetLight data. More information regarding the turning movement count collection and adjustments can be found in **Appendix 3E.** Raw data and balanced turn movement counts used for traffic analysis can also be found in **Appendix 3E.**

Figure 13: Existing Annual Average Daily Traffic (AADT)



Travel Time

Clearguide Analysis

The average travel time of the corridor sits between 10 and 15 minutes. However, that can vary greatly depending on the season or weather conditions. **Figure 14** and **Figure 15** show the average travel time for every hour over the past five years. Spikes in travel time during the winter are likely from adverse weather conditions or accidents. This is shown in every year with increased travel times over the course of the winter. Spikes in travel times are also during the summer months with the exception 2020, due to effects of the global pandemic. The eastbound Sunday average travel time is 13.04 minutes (3% more than average weekday), and westbound Friday average travel time is 12.84 minutes (5.5% more than average weekday). The Clearguide also shows more variability of travel time for the westbound direction compared to the eastbound.

Figure 14: Average Eastbound Travel Time

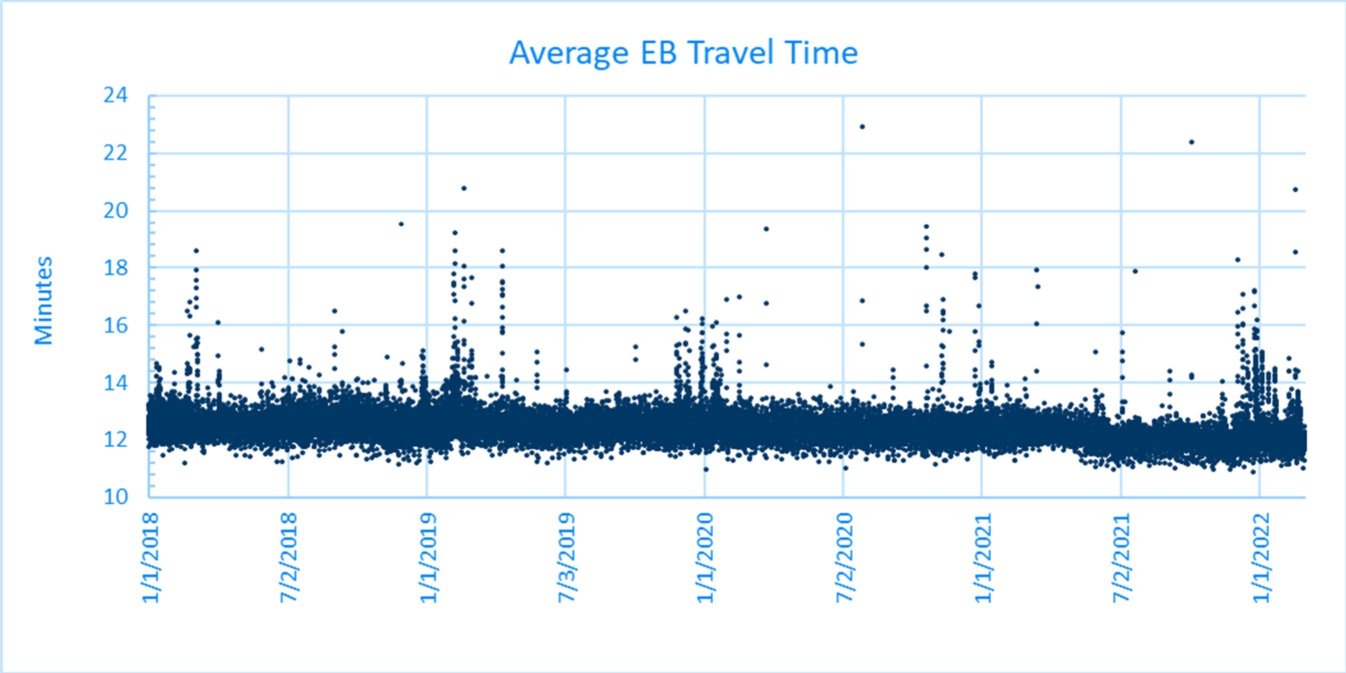
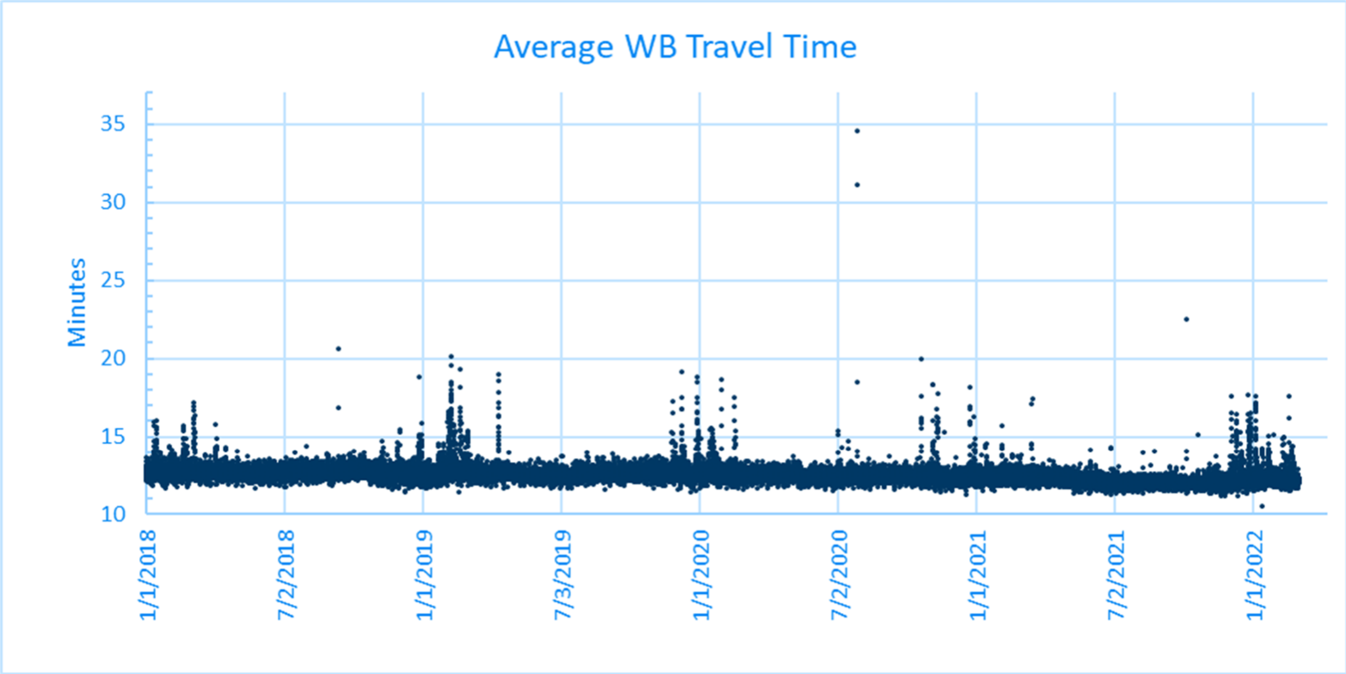


Figure 15: Average Westbound Travel Time



Traffic congestion percentage is shown in **Figure 16** and **Figure 17** that echoes a similar conclusion. The number of hours congested is higher during recent winter months from weather, but the heavier congestion is shown to occur more frequently in the summer months due to peak travel periods in Minnesota. These periods tend to take place in the northbound corridor on Thursday evening and Friday afternoon and evening. On the southbound corridor, the peak travel period is on Sunday afternoon and evening. An example of this is shown in **Figure 14**, where on a Sunday during the summer months, the average travel time more than 35 minutes at 1:00 PM. This is an even larger occurrence on holiday weekends such as Memorial Day, the Fourth of July, and Labor Day.

Figure 16: Eastbound Congested Periods over Free Flow Speed

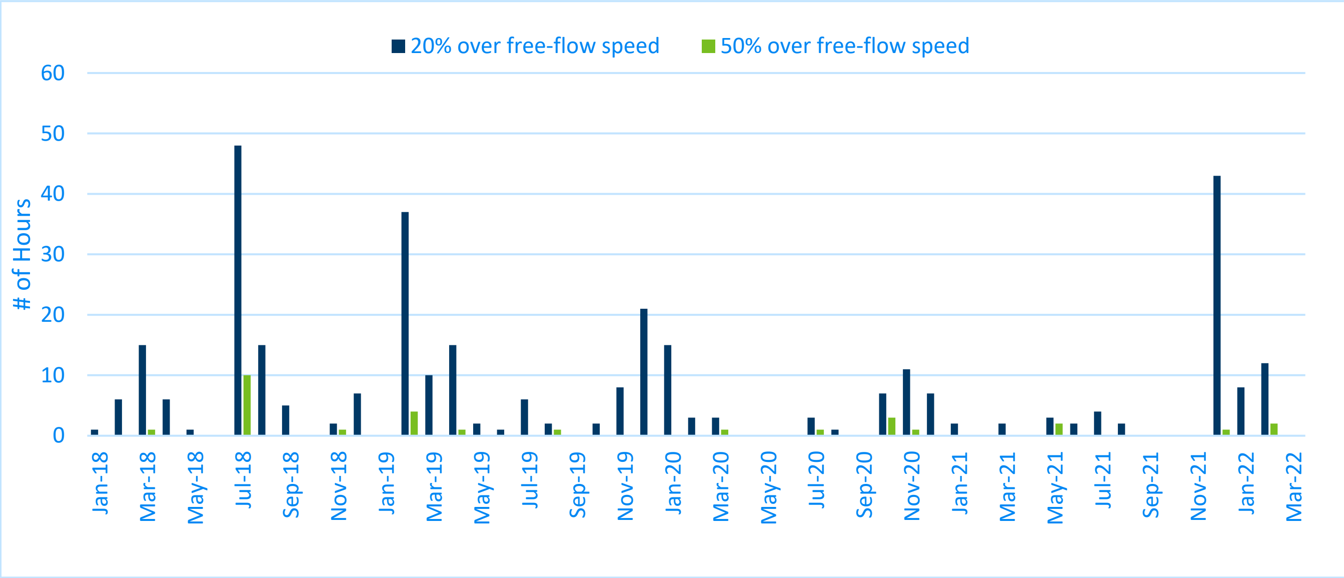
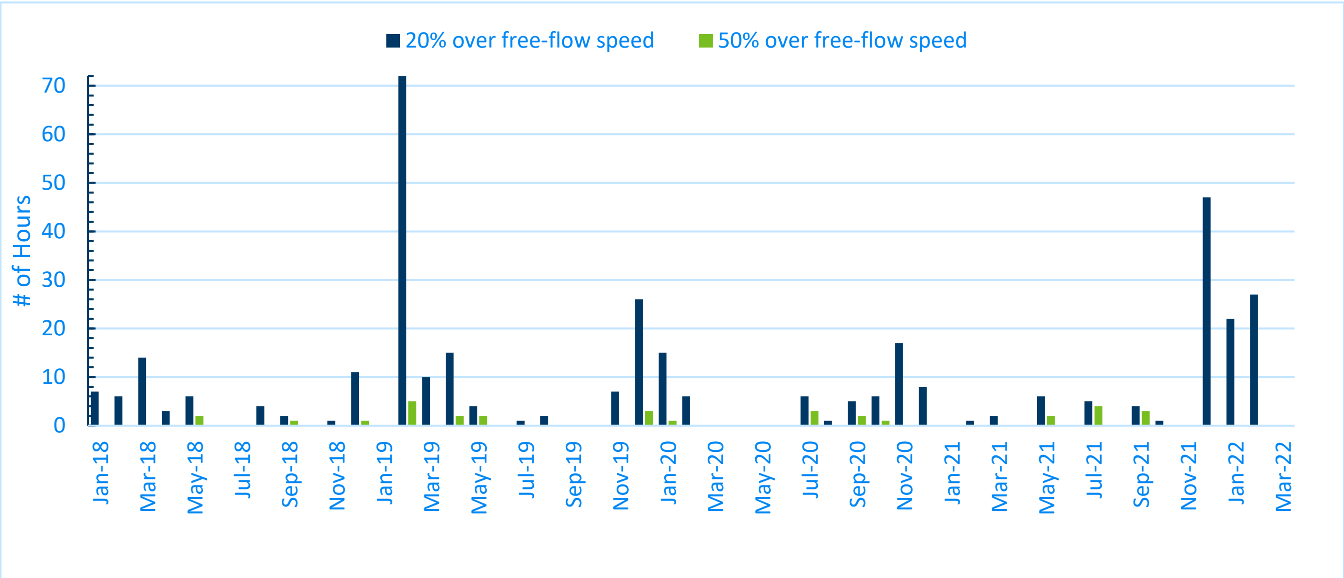


Figure 17: Westbound Congested Periods over Free Flow Speed



Traffic Forecasting

Historical AADT data was examined to develop forecast traffic data. The data was acquired from MnDOT's Traffic Mapping Application Tool. The gathered AADT was compared to the AADT from the collected TMC and StreetLight data. The existing AADT was determined from looking at the three sets of data.

Where data was available from MnDOT's data set, a linear regression analysis was conducted using the ten most recent years of data and the full available set of data. The two analyses were used to determine the annual growth rates for all legs of all intersections. For consistency, the calculated growth rate on Highway 10 was averaged throughout the corridor and applied to the whole corridor. For legs where the regression analysis resulted in an unrealistic or inconsistent rate or where data was not available, the annual growth rate was set to 1%. The resultant growth rates and forecast AADT for the year 2048 is shown in **Table 3** and **Table 4**.

Table 3: Historic Traffic Growth Rates

Intersection	NB/EB Annual Growth Rate	SB/WB Annual Growth Rate	EB Hwy 10 Annual Growth Rate	WB Hwy 10 Annual Growth Rate
Hwy 24 / Main Ave	1.4%	2.3%	1%	1%
Mill St		1%	1%	1%
Henry St	1%	1%	1%	1%
75th Ave		1.6%	1%	1%
70th Ave	1%	1%	1%	1%
Haven Rd S leg		1%	1%	1%
64th St		1%	1%	1%
Frontage Rd SE		1%	1%	1%
60th St	1.5%	1.4%	1%	1%
Haven Rd N leg	1%	1%	1%	1%
47th St		1.5%	1%	1%
45th Ave	1%	1%	1%	1%
42nd St	1.7%	2.1%	1%	1%
32nd St	1%	0.2%	1%	1%
UPS Entrance		1%	1%	1%
North Star Truck		1%	1%	1%
Courtesy Auto		1%	1%	1%
Rest Stop Exit		1%	1%	1%
Rest Stop Entrance		1%	1%	1%
Quarry	1%	1%	1%	1%
Amcon		1%	1%	1%
Minnesota Blvd	0.8%	0.8%	1%	1%
12th St		1%	1%	1%
Park-and-Ride / Lincoln Ave	1%		1%	1%
Sysco	1%	1%	1%	1%
15th Ave	0.2%	0.2%	1%	1%

Table 4: Future ADT Forecasts

Intersection (w/ Hwy 10)	2021 Existing ADT NB/EB	2021 Existing ADT SB/WB	2021 Existing ADT EB Hwy 10	2021 Existing ADT WB Hwy 10	2048 Forecast ADT NB/EB	2048 Forecast ADT NB/EB	2048 Forecast ADT EB Hwy 10	2048 Forecast ADT WB Hwy 10
Hwy 24 / Main Ave	8,900	2,740	22,000	17,800	12,900	4,900	28,500	23,100
Mill St		400	22,000	22,000		520	28,500	28,500
Henry St	510	10	22,000	21,900	700	10	28,500	28,400
75th Ave		440	21,900	22,000		660	28,400	28,500
70th Ave	160	50	21,600	21,500	210	60	28,000	27,800
Haven Rd S leg		40	21,600	21,600		50	28,000	28,000
64th St		220	21,600	21,600		280	28,000	28,000
Frontage Rd SE		700	21,600	21,600		910	28,000	28,000
60th St	390	1,500	22,900	21,600	580	2,200	29,700	28,000
Haven Rd N leg	30	160	23,100	22,900	40	210	29,900	29,700
47th St		170	23,200	23,100		250	30,000	29,900
45th Ave	260	500	23,000	23,200	300	600	29,800	30,000
42nd St	260	230	23,100	22,900	400	400	29,900	29,900
32nd St	80	1000	23,600	23,100	100	1,000	30,600	29,900
UPS Entrance		800	23,600	23,600		1,000	30,600	30,600
North Star Truck		320	23,600	23,600		400	30,600	30,600
Courtesy Auto		10	23,600	23,600		10	30,600	30,600
Rest Stop Exit		510	23,100	23,100		700	29,900	29,900
Rest Stop Entrance		510	23,100	23,100		700	29,900	29,900
Quarry	770	560	23,200	22,900	1,000	700	30,000	29,700
Amcon		110	23,200	23,200		100	30,000	30,000
Minnesota Blvd	2,600	230	21,700	23,100	3,200	300	28,100	29,900
12th St		1,100	22,600	21,800		1,400	29,300	28,200
Park-and-Ride / Lincoln Ave	580		22,300	22,300	800		28,900	28,900
Sysco	1,800	2,600	22,500	22,100	2,300	3,400	29,100	28,600
15th Ave	7,000	4,200	24,500	24,500	7,400	4,400	31,700	28,200

Traffic Safety

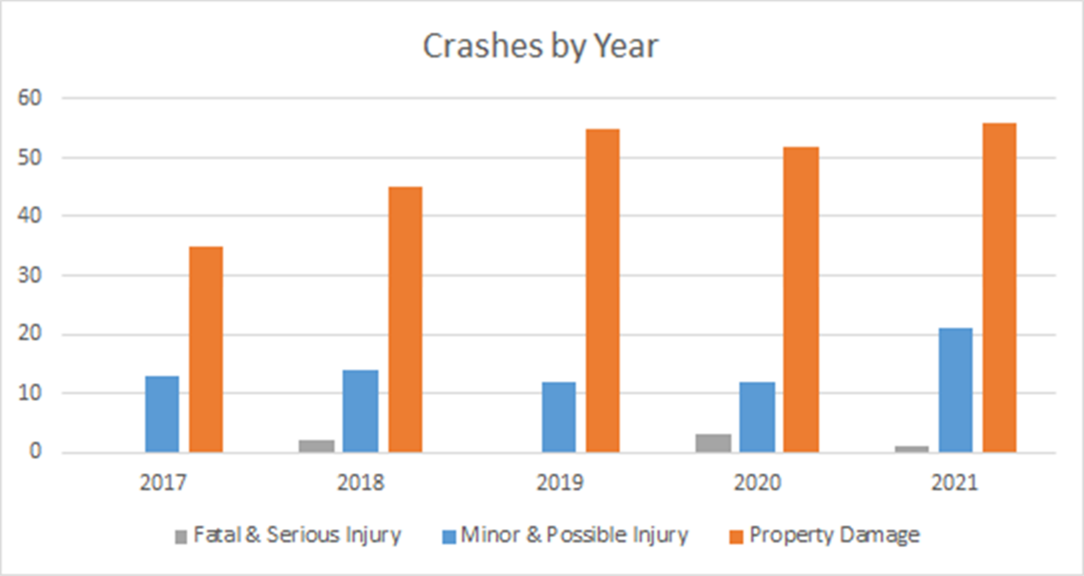
Five years of crash data were analyzed for the period including January 1, 2017, through December 31, 2021, obtained from the MnCMAT2 database. Additional safety data is provided in **Appendix 3F**. There were 315 crashes recorded on the corridor over the five-year period:

- 72 crashes (23%) were Fatal or Injury Type A, B, or C; six (6) were Fatal or Injury Type A
- 243 crashes (77%) were property damage only (PDO)
- Results in annual averages of
  - 63 crashes per year
  - 14.4 Fatal or Injury Type A, B, or C crashes per year
  - 1.2 Fatal or Injury Type A crashes per year

Out of the 315 crashes, 177 (56%) were segment-related and 138 (44%) were intersection-related.

Figure 18 illustrates the annual distribution of crashes over the five-year period. The total number of crashes is in a general uptrend except for 2020 where it broke the trend by a small decrease in crashes which could be attributed to the effects of pandemic on total traffic volumes. There was also a significantly higher number of injury crashes during 2021. In 2020, the crash decrease related to a decrease in traffic volume was lower than expected compared to other years.

Figure 18: Crashes by Year



A review of when crashes were occurring revealed that crashes were higher during the months of November through February when adverse weather and roadway surface conditions are most likely to occur. There is also a smaller peak from mid-summer to mid-fall months when traffic volumes are higher from increased recreational travel. The data shows nearly equal distribution over all days of the week with slight decreases on weekends and on Tuesdays. Crashes are more frequent during morning (6:00 a.m. to 10:00 a.m.) and afternoon (2:00 p.m. to

5:00 p.m.) time periods, with a peak at 2:00 in the afternoon. The afternoon period has a slightly higher number of crashes than the morning period.

Critical Crash Locations

Crash rates (CR) were calculated using the five-year crash data (2017-2021) and guidelines from the MnDOT Traffic Fundamentals Handbook (2015). Crash rates specific to Fatal and Serious Injury crashes were also calculated and reported as Fatal and A-Injury Rate (FAR). These crash rates were compared with critical crash rates for similar intersection/segment conditions to determine if the given intersection/segment conditions are potentially at fault. These were also compared against the statewide average rates for all similar types of intersections or segments.

Table 5 and **Table 6** summarize crash rates for all corridor intersections and segments.

During the five-year analysis period, two (2) intersections show crash rates higher than the critical rate and one (1) intersection suffered a crash rate higher than the statewide average. Two (2) of these three intersections show a FAR greater than the statewide average, but none of the intersections show a FAR greater than the critical FAR.

During the same period, one segment showed a crash rate and FAR higher than critical rates. Another segment had a crash rate higher than the statewide average.

Fatal and Serious Injury Crash Analysis

During the five-year crash analysis period (2017-2021) there were three (3) fatal and three (3) serious injury crashes along the corridor. Two (2) of the fatal or serious injury crashes were intersection-related, and four (4) were segment-related.

Manner of Collision

Three (3) out of six (6) fatal and serious injury crashes were run-off-road type crashes, where two (2) resulted in fatalities. Two (2) of the run-off-road crashes involved drivers who were under influence; the contributing factor for the remaining crash was failing to keep in the correct lane. One (1) out of the six (6) crashes was an angle crash where a motorcycle ran a red light. One (1) out of the six (6) crashes was a rear-end crash, which resulted in a fatality and the contributing factor was not known. One (1) out of the six (6) crashes was between a vehicle and a pedestrian where the report said the pedestrian was darting onto the highway.

Vehicles and Drivers Involved

Two (2) out of six (6) crashes involved motorcycles, two (2) involved heavy trucks, and one (1) involved a pedestrian. Three (3) out of six (6) crashes involved a driver in their 20s, one of whom only had a learners permit and was driving a motorcycle.

Lighting, Weather, and Road conditions

Four (4) out of six (6) crashes occurred in the afternoon or evening from 3:00 p.m. to 9:00 p.m. Weather and road conditions were fair for all of the crashes except for one, where the lighting was dark. Four (4) of the six (6) fatal and serious injury crashes occurred in the summer months of June and July. One crash occurred in September, and one occurred in March.

Table 5: Crash Rates and Fatal and Serious Injury Rate by Intersection

Intersection (w/ Hwy 10)	Traffic Control	EV ('000)	Statewide CR	Observed CR	Critical CR	Statewide FAR	Observed FAR	Critical FAR
Hwy 24	Signal	30.9	0.508	**0.779**	0.760	0.690	**1.771**	2.990
Henry St	TWSC	21.1	0.100	0.000	0.240	0.548	0.000	3.370
CSAH 20	TWSC	25.4	0.100	0.065	0.230	0.548	0.000	3.020
70th Ave	TWSC	25.4	0.100	0.043	0.230	0.548	0.000	3.020
Haven Rd SE 1050	TWSC	24.9	0.100	0.000	0.230	0.548	0.000	3.050
64th St	RIRO	25.1	0.100	0.022	0.230	0.548	0.000	3.040
Service Road	TWSC	25.2	0.100	0.022	0.230	0.548	0.000	3.030
Frontage Rd SE	RIRO	25.7	0.100	0.000	0.230	0.548	0.000	3.000
60th St SE	TWSC	27.0	0.100	**0.122**	0.230	0.548	0.000	2.910
Haven Rd SE 1100	TWSC	25.3	0.100	0.043	0.230	0.548	0.000	3.030
47th St SE	TWSC	25.0	0.100	0.000	0.230	0.548	0.000	3.050
45th Ave SE	TWSC	25.4	0.100	0.086	0.230	0.548	0.000	3.020
42nd St SE	TWSC	25.4	0.100	0.065	0.230	0.548	0.000	3.020
32nd St SE	TWSC	26.1	0.100	**0.126**	0.230	0.548	0.000	2.970
Rest Area Rd	Other	25.4	0.100	0.000	0.230	0.548	0.000	3.020
Rest Area Rd	Other	25.5	0.100	0.021	0.230	0.548	0.000	3.010
Minnesota Blvd	TWSC	30.0	0.100	0.219	0.220	0.548	0.000	2.740
12th St SE	TWSC	28.2	0.100	0.097	0.220	0.548	0.000	2.840
CR 63	TWSC	28.1	0.100	0.078	0.220	0.548	0.000	2.850
15th Ave	Signal	33.0	0.508	0.697	0.750	0.690	1.659	2.890

*Note: **Red** – Observed Rate is greater than Critical Rate; Yellow – Observed Crash Rate is greater than Statewide Average Rate*

Table 6: Crash Rates and Fatal and Serious Injury Rates by Segment

Segment	MVMT	Statewide CR	Observed CR	Critical CR	Statewide FAR	Observed FAR	Critical FAR
Hwy 24 to CSAH 20	26.09	0.481	**2.491**	0.850	1.405	**7.666**	6.300
CSAH 20 to 60th St SE	117.8	0.481	0.289	0.650	1.405	0.000	3.230
60th St SE to 32nd St SE	163.11	0.481	0.386	0.620	1.405	1.226	2.900
32nd St SE to 15th Ave SE	157.85	0.481	**0.969**	0.630	1.405	1.267	2.930

*Note: **Red** – Observed Rate is greater than Critical Rate; Yellow – Observed Crash Rate is greater than Statewide Average Rate*

Fatal Crash Details

- 24/03/2020, Tuesday, 10 AM, Daylight-Cloudy-Dry, At Highway 10 and 15th Avenue SE: A heavy truck (62 M) was stopped at red light, a pickup truck (48 M) approaching intersection did not stop and rear-ended. Driver died and the probable cause could not be determined.
- 03/06/2020, Wednesday, 9 AM, Daylight-Clear-Dry, At Highway 10 between Henry Street and 75th Avenue SE: A car (29 F) changed lanes along a horizontal curve at 65-70 mph speed (Posted speed Limit of 65mph), hits billboard. Driver died at the scene.
- 28/07/2020, Tuesday, 4 PM, Daylight-Clear-Dry, At Highway 10 just north of 32nd Street: A car (21 F) on WB lane ran off road crossing the median to EB lanes, hits a pickup truck (41 F) head on. Both car and pickup truck rebound and cause secondary crashes. The car hits a motorcycle (45 M) and the pickup hits a car (53 M). Drivers of the first car and pickup truck died.

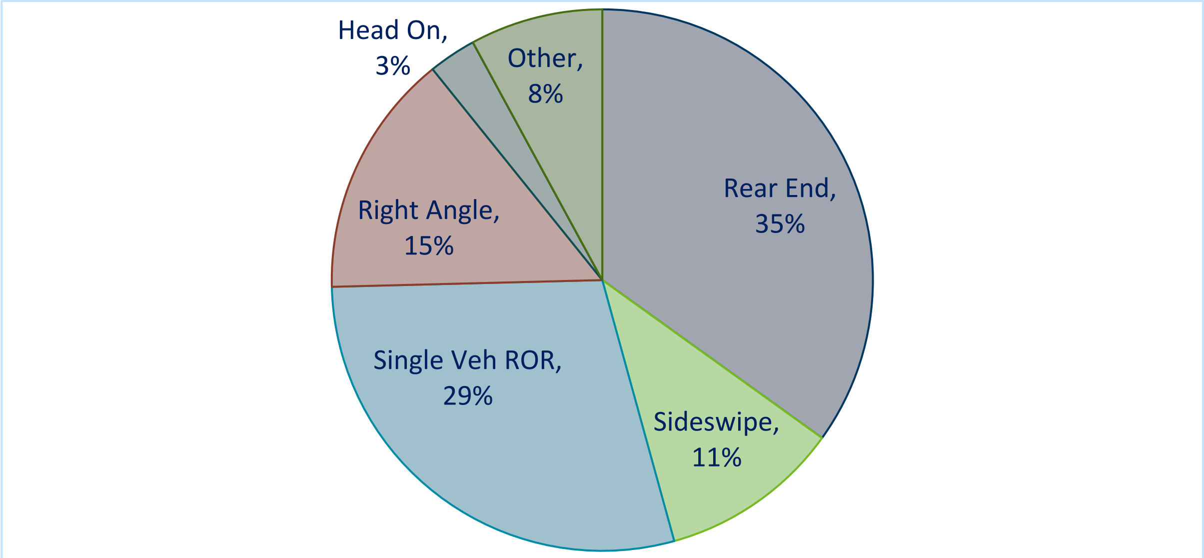
Serious Injury crash details

- 07/07/2018, Saturday, 6 PM, Daylight-Clear-Dry, At Highway 10 and Highway 24: A Motorcycle (60 M) ran red light hitting a car (71 F) who had green light.
- 12/09/2018, Wednesday, 3 PM, Daylight-Clear-Dry, At Highway 10 between 60th Street and Haven Road: A Truck (65 M) was swerving left to avoid a slowing car and report stated a person (44 F) suddenly got out of the car and darted across the highway hitting the truck on the rear axles.
- 22/07/2021, Thursday, 9 PM, Dark-Clear-Dry, At Highway 10 between 60th Street and Haven Road: Motorcycle (27 M) driver with permit only (not license) ran off the road to the right, and came to a stop in the median

Crash Types and Factors

The largest portion of the 315 crashes were rear-end crashes (110, 35%). The next most frequent crash type was single vehicle ran off the road (91, 29%); angled crashes made up 15% and sideswipes were at 11%. **Figure 19** shows the corridor crash rates by manner of collision.

Figure 19: Crash Distribution by Manner of Collision



For the single vehicle type crashes, swerving/avoiding (11%), running off the road (8%), and failing to keep in lane (8%) were the major contributing factors. Other contributing factors were driving in a careless manner, distracted driving, speeding, and overcorrecting. Two (2) of these crashes involved a pedestrian, two (2) resulted in a death, and one (1) resulted in serious injury.

The rear-end crashes were mostly attributed to following too closely (26%), distracted driving (15%), and careless driving (13%). Other contributing factors were swerving to avoid, speeding, failure to yield, running a red light, and passing on the shoulder. One of the rear-end crashes ended in fatality.

The angled crashes were mostly attributed to failure to yield right-of-way (46%) and to running a red light (11%). Other contributing factors were failing to keep in proper lane, improper turn, careless driving, speeding, and swerving.

Pedestrian- and Bike-Related Crashes

The data showed two (2) crashes involving pedestrians. For both crashes involving pedestrians, the report stated pedestrians were at fault due to unanticipated behavior.

Crash Details

- 12/09/2018, Wednesday, 3 PM, Daylight-Clear-Dry, At Highway 10 between 60th Street and Haven Road: A truck (65 M) was swerving left to avoid a slowing car when a person (44 F) suddenly exited the car and darted across the highway hitting the truck on the rear axles. These conditions resulted in a serious injury for the pedestrian.
- 22/08/2021, Sunday, 1 PM, Daylight-Clear-Dry, At Highway 10 and 12th Street SE: A woman (40 F) was jumping on the street. The report stated a car (57 M) could barely slow down when seeing the pedestrian, and the woman hit the car. The pedestrian was not injured, and the crash resulted in some damage to the car. The crash report stated the woman was high on drugs, emotionally depressed, angry, or disturbed.

Crash Hotspots

The analysis identified three intersections with the majority of crashes and a hotspot analysis was performed to identify specific issues at each intersection.

Highway 10 and Highway 24

Forty-four (44) crashes occurred at this intersection during the five-year study period. This is 32% of the total (138) intersection-related crashes. This averages out to 8.8 crashes per year. There was one serious injury crash at this location which was an angled collision caused by running a red light.

- The most prominent type of crash at this intersection was rear-end (29, 66%) followed by angled crashes (6, 14%). The major contributing factors for crashes were distracted driving, careless driving, and speeding, which added up to 16 crashes or 36%.

- This signal-controlled intersection is the only flow interruption in an 8-mile, high-speed segment of Highway 10. The signal has all-way-flasher warning assemblies for all approaches and a reduced speed limit of 60 mph to try to mitigate the potential unexpected stop condition.
- The crashes occurred throughout the day with peaks at 10:00 a.m., 1:00 p.m., and 5:00 p.m. There were also peaks for the months of December through February and July through August, consistent with the seasonal trend earlier.
- Most of the crashes involved drivers under the age of 40 with a higher concentration in their late 20s and early 30s.
- Fourteen (14, 32%) crashes occurred during adverse weather conditions like snow, rain, ice, or high winds.

Highway 10 and 15th Avenue SE

Forty-two (42) crashes occurred at this intersection during the five-year study period. This is 30% of the total (138) intersection-related crashes. This averages out to 8.4 crashes per year. There was one fatal crash at this location which was a rear-end crash caused by failure to stop at a red light.

- The most prominent type of crash at this intersection was rear-end crashes (29, 69%) followed by angled crashes (10, 24%). The major contributing factor for crashes was following too closely (12, 29%). Other factors were running red light, improper turning, distracting driving, and careless driving.
- This intersection is located one half-mile southeast of the full-access Highway 10 and Highway 23 interchange. The proximity of the two access points may contribute to driver speeding and ability to stop.
- The crashes occurred with higher frequency in the morning to early afternoon hours with a peak at 2:00 p.m. There is a higher frequency of crashes during the months of December through March and June through October, consistent with the seasonal trend discussed previously.
- Analysis showed no variation among the age of the drivers involved in crashes.
- Six (6, 14%) crashes occurred during adverse weather conditions like snow, rain, ice, or high winds.

Highway 10 & Minnesota Boulevard

Fourteen (14) crashes occurred at this intersection during the five-year study period. This is 10% of the total (138) intersection-related crashes. This averages out to 2.8 crashes per year. There were no fatal or serious injury crashes at this intersection.

- The most prominent type of crash at this intersection was angled crashes (6, 43%) followed by rear-end crashes (2, 14%). The major contributing factor for crashes was failing to yield right-of-way (6, 43%). Other factors were speeding, swerving, and careless driving.
- The crashes occurred with higher frequency in the AM peak (7:00 a.m. to 8:00 a.m.) and during the afternoon (2:00 p.m. to 3:00 p.m.). Crash frequencies peaked in September and February.
- Analysis showed no variation among the age of the drivers involved in crashes.
- Four (4, 29%) crashes occurred during adverse weather conditions like snow, rain, ice, or high winds.

Risk Factor Analysis

The 2007 MnDOT Strategic Highway Safety Plan (SHSP) included the first discussion of a proactive approach to safety improvements (Chapter 6 of the report). The document acknowledged that the historic "reactive-only" approach had not been successful at reducing fatal crashes because it tended to direct safety investments to locations with relatively low numbers of fatal crashes but high frequencies of total crashes, generally in urban environments. The SHSP suggested that in order to make significant progress in reducing fatalities and moving closer to the Minnesota Towards Zero Deaths (TZD) goal, the State would need to transition to a more balanced approach of proactive and reactive analysis. A Risk Factor Analysis helps with the proactive approach to safety in the evaluation for potential improvements. The goal of the analysis is to capture and qualitatively describe anything related to safety that the crash history does not directly show as a trend. The Risk Factor Analysis completed for Highway 10 is shown in **Table 7.**

Table 7: Risk Factor Matrix

Risk Factor	Location	Description
Heavy Trucks	Entire corridor	Heavy trucks are not as easily maneuvered, are slower to accelerate, and cannot be stopped quickly when operating at high speeds. This makes them less capable of reacting to potential hazards in the roadway or merging onto a high-speed corridor from a full stop with no acceleration lane.
Heavy Rail	At intersections	Heavy rail cannot be stopped quickly when operating at high speeds. Drivers that do not pay attention to advanced warnings of rail crossings run the risk of a severe collision.
Narrow Median	Entire corridor	A narrow median has less traversable space between oncoming lanes of traffic and increases the possibility of a head-on collision. Additionally, narrow medians create difficulties to stage vehicles in crossovers waiting to make U-turns.
Roadside Design	Entire corridor	Roadside features such as signage, plant life, steep slopes, and guardrail can increase the crash severity of vehicles that run off the road.
Traveled Speeds	Entire corridor	High-speed corridors increase the risk for higher severity crashes.
Lighting	Entire corridor	The lack of lighting, including at most intersections, increases the possibility of crashes in low light situations.

Table 7 Continued

Risk Factor	Location	Description
High Access Density	Entire corridor	The corridor has a high density of access points including intersections, residential and commercial driveways, and agricultural accesses. The high density of accesses can lead to higher crash rates on the corridor from unexpected mergers onto the mainline.
Full Access Intersections	Almost all intersections and some driveways	Uncontrolled full access intersections on high-speed corridors can contribute to higher crash rates from left-turning and through movements from the minor approaches, particularly as mainline volumes increase.
Skewed Intersections	60th St, Haven Rd/ 52nd St, 47th St, 45th Ave, 42nd St, 32nd St, Minnesota Blvd, some driveways	Skewed intersections result in poor sightline angles for drivers on the minor approaches leading to higher rates of crashes.
Driveway Profile	Knife River Facility	Driveway slope is too steep approaching Highway 10 from the railroad tracks, which increases the risk of trucks being unable to stop.
Lack of Ped Facilities	Entire corridor	With the exception of the two signalized intersections, there are no pedestrian facilities along the corridor. The lack of facilities makes pedestrian and bicycle crossings difficult.

Traffic Operations

Intersection Results

Table 8: Level of Service Thresholds

Unsignalized Intersection Control Delay (sec/veh)	**Signalized** Intersection Control Delay (sec/veh)	**Level of Service (LOS)**
≤ 10	≤ 10	A
> 10-15	> 10-20	B
> 15-25	> 20-35	C
> 25-35	> 35-55	**D**
> 35-50	**> 55-80**	**E**
> 50	**> 80**	**F**

Level of Service (LOS) quantifies how an intersection is operating. Intersections are graded from LOS A through LOS F, which corresponds to the average delay per vehicle value shown in **Table 8.** An overall intersection LOS A through LOS D is generally considered acceptable under MnDOT standards. LOS A indicates the best traffic operation, while LOS F indicates an intersection where demand exceeds capacity. Traffic delay and LOS were measured for each study intersection using PTV VISSIM. VISSIM software simulates the movement of every vehicle through an intersection and collects information for associated performance measures like delay, queue lengths, travel times, and vehicle density. VISSIM results can be found in **Appendix 3G**.

Existing Conditions

Intersection traffic operations results using 2022 traffic volumes are shown in **Table 9.** Weekday volumes are used as normal day conditions while Friday and Sunday are the Recreation Peak volumes. For each side-street stop-controlled intersection, the Level of Service (LOS) is shown for the total intersection followed by the worst minor approach. Each signalized intersection shows total intersection operations. For each of the four traffic scenarios, deficient operations were identified:

- Under Existing Weekday conditions, all side-street stop-controlled approaches and signals through the corridor operate acceptably at LOS D or better.
- The Highway 24 signal in Clear Lake operates at LOS E in the Existing Friday PM peak due to the heavy northbound right and conflicting Highway 10 volumes.
- The Friday AM Peak has two approaches operating under deficient operations of LOS E/F and six approaches in the PM peak with deficient LOS E/F.
- Existing Sunday operations showed three deficient side-street stop-controlled intersections in the AM peak and six in the PM peak

Table 9: Existing Intersection Level of Service Results

Segment	Weekday AM LOS	Weekday PM LOS	Friday AM LOS	Friday PM LOS	Sunday AM LOS	Sunday PM LOS
Hwy 24	C	C	**D**	**E**	C	C
Mill St	A/A	A/A	A/A	**A/D**	A/A	**A/E**
Henry St	A/C	A/B	A/C	A/C	A/C	A/B
75th Ave	A/C	A/C	A/C	**A/D**	A/C	A/C
70th Ave	**A/D**	A/C	A/A	**A/E**	A/A	**A/E**
Haven Rd S	A/C	A/C	A/A	**A/D**	A/A	A/C
64th St	A/A	A/A	A/A	A/A	A/A	A/A
Frontage Rd SE	A/C	A/A	A/A	A/A	A/A	A/A
60th St	A/B	A/C	**A/D**	**A/E**	**A/E**	**A/D**
Haven Rd N	A/C	A/A	A/C	A/B	A/C	**A/D**
47th St	A/A	A/A	A/A	A/A	A/A	A/A
45th Ave	A/C	**A/D**	**A/E**	**A/E**	**A/D**	**A/E**
42nd St	A/A	A/A	A/B	A/A	A/B	A/A
32nd St	A/C	**A/D**	**A/F**	**A/F**	**A/E**	**A/F**
UPS Entrance	A/B	A/B	A/C	A/C	A/C	A/C
North Star Truck	A/A	A/A	A/A	A/A	A/A	A/A
Courtesy Auto	A/A	A/A	A/A	A/A	A/A	**A/E**
Rest Stop	A/A	A/A	A/B	A/C	A/A	A/B
Quarry	A/C	A/C	**A/D**	**A/E**	**A/E**	**A/E**
Amcon	A/A	A/B	A/C	**A/D**	A/B	A/C
Minnesota Blvd/MN 301	A/C	A/C	**A/D**	**A/D**	**A/D**	**A/D**
12th St	A/A	A/A	A/A	A/A	A/A	A/B
60th Ave	A/A	A/A	A/B	A/A	A/B	A/B
Birch St	A/B	A/B	**A/D**	A/C	**A/D**	A/C
15th Ave	B	C	C	**D**	C	C

Note: For each side-street stop-controlled intersection, the Level of Service (LOS) is shown for the total intersection followed by the worst minor approach.

Future No-Build Conditions

Intersection traffic operations results using 2048 projected traffic volumes are shown in **Table 10.** For each side-street stop-controlled intersection, the Level of Service (LOS) is shown for the total intersection followed by the worst minor approach. Each signalized intersection shows total intersection operations. For each of the three traffic scenarios, deficient operations were identified under the following scenarios:

- Under future weekday conditions, one stop-controlled minor approach is deficient in the AM peak with three deficient minor stops in the PM peak.
  - The signalized intersection of Highway 24 is deficient during the Weekday PM peak. Additional signal time for the minor approaches may fix this deficiency.
- Friday operations see minor approach operations throughout the study area in the LOS D through F range throughout the day. Eight minor approaches and both signals are deficient in the AM peak and 12 stop-controlled minor approaches and the 15th Avenue SE signal are deficient in the PM peak.
  - Various major left turns are showing LOS E or F due to the high conflicting mainline volume with few acceptable gaps and causing extreme delays on the minor approaches.

» Sunday Operations show five deficient stop controlled minor approaches, primarily LOS E, in the AM peak. The PM peak has eight deficient minor approaches along the corridor.

Table 10: Future Intersection Level of Service Results

Segment	Weekday AM LOS	Weekday PM LOS	Friday AM LOS	Friday PM LOS	Sunday AM LOS	Sunday PM LOS
Hwy 24	C	**E**	**E**	**D**	C	**D**
Mill St	A/A	A/B	B/A	**A/F**	A/A	**A/F**
Henry St	A/C	A/C	**A/F**	**A/E**	**A/D**	**A/E**
75th Ave	A/C	A/C	**A/D**	**A/E**	A/C	**A/D**
70th Ave	**A/D**	**A/E**	A/A	**A/F**	A/A	**A/E**
Haven Rd S	A/C	A/C	A/A	**A/E**	A/A	**A/D**
64th St	A/A	A/A	A/A	A/A	A/A	A/A
Frontage Rd SE	A/C	A/A	A/A	A/A	A/A	A/A
60th St	A/B	**A/F**	**A/F**	**A/F**	**A/F**	**A/F**
Haven Rd N	A/C	A/A	**A/E**	A/A	A/C	A/A
47th St	A/A	A/A	A/A	A/A	A/A	A/A
45th Ave	**A/D**	**A/D**	**A/F**	**A/F**	**A/E**	**A/E**
42nd St	A/A	A/A	A/B	A/B	A/B	A/A
32nd St	A/C	**A/E**	**A/F**	**A/F**	**A/E**	**A/F**
UPS Entrance	A/C	A/C	**A/D**	**A/E**	A/C	A/C
North Star Truck	A/A	A/A	A/B	A/B	A/A	A/A
Courtesy Auto	A/A	A/A	A/A	A/A	A/A	A/A
Rest Stop	A/A	A/B	A/B	A/B	A/B	A/B
Quarry	**A/D**	**A/D**	**A/F**	**A/F**	**A/E**	**A/F**
Amcon	A/A	A/C	A/C	A/A	A/C	A/C
Minnesota Blvd/MN 301	**A/E**	**A/D**	**A/F**	**E/F**	**A/E**	**A/F**
12th St	A/A	A/A	A/A	A/C	A/A	A/B
60th Ave	A/A	A/B	A/C	A/C	A/B	A/C
Birch St	A/B	A/B	**A/F**	**A/F**	**A/E**	**A/D**
15th Ave	C	C	**E**	**E**	C	**D**

Note: For each side-street stop-controlled intersection, the Level of Service (LOS) is shown for the total intersection followed by the worst minor approach.

Network Results

Network delay from the 24-hour analysis period was quantified to show the increases in delay, latent demand, and vehicle hours traveled between each scenario. Network traffic analysis results are shown in **Table 11,** and travel times in **Table 12**. Hourly delay charts are shown in **Figure 20** and **Figure 21** for existing conditions and future conditions, respectively.

Notable network results for existing conditions include:

- Average delay per vehicle increases by 75% on Fridays and 20% on Sundays, compared to peak season weekday use.

- The primary source of delay along the Highway 10 Corridor is the minor approach traffic getting onto Highway 10.

Notable network results for future no-build conditions include:

- Weekday volume increases by 28%, Friday by 62%, and Sunday by 31%.
    - Friday volume is now nearly twice Weekday volume.
- Average delay per vehicle increases by threefold on Saturdays and 30% on Sundays compared to weekday use.
- The explosion in delay on Fridays is caused by side-street stop-controlled minor approaches that are over capacity.
- By 8:00 a.m. on Friday, the corridor is over capacity and does not recover until after midnight.

Average travel times through the study corridor were modeled in VISSIM using existing and future no-build traffic conditions for the three daily scenarios. For all scenarios, free-flow travel time is around 9.8 minutes in each direction. Under existing conditions, all scenarios have average travel times of around ten minutes, with the 95th percentile times no more than 0.1 minutes above their respective average. Travel times minimally increased over existing volumes for future no-build conditions. Future travel times are increasing to 11.0 minutes compared to 10.3 minutes in the existing conditions.

Table 11: Existing and Future No-Build Network Results

Metric	Existing Weekday	Existing Friday	Existing Sunday	Future No-Build Weekday	Future No-Build Friday	Future No-Build Sunday
Network Vehicles / Day	40,894	63,364	54,057	52,535	103,011	70,874
Avg Delay (sec/veh)	27	47	32	34	106	44
Vehicle Hours Traveled	4.495	8,052	6,562	6,023	15,523	8,797
Vehicle Miles Traveled	257,857	428,779	368,484	334,591	692,806	474,596

Table 12: Existing and Future Travel Time Results

Travel Time (minutes)	Existing Weekday	Existing Friday	Existing Sunday	Future No-Build Weekday	Future No-Build Friday	Future No-Build Sunday
EB Hwy 10 Average	9.97	10.22	10.19	10.09	10.92	10.40
EB Hwy 10 95th Percentile	10.02	10.29	10.22	10.12	10.98	10.45
WB Hwy 10 Average	9.90	10.27	9.94	10.02	10.49	10.12
WB Hwy 10 95th Percentile	9.94	10.31	10.01	10.04	10.53	10.14

Figure 20: Existing Hourly Network Delay Throughout the Day

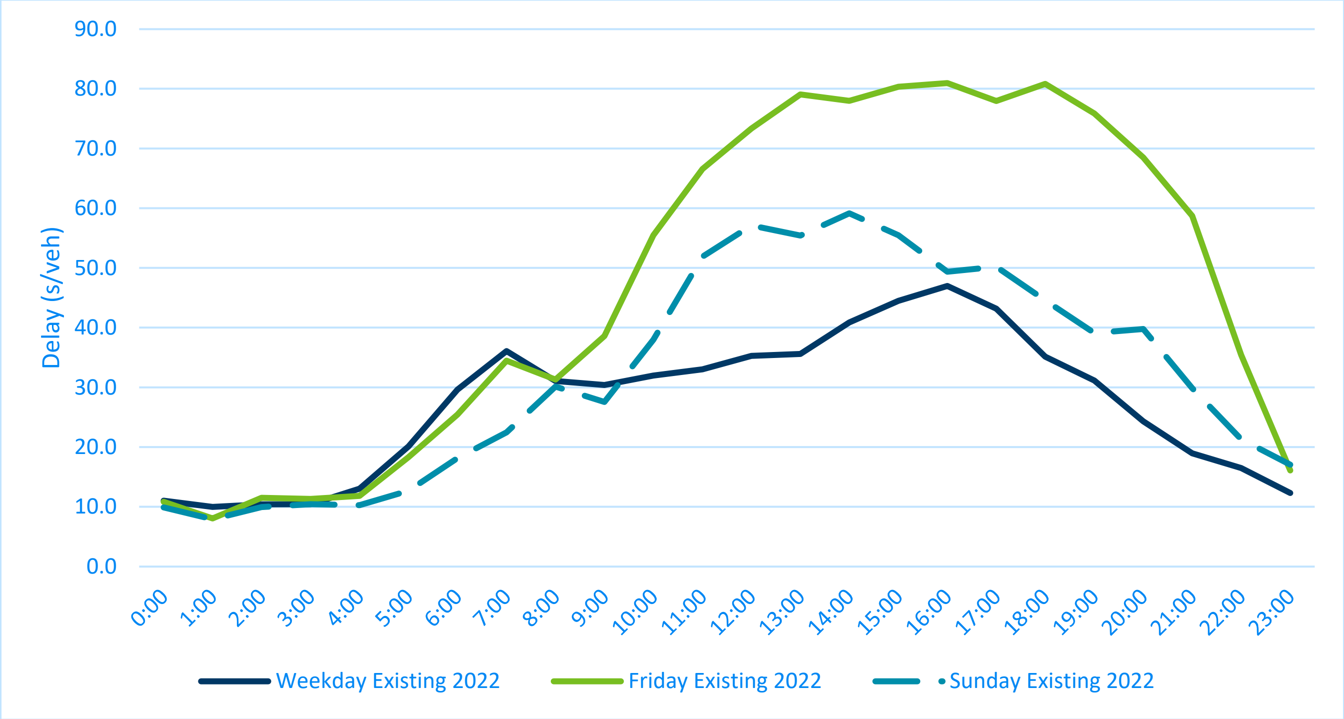
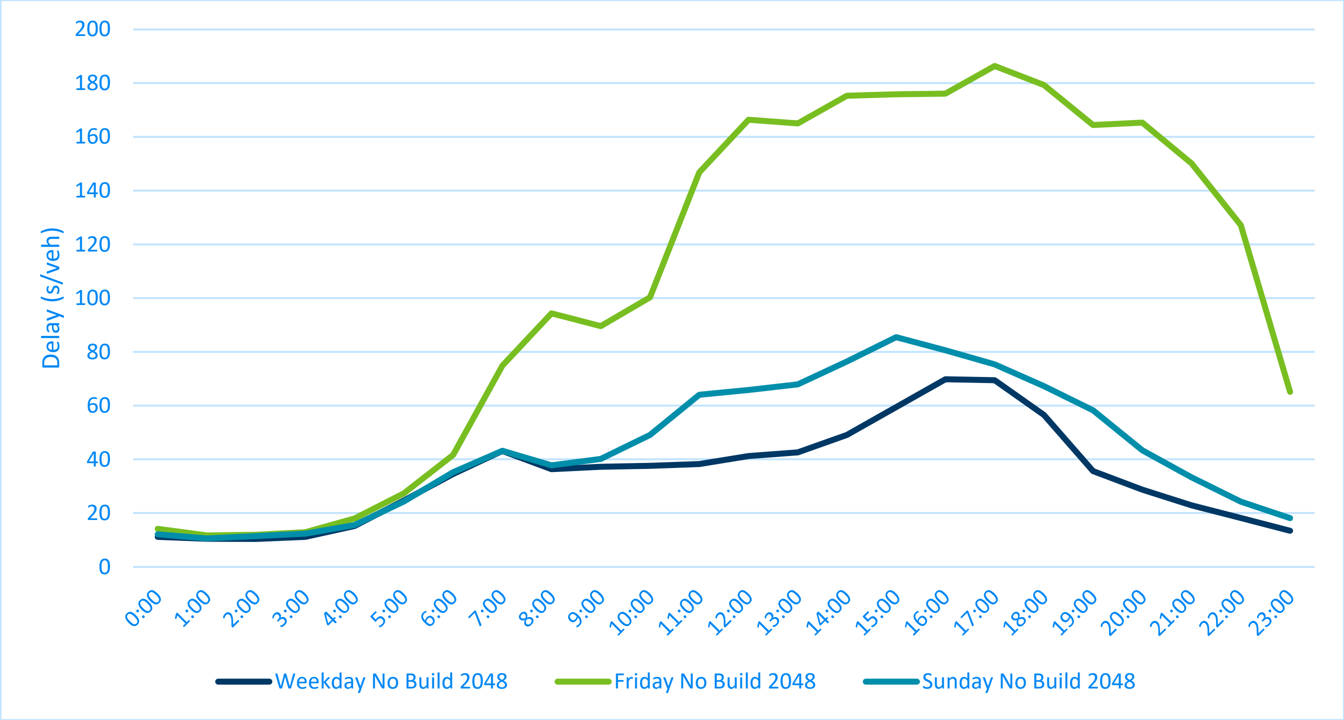


Figure 21: Future No-Build Hourly Network Delay Throughout the Day



SSAM Results

To better understand the safety implications of each existing scenario, vehicle conflicts were tabulated from VISSIM using the Surrogate Safety Assessment Model (SSAM). SSAM uses vehicle trajectory information to simulate vehicle-to-vehicle conflict events and near-miss conflicts. This analysis considers vehicle speeds, deceleration characteristics, typical gap acceptance behavior, traffic volumes, and site-specific vehicle paths to quantify predicted conflicts for rear-end, crossing, and lane change crash types.

Simulated conflicts do not directly correlate to crashes. Therefore, this tool is best used to identify conditions with a high *potential* for crashes and to identify trends between scenarios and future alternatives to maximize the future safety design of the roadway. Ten 24-hour VISSIM model runs were averaged for each existing and future no-build scenario, and the results are shown in **Table 13**.

The SSAM predicted 73% of the recorded crashes on MnDOT CMAT2. Of the recorded crashes, 83% of the crash cost is due to right angle crashes, which equates to crossing conflicts in SSAM and tend to have the highest severity.

Results of the existing SSAM analysis showed that weekday conflicts were highest among the rear-end type consisting of about 60% of total conflicts and the remaining 40% were closely split between the merging and crossing conflicts. Friday conflicts nearly tripled from the weekday conflicts among all types, while network trips only increased by 54%. Sunday conflicts were about double the weekday conflicts, while network trips only increased by 32%, with about the same ratio for conflict types.

Results of the future SSAM analysis showed that weekday conflicts show similar conflict breakdown by type, but Friday and Sunday rear-end conflicts increase up to 450% over the future weekday conflicts. Friday conflicts increased vastly over the existing Friday conditions due to the signal and side-street stop-controlled deficiencies creating rear-end conflicts and the high volume on mainline Highway 10 increasing the merging conflicts. SSAM analysis is based on gaps in vehicular traffic and measures near-miss potential. SSAM results show that future no-build scenarios are expected to experience an increase in crashes, due to higher volumes, which limit available gaps.

Table 13: Existing and Future Conflict Results

Conflict Type	Existing Weekday	Existing Friday	Existing Sunday	Future No-Build Weekday	Future No-Build Friday	Future No-Build Sunday
Crossing	199	499	449	365	2,141	777
Rear-End	612	1,800	1,146	1,033	5,652	2,054
Merging	268	648	555	467	1,764	850
Total	1,079	2,947	2,150	1,865	9,558	3,681
Change from Existing	N/A	N/A	N/A	+73%	+224%	+71%

Corridor Issues and Opportunities Identification

A key product of the existing and future conditions analysis is the identification of corridor issues. The issues identification process incorporated the technical analysis presented in this chapter, input received through public engagement, and the recommendations and policy direction put forth in planning documents from partner jurisdictions. Identification of issues is an important step in understanding the needs of corridor users, anticipating future challenges, and developing effective, viable solutions.

The corridor issues are presented in **Table 14**, **Table 15**, and **Table 16**, where they are organized within three primary issue areas: Safety, Mobility and Access. Within each issue area, sub-issues and opportunities are presented for motorized and non-motorized modes. Motorized modes of travel include personal vehicles, heavy freight and commercial vehicles, school buses, and public transit service from Tri-Cap and St. Cloud Metro Bus.

Table 14: Safety Issues and Opportunities

Sub-Issues
Motorized

Intersection-/Driveway-Related
• **Density** – High density of intersections and driveways result in undesirable spacing
• **Design**
  o Skewed intersections hamper driver sightlines and increase vehicle path overlap
  o Full access with narrow medians forces unsafe single-stage crossings
  o High-speed signals increase total crashes and risk of high severity rear-end and ped/bike crashes
• **Speed** – High mainline speeds increase crash severity and require longer gaps
• **Volumes** – High volumes limit available gaps, increasing risky gap acceptance
• **Mainline Queuing** – Queuing from signals and out of left turn lanes results in unexpected slowed or stopped vehicles in through lanes
• **Heavy Commercial Vehicles** – High volumes of loaded commercial vehicles enter and exit the corridor
• **Community Transit**
  o High volumes of school buses and regular route bus service enter and exit the corridor.
  o No transit stops exist directly on Highway 10 due to safety and mobility concerns for passengers
• **BNSF Railroad Tracks**
  o High volume twin tracks reduce safety on cross streets
  o Trains create delay that queues onto Highway 10
Lane Departure
• **Roadside Design** – Steep slopes, substandard approaches, and trees located in and just outside the clear zone
• **Road Surface** – Public and crash reports indicate frequent unexpected low-friction conditions
• **Separation Between Lanes** – No barrier between oncoming traffic to prevent head on crashes

Non-Motorized

Crossing Highway 10
• **Speeds**
  o High speeds require long gaps for ped/bike crossings and effectively eliminate driver yielding at legal crossings
  o High-traveled speeds exponentially increase the risk of severe or fatal injury if a crash occurs
• **Volumes** – High volumes result in few appropriate gaps, leading to risky gap acceptance
• **Geometry**
  o Multiple through and turn lanes complicate gap recognition and increase exposure time
  o Large radii for right turns encourage drivers to cross crosswalks and unmarked crossings with higher speeds
• **Lack of Facilities** – Requires users to navigate Highway 10 speed, volume, and geometry issues with no signals, crosswalk markings, or warning to drivers
Traveling Along Highway 10
• Lack of Facilities
  o Requires users to utilize non-ADA compliant shoulder next to high-volume, high-speed traffic

Table 14 Continued

Opportunities
Motorized

Intersection-/Driveway-Related
• **Density** – Reduce the density of driveways and intersections through access management techniques (consolidating and closing access points, using underpasses or overpasses for local roads, adding medians, etc.)
• **Design** – Identify opportunities for alternate intersection configurations such as RCIs, roundabouts, and interchanges
• **Volumes, Mainline Queuing, Heavy Commercial Vehicles, Community Transit**
  o Manage high-volume conflicting movements using alternate intersection configurations
  o Develop local road network
• **Mainline Queuing** – Improve intersection operations and/or geometry to reduce queueing
• **Heavy Commercial Vehicles** – Improve corridor safety to mitigate potential hazard of heavy vehicles
• **BNSF Railroad Tracks** – Reduce the amount of at grade crossings at railroad tracks to improve operations and safety
Lane Departure
• **Roadside Design** – Flatten dangerous slopes, improve approaches, and remove obstacles in the clear zone
• **Road Surface** – Improve and maintain roadway surface conditions for better friction
• **Separation Between Lanes** – Add median barrier to reduce the potential for head on crashes

Non-Motorized
Crossing Highway 10 • Provide safe and ADA-accessible opportunities to cross Highway 10 at consolidated locations **Traveling Along Highway 10** • Provide an ADA-accessible shared-use path facility along the Highway 10 corridor

Table 15: Mobility Issues and Opportunities

Sub-Issues
Motorized

Controlled Intersections
• **Daily Peak Periods**
  ○ Signalized intersections experience significant cross street delay during peak periods
  ○ Future (2048) overall intersection delay nearing LOS F at Mill St, 70th Ave, 60th St, 45th Ave, 32nd St, the Quarry Access, Minnesota Blvd, and Birch St
• **Seasonal/Recreational Peaks**
  ○ Signalized intersections experience significant mainline and cross street delay during peak periods
  ○ Friday PM peak nearing LOS F under existing conditions
Uncontrolled Intersections
• **Full Access, Side-Street Stop-Controlled Intersections**
  ○ Side approach LOS D to F under existing conditions at some intersections
  ○ Side approach LOS F for approximately half of intersections in 2048 future conditions
• **Restricted Access Intersections (currently some RI/RO)**
  ○ Lower intersection delay, but additional travel time for some movements
  ○ Limited local network to accommodate movements off Highway 10
Local and Regional Network
• **Limited Parallel Routes (North-South or East-West)** – Forces or incentivizes local traffic to use Highway 10
• **Potential Network Expansion**
  ○ 33rd Street River Bridge Corridor and Beltway Concept could change travel patterns
  ○ Highway 24 new river crossing and Highway 10 connection could induce higher volumes on Highway 10
• **Sources of Congestion** – Congestion from signalized intersections, crashes (particularly fatal and serious injury), and roadway condition due to weather are primary causes of increased travel times along the corridor

Non-Motorized

Crossing Highway 10
• **Lack of Acceptable Gaps** – High speeds and volumes result in very few acceptable gaps, leading to significant wait periods
• **Lack of Controlled or Separated Crossings**
  ○ Controlled crossings are only available at the signalized intersections at Highway 24 and 15th Avenue SE
  ○ Controlled crossings have long wait times due to signal cycle lengths
Traveling Along Highway 10
• **Lack of Facilities**
  ○ Lack of ped/bike facilities force users to choose inconvenient, circuitous routes, decreasing safety and adding travel time
  ○ Highway 10 study area includes a larger share of households in poverty as compared to the countywide average

Table 15 Continued

Opportunities
Motorized

Controlled Intersections
• **Daily Peak Periods**
  ○ Optimize signal timing to improve side-street delay
  ○ Grade separate the side-street from Highway 10 and create an interchange
• **Seasonal/Recreational Peaks** – Optimize signal timing for seasonal recreational travel
Uncontrolled Intersections
• **Full Access, Side-Street Stop-Controlled Intersections**
  ○ Restrict access and eliminate some movements to improve operations and safety
  ○ In the future, remove some accesses and add interchanges as new accesses
• **Restricted Access Intersections (currently some RI/RO)** – Highlight the successes and limitations of these accesses as a model for future RI/RO access conversions on the corridor
Local and Regional Network
• **Potential Network Expansion** – The Mississippi River Bridge Planning Study will explore the extension of 33rd Street as a minor arterial across the river to Highway 10
• **Sources of Congestion** – Address primary sources of congestion by reducing crash frequency and severity, shortening incident response times, improving winter roadway maintenance, and modifying intersection location, type, and function

Non-Motorized
Crossing Highway 10 • Provide safe opportunities to cross Highway 10 at consolidated locations **Traveling Along Highway 10** • Provide a shared-use path facility along the Highway 10 corridor

Table 16: Access Issues and Opportunities

Sub-Issues
Motorized

Destinations Within the Corridor

- **Direct Access**
  - Multiple use types (commercial, mining, residential, retail) have only Highway 10 access
  - The majority of access is set by MnDOT legal precedent
  - Access types and spacing are non-conforming for a fully access-controlled Highway 10
  - Future development will access Highway 10 from local network or directly without significant investment in access consolidation and improvement
- **Local Network**
  - Limited potential to reroute trips on the current network
  - Access is focused on Highway 10

Destinations Across the Corridor

- **Current Full Access** – Allows for crossing Highway 10 but is challenging due to volumes, speed, and geometry
- **Local Network** – Limited east-west routes result in significant volumes both entering and exiting Highway 10 within the study area to complete east-west trips

Destinations Through the Corridor

- **Regional Connections**
  - Regional traffic is well served, though beginning a regional trip on the corridor is difficult
  - Traveler Information Center is difficult to utilize due to direct, at-grade connections

Non-Motorized

Destinations Within the Corridor

- **Lack of Controlled Crossings** – Pedestrian crossings are unsafe, preventing users from accessing destinations along the corridor. This is particularly important for low-income and transportation disadvantaged residents who rely on non-motorized travel
- **Lack of Parallel Facilities** – Access to businesses, residences, and recreational sites along the corridor require long and circuitous routes

Destinations Across the Corridor

- **Lack of Controlled Crossings** – NW/SE corridor alignment results in a barrier for both east-west and north-south trips

Destinations Through the Corridor

- **Lack of Parallel Facilities**
  - Requires users to travel on other roadways with lower volumes and speeds, often resulting in longer, more circuitous trips
  - The lack of bicycle and pedestrian facilities deters most non-motorized travel along the corridor

Table 16 Continued

Opportunities

Motorized

Destinations Within the Corridor

- **Direct Access** – Reduce the density of driveways and intersections by removing and consolidating access points
- **Local Network** – Create a local service road system to provide direct access to properties

Destinations Across the Corridor

- **Current Full Access**
  - Change intersection control types
  - Evaluate the viability of the location for a future interchange
- **Local Network** – 33rd Street River Bridge Corridor and Beltway Concept will provide additional east-west connectivity, reducing the circuity of travel

Destinations Through the Corridor

- **Regional Connections** – Assess and reclassify connecting roadways to reflect FHWA's system continuity guidelines

Non-Motorized

Destinations Within the Corridor

- **Lack of Controlled Crossings** – Add new crossings where none exist today
- **Lack of Parallel Facilities** – Add a shared-use path or other bicycle and pedestrian facilities along the corridor, as well as along new service roads

Destinations Across the Corridor

- **Lack of Controlled Crossings** – Add safe crossings with any new intersection reconfiguration

Destinations Through the Corridor

- **Lack of Parallel Facilities** – Add a facility within the corridor

Corridor Vision Statement and Goals

Overall, the study purpose is to establish a corridor management strategy for Highway 10 to develop a series of Low-, Mid- and High-Cost intersection-level and corridor-level multimodal improvements. The overarching corridor needs are safety, mobility, and access.

The corridor vision is to develop a safe, efficient, and accessible highway for all users with destinations along, across, or through Highway 10 between Highway 24 in Clear Lake and 15th Avenue SE in St. Cloud. The corridor goals and guiding principles serve as a summary of the existing conditions analysis, identify the needs specific to the corridor, and ensure that the results of the study stay on track to make the project successfully serve the users and the community. Within the next steps of the report, the goals and guiding principles helped establish the alternatives analysis criteria, early screening of alternatives, and layout development details.

The corridor goals include:

- Improve safety for all users of Highway 10, which has an ongoing history of high-severity vehicle crashes and many risk factors for both motorized and non-motorized users.
- Reduce overall delay for all users on Highway 10, which currently experience excessive intersection delay at the Highway 24 and 15th Avenue SE intersections, and significant delay for side-street users entering, crossing, or turning left off of Highway 10.
- Modernize access along and across the corridor to industrial, commercial, agricultural, institutional, and residential properties for all users and vehicle types, as appropriate for a high-speed, high-volume interregional corridor.

The guiding principles include:

- Facilitate interregional mobility
- Improve safety and operations
- Better manage access, with long-term goals and short-term/interim improvements
- Accommodate existing and projected business development, agricultural operations, and residential growth along the corridor
- Respond to large truck traffic and the recreational and seasonal peaks
- Improve network connectivity and functionality
- Support long-range transportation investments such as the 33rd Street corridor across the Mississippi River, the St. Cloud Beltline concept and potential realignment of Highway 24 near Clear Lake.

Hwy 10 Corridor Study

HIGHWAY 10 CORRIDOR STUDY
CHAPTER 4: ALTERNATIVES ANALYSIS REPORT

September 2023

DEPARTMENT OF TRANSPORTATION

Prepared by KLJ

Table of Contents

List of Figures

List of Tables

Appendix

Introduction

This report details the methodology, results, and recommendations of the alternatives analysis of U.S. Trunk Highway 10 in Sherburne County, MN. The project extends from the intersection of Highway 24 in Clear Lake, MN to the intersection of 15th Avenue SE in Saint Cloud, MN. The purpose of this report is to evaluate a refined list of Low-, Mid-, and High-Cost solutions, and offer recommendations to address the primary operational and safety concerns that were determined in the Existing and Future Conditions section of this project. The corridor goals and guiding principles serve as a summary of the existing conditions analysis, identify the needs specific to the corridor, and ensure that the results of the study stay on track to make the project successfully serve the users and community. Within the next steps of the report, the goals and guiding principles helped establish the alternatives analysis criteria, early screening of alternatives, and layout development details. The corridor guiding principles, vision, and goals identified for the corridor are described below.

Guiding Principles:

- Facilitate interregional mobility, support improved safety and operations, and better manage access
- Accommodate existing and projected business development, agricultural operations, and residential growth along the corridor.
- Respond to large truck traffic and the recreational and seasonal peaks.
- Maintain network connectivity and functionality
- Support long range transportation investments such as the 33rd Street corridor across the Mississippi River, the St. Cloud Beltline concept and potential realignment of Highway 24 near Clear Lake.

Vision: Develop a safe, efficient, and accessible highway for all users with destinations along, across, or through Highway 10 between MN Highway 24 and 15th Avenue SE.

Goal #1: Improve safety for all users of Highway 10, which has an ongoing history of high severity vehicle crashes and many risk factors for both motorized and non-motorized users.

Goal #2: Reduce overall delay for all users on Highway 10, which currently experience excessive intersection delay at the Highway 24 and 15th Avenue SE intersections and significant delay for side road users entering, crossing, or turning left off of Highway 10.

Goal #3: Modernize access along and across the corridor to industrial, commercial, agricultural, institutional, and residential properties for all users and vehicle types, as appropriate for a high-speed, high-volume interregional corridor.

Contents

This chapter of the Trunk Highway 10 Corridor Study documents the final steps of the alternative development, alternatives analysis process, and supporting investigation for this stage of the projects. The five main components of this chapter are as follows:

- **Alternatives Refinement**: This section documents the refinement process completed between the secondary high-level screening and full detailed analysis.
- **Methodology**: This section describes the process used to evaluate the final layouts in detail. The evaluation approach involved analyzing data for each alternative, presented in a matrix for simple comparison. The evaluation criteria and their respective applications are described in this section.
- **Results**: This section describes the results of the evaluation methods explained in the previous section and offers commentary on the strengths and weaknesses of each alternative.
- **Benefit-Cost Analysis**: This section describes the Benefit-Cost Analysis (BCA) methodology and results for each alternative.
- **Recommendation**: This section provides a final, refined recommendation for each of the Low-, Mid-, and High-Cost alternatives.

Alternatives Screening

Early Screening

The Existing and Future Conditions Report and TAC feedback identified several issues and sub-issues currently existing along the Highway 10 corridor. Feasible alternatives were developed to specifically address the corridor issues identified.

Corridor issues identified include:

- Volumes – high traffic volumes at high speeds, and a high percentage of heavy vehicles
- Intersections and driveway access – high access density and skewed intersections
- BNSF Railroad – high-volume railroad parallel to the corridor
- Lane departure – clear zone improvements and median barrier needs
- Non-motorized – the 10-mile corridor currently has two controlled non-motorized crossing locations at the north and south ends of the corridor. 10-foot shoulders allow legal travel, but no other parallel routes exist.

The project scope included intent to develop alternative options into three cost-based levels: Low-Cost, Mid-Cost, and High-Cost to allow flexibility with funding outcomes. Due to high speeds and high volumes along the corridor, no full-access intersections or driveways are included in any alternative. Based on existing and projected conditions along the corridor, as well as previous studies and TAC feedback, Highway 10 was identified as a corridor that would benefit from conversion to a freeway. Therefore, the cost-based levels were split into High-Cost focusing on freeway design, and Low- and Mid-Cost focusing on non-freeway design. Low-Cost alternatives still address the longer-term needs identified for the corridor and demonstrate a high return-on-investment. Typically, they are less complex and can be implemented quicker than higher-cost alternatives, which tend to require additional planning, environmental review, and engineering. They also differ from High-Cost alternatives as they fall short of addressing some of the more visionary goals for the corridor.

The High-Cost alternatives focused on a freeway concept with grade-separated interchanges. Specific interchange options were significantly restricted, due to the corridor's proximity to the BNSF railroad and clearance requirements. The Low-Cost and Mid-Cost alternatives were developed through individual intersection assessment, beginning with Low-Cost. Development focused on how different options affected mainline mobility and travel time, upstream and downstream intersections, and adjacent railroad crossings. Construction of new traditional signalized intersections were ruled out from all alternatives, due to negative impact to mainline mobility, as well as historic rear-end crash trends at the existing signals at Highway 24 and 15th Avenue SE. All-way stop-control was also ruled out due to mainline mobility impacts. Roundabout concepts were removed from further analysis due to high mainline volume and high speeds along the corridor. This left the design team to consider unique alternative intersections that modify access. The alternatives were developed with careful consideration for how the intersection reconstruction would interact with nearby intersections and re-routing of local trips.

The Low-Cost alternatives focused on improvements within existing mainline right-of-way. The Mid-Cost alternatives built on the Low-Cost alternatives and included more off right-of-way work and further restrictions to access points. These alternatives incorporated more total access closure to encourage the usage of service roads and alleviate side-street interaction with the high volume on Highway 10. Initial development began with one alternative in each cost-based category. These alternatives were presented to the TAC, who then helped to develop a second version of each alternative category.

Guiding Themes

MnDOT performed a Quality-of-Life study in 2013, which included a thorough literature review and focus groups. The goal of this study was to define and assess public opinion of transportation projects. Focus group participants identified seven major categories as primary factors to their overall quality of life (QOL). The seven categories (in alphabetical order) are: access, design, environment, maintenance, mobility, safety, and transparency. For purposes of this study regarding Highway 10, some of these categories were combined and some were emphasized, to fit the specific needs of the corridor and surrounding network. **Table 1** shows the relationship between this study's defined evaluation metrics and MnDOT's QOL categories.

Table 1: Quality of Life and Evaluation Metric Comparison Matrix

MnDOT Quality of Life Metrics	Safety	Mobility	Access	Cost and Impacts	Additional Considerations
Access			X		
Design	X	X	X	X	
Environment				X	
Maintenance				X	X
Mobility		X	X		
Safety	X				
Transparency				X	X

Final Alternatives

After early screening with a fatal flaw analysis and a review of the corridor goals and vision, the alternatives were refined to six alternatives, with two Low-Cost, two Mid-Cost and two High-Cost alternatives. The alternatives are discussed below and detailed layouts of each of them are shown in their entirety in **Appendix 4A**.

Low-Cost alternatives were focused on intersection improvements that could be completed primarily within the existing right-of-way. Low-Cost alternatives include:

- Low-Cost Alternative A: Acceleration Lane Corridor
    - This alternative includes the implementation of several modified continuous-T intersections. An example of a modified continuous-T intersection is shown in **Figure 1**. This intersection design restricts left turns off of Highway 10 and instead allows left turns onto Highway 10 with an acceleration lane. This alternative will remove crossings and access points along the corridor, as well as reduce left-turn movements at existing intersections. This alternative will keep 19 intersections along the 10-mile corridor. A new service road will be included parallel to Highway 10 from 32nd Street SE to the Traveler Information Center. Local trips will be directed to local roads with this alternative. An overview of Low-Cost alternative A is shown in **Figure 4**.
- Low-Cost Alternative B: Reduced Conflict Intersection (RCI)[1] Corridor
    - This alternative includes the implementation of several RCIs along the corridor. An example of an RCI is shown in **Figure 2**. RCIs feature the restriction of left-turn and minor through movements at an intersection and reroute these movements to U-turns located downstream of the intersection. RCIs are designed to reduce the frequency and severity of angle crashes. This alternative will also remove crossings and access points, reduce left-turn movements, and include a new service road from 32nd Street SE to the Traveler Information Center. This alternative will keep 15 intersections. Local traffic will be directed to make U-turns along the corridor. An overview of Low-Cost alternative B is shown in **Figure 5**.

Mid-Cost alternatives were focused on the consolidation of intersections and the development of more local connections. Mid-Cost alternatives include:

- Mid-Cost Alternative A: Greater Consolidation
    - This alternative was developed to reduce the amount of turns at the intersections along the corridor. The number of intersections will be reduced to five. This alternative adds a signalized RCI in the middle of the corridor to accommodate consolidated traffic. An example of a signalized RCI intersection is shown in **Figure 3**. Local roads will be built as well to divert trips from Highway 10. This alternative includes five miles of service roads to the east of Highway 10 and 3.5 miles to the

[1] Reduced Conflict Intersections (RCIs) include J-turns, 3/4 intersections, median U-turn (MUT) intersections, restricted crossing U-turn (RCUT) intersections, etc.

west. The intersections of 32nd Street SE and Minnesota Boulevard will be closed. An overview of Mid-Cost alternative A is shown in **Figure 6**.

- Mid-Cost Alternative B: Lesser Consolidation
    - This alternative includes two miles of service roads to the east of Highway 10. This alternative will close all but seven intersections along the corridor. Local traffic will be diverted to local roads, but less so than Mid-Cost alternative A. An overview of Mid-Cost alternative B is shown in **Figure 7**.

High-Cost alternatives involved a full grade-separated freeway design to accommodate the future APO Beltway.

- High-Cost Alternative A: Existing Interchange Locations
    - This alternative includes three grade-separated interchanges and an overpass. The number of intersections along the corridor will be reduced to five. The intersections of Highway 10 and Highway 24 in Clear Lake and Highway 10 and 15th Avenue SE in St. Cloud will be converted to an interchange at their existing locations, an interchange will be constructed north of 45th Avenue SE (CR 65), and an overpass will be constructed at 60th Street SE. An overview of High-Cost alternative A is shown in **Figure 8**.
- High-Cost Alternative B: Displaced Interchanges Locations
    - This alternative also includes three grade-separated interchanges and an overpass, and the number of intersections will be reduced to five. The intersection located at Highway 24 in Clear Lake will be moved approximately one mile north, and the intersection at 15th Avenue SE in St. Cloud will be moved approximately one half-mile south. Both intersections will also be converted to a grade-separated interchange. An interchange will be constructed north of 45th Avenue SE (CR 65) and an overpass will be constructed at 60th Street SE. Feedback from study partners indicated that the interchange location at the south end of the corridor in this alternative would not be acceptable to Clear Lake. An overview of High-Cost alternative B is shown in **Figure 9**.

Figures 4-9 show high-level visual representations of the alternatives. Detailed layouts are available in **Appendix 4A**.

Figure 1: Modified Continuous-T Example

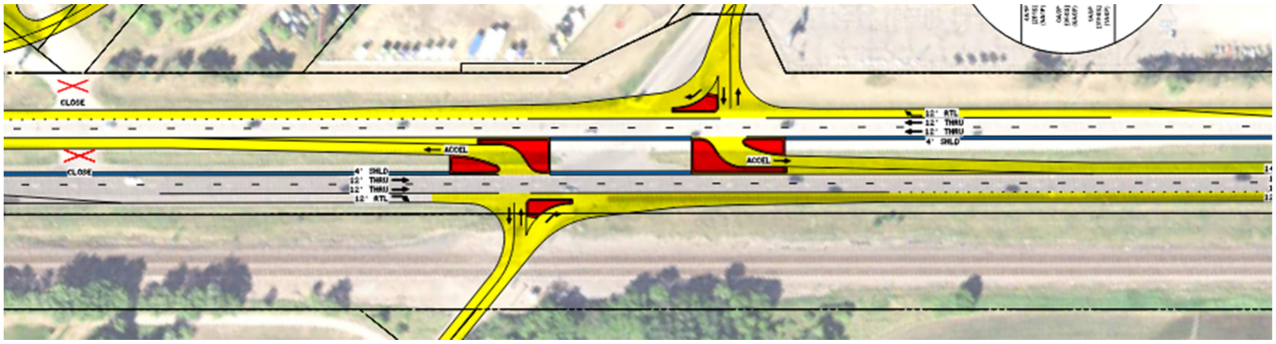


Figure 2: Reduced Conflict Intersection (RCI) Example

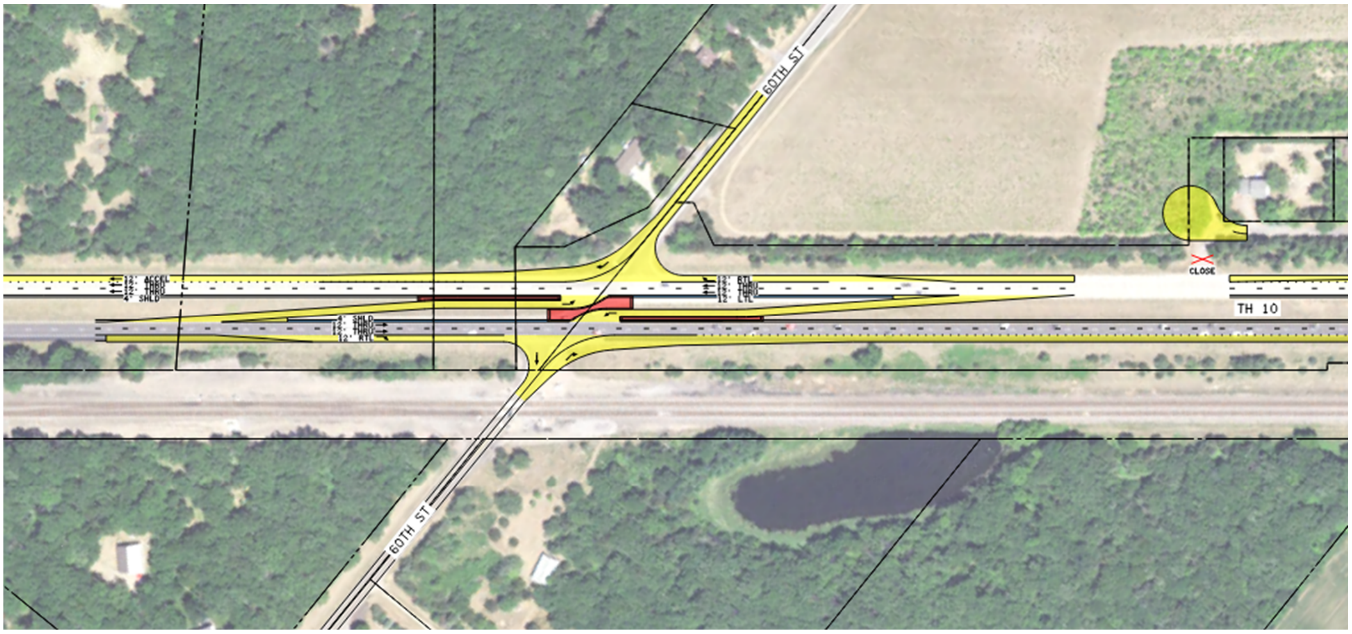


Figure 3: Signalized Reduced Conflict Intersection (RCI) Example

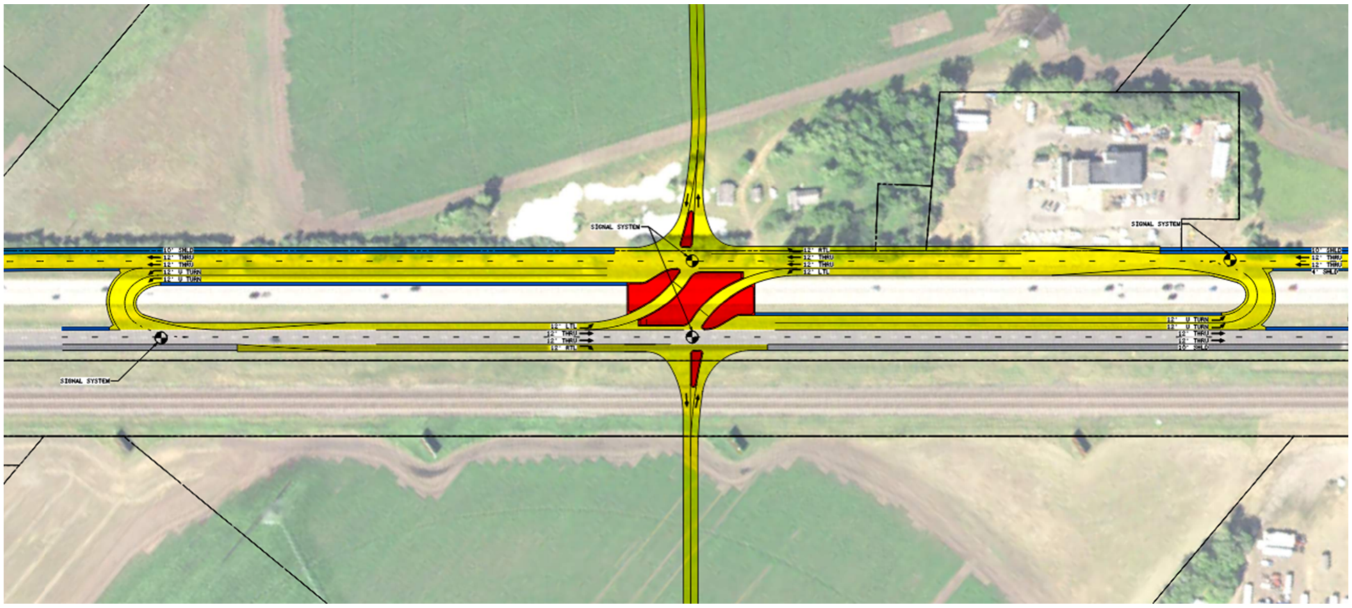


Figure 4: Low-Cost Alternative A – Acceleration Lane Corridor

Figure 5: Low-Cost Alternative B – RCI Corridor

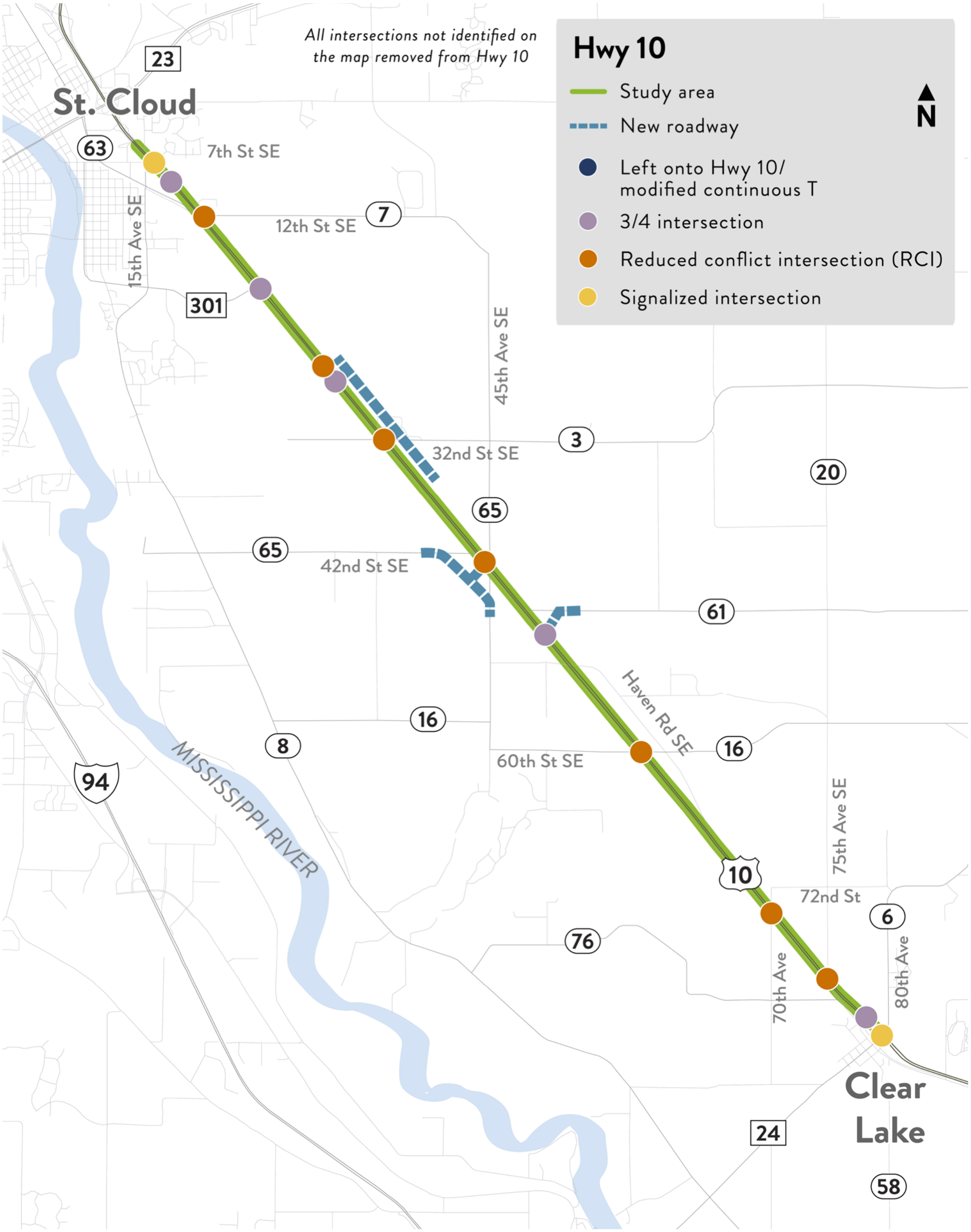


Figure 6: Mid-Cost Alternative A – Greater Consolidation

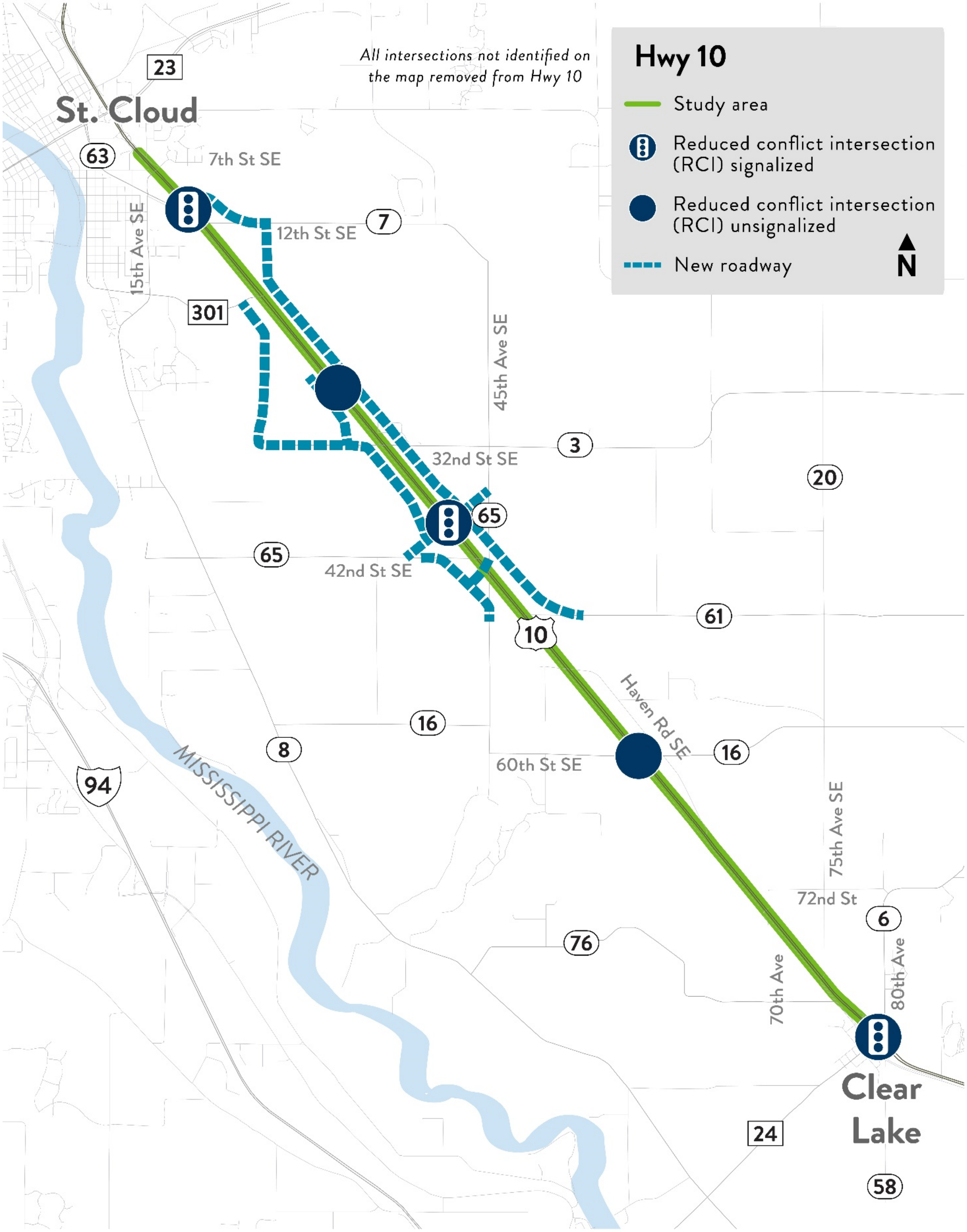
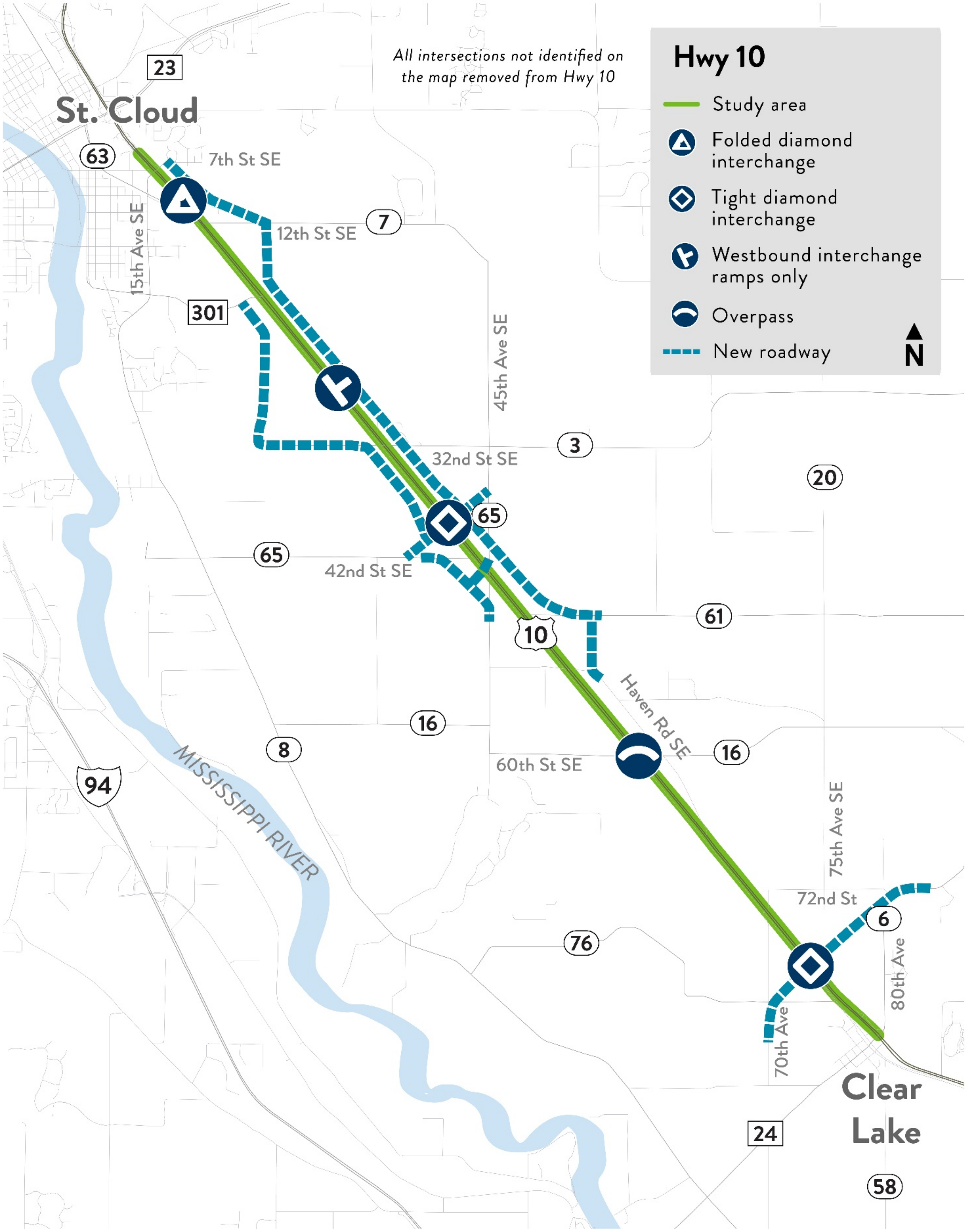


Figure 7: Mid-Cost Alternative B – Lesser Consolidation

Figure 8: High-Cost Alternative A – Existing Interchange Locations

Figure 9: High-Cost Alternative B – Displaced Interchange Locations



Evaluation Criteria & Process

Process

Three major categories of improvement were identified as priorities in the Existing Conditions report. These categories include Safety, Mobility, and Access. The evaluation metrics used in this analysis were organized under these priorities, as well as Cost and Impacts, and Additional Considerations. Each of these metrics, the resulting units, and the tool used for analysis are shown in the **Methodology** sections. A full table, including analysis results, can be found in **Appendix 4B**.

Methodology

This section details the methodology used to evaluate each alternative, organized by the five major categories shown previously.

Safety

The metrics used to evaluate safety along the corridor are shown in **Table 2**, along with the metric units and analysis tool for each. The specific metrics are described in detail in the following section.

Table 2: Evaluation Criteria and Methodology – Safety

Metric	Units	Analysis Tool
SSAM - Total Network	Percent change	VISSIM
SSAM - Mainline	Percent change	VISSIM
Risk Factor Analysis	Score (1 - best; 5 - worst)	Design Audit
Acceleration Lane Evaluation	Score (1 - best; 5 - worst)	Design Audit
Conflict Point Analysis	Percent change	Count of conflict points by type

Surrogate Safety Analysis Model (SSAM)

The first sub-category used in the Safety category of the alternatives analysis is the Surrogate Safety Analysis Model (SSAM). SSAM is a software to identify, classify, and evaluate traffic conflicts using vehicle trajectory data resulting from VISSIM microscopic traffic simulations. SSAM results produce a total count for the potential occurrences of crossing, rear-end, or sideswipe conflicts. This metric does not directly predict crash occurrences for each alternative but is effective in establishing an estimate of conflict potential. For this metric, the SSAM results from each alternative were compared to future no-build conditions. SSAM results were determined for the total network (including side-streets) and for the Highway 10 mainline alone. The metric shown for this evaluation is the percent change in potential conflicts from no-build conditions.

Risk Factor Analysis

The second sub-category used to evaluate alternatives is the risk factor analysis. For many cases, there are additional risk factors that are not fully assessed with crash data and SSAM. Risk factors play an important role in identifying mitigatable design features beyond the driver conflict analysis of SSAM. This type of analysis takes a wholistic approach in efforts to identify issues that may not be apparent in traditional quantitative analysis. Risk factors also aid in taking a proactive approach to safety rather than a reactive approach that primarily considers crash history. Key risk factors were identified in the Existing and Future Conditions Report and are listed below:

- Heavy trucks
- Heavy rail
- Narrow median width
- Substandard roadside design
- High travel speeds
- Lack of lighting
- High access density
- Full-access intersections
- Skewed intersections
- Substandard driveway profiles
- Lack of pedestrian facilities

A brief questionnaire was developed to evaluate how well each alternative addresses these factors. The questionnaire was designed to elicit simple straightforward responses. The safety risk analysis included six questions which are described below.

1. **Number of Intersections:** The alternatives were given a rating related to the number of intersections with Highway 10. While there are many reasons that less intersections can be safer on a corridor, the two most relevant for the project are that less intersections with Highway 10 also means there are less railroad crossings, which reduces exposure for collision involving a rail car. Fewer intersections also create less interaction with mainline through traffic and side-street traffic, creating fewer unexpected stop conditions and conflict points. Studies show that each additional access point per mile increases the crash rate along a corridor by three to five percent.
2. **Traffic Signals**: The alternatives were given a rating related to the number of traffic signals on the corridor. Due to the high-speed, high-volume, rural expressway design, additional traffic signals are considered unfavorable. The highway is mobility-focused and the introduction of traffic signals, especially in the middle of the corridor, creates an unexpected stop condition for mainline traffic, which could lead to an increase in high-speed rear-end collisions.
3. **Minor Left Exposure**: The alternatives were given a rating based on how intersection treatments handled the safety of left turns onto Highway 10. The most desirable (score 1) alternatives were the High-Cost alternatives, as they would relocate left turns to an interchange with controlled access to Highway 10. The next most desirable alternative (score 2) was assigned to Low-Cost alternative A, as it removed all conflicts with far side traffic and provides the minor approach left turns a dedicated acceleration lane. The next-most desirable alternatives (score 3) were both the Mid-Cost alternatives, as they would eliminate several intersections and reduce the number of conflicts for the side-street left turns with reduced conflict intersections. The least desirable alternative for left turns was Low-Cost alternative B (score 4), as it does not remove as many intersections as the Mid-Cost alternatives. However, Low-Cost alternative B odes reduce the number of conflicts for the side-street left turns with the implementation of RCIs.
4. **Acceleration Lanes and Ramps**: The inclusion of ramps in the concepts is the most desirable (score 1) because they provide the most physical separation as the vehicles are accelerating. Acceleration lanes adjacent to the median are the next most desirable (score 2) alternative because they allow users to reach traveled speeds before merging into traffic and do not introduce a crossing conflict like U-turns. Acceleration lanes on the outer edge of the roadway at U-turn locations are the least desirable (score 3),

but still provide important safety benefit for heavy trucks to accelerate in a dedicated location. It should be noted that all alternatives provide right-turn acceleration lanes throughout the corridor at key locations.

5. **Median Design and Openings:** The alternatives were given a rating for the safety improvements related to the median and likelihood for head-on and run-off-road left-side collisions. Both the median design type and number of openings in the median were considered. All alternatives are expected to have the same type of median design with a cable barrier. The difference in results is due to the number of access openings. Both High-Cost alternatives and Mid-Cost alternative A are expected to have less than ten median opening and the Low-Cost alternatives and Mid-Cost B alternative expected to have more than ten openings.
6. **Roadside Hazards:** The alternatives were given a rating for safety improvements to the roadside design elements such as ditch slopes, clear zones, and shoulder widths. All alternatives are expected to improve the roadside design in the same manner.

Acceleration Lane Evaluation

The third safety sub-category is the acceleration lane evaluation. This metric rates the ability for heavy vehicles to safely accelerate and merge onto Highway 10. Standard intersections (signalized and unsignalized) offer the least support for heavy truck acceleration, as trucks and heavy vehicles must make a full turn and accelerate from a full stop. This requires heavy vehicles to wait much longer for an acceptable gap and could cause other vehicles on the highway to slow significantly or merge to alternate lanes, resulting in safety concerns and delay. The Highway 10 corridor has a high truck volume (approximately 15%), as it serves as primary access to industrial land use zones south of St. Cloud and as a regional and interregional freight corridor. Providing locations for heavy vehicles to accelerate and merge at or near full speed on the corridor allows traffic on the corridor to flow more continuously and reduces the potential for conflict. Each alternative was scored by how many acceleration movements are required.

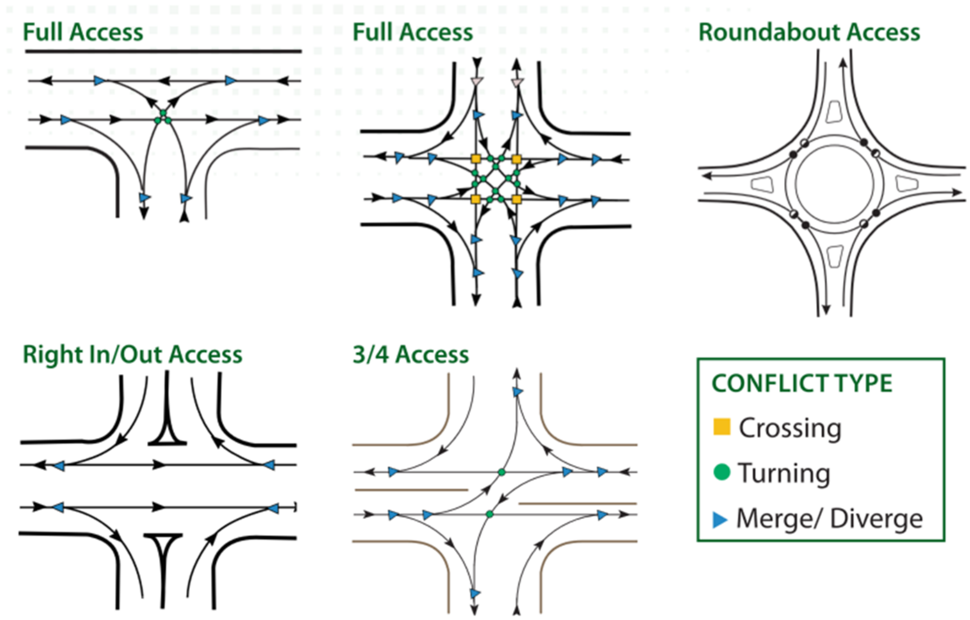
Conflict Point Analysis

The fourth and final safety evaluation sub-category is the conflict point analysis. Conflict points refer to locations within an intersection where movement paths overlap, resulting in the potential for a conflict. MnDOT[2] defines the conflict points in three types: crossing, turning, and merging/diverging. Crossing conflicts are located where through movements cross, such as a northbound through movement crossing the eastbound and westbound through movements of a road. Crossing conflicts typically result in crossing or angle crash types, which are commonly crashes of higher severity. Turning conflicts occur when one or more vehicles are making a turning movement, such as a vehicle making a left turn onto a roadway. Merging and diverging conflicts occur where movements merge two separate paths into one continuous path or split from a continuous path to two separate

[2] Preston, H., Farrington, N. (2011). *Minnesota's Best Practices and Policies for Safety Strategies on Highways and Local Roads.* (Report No. MN/RC 2011-21). Minnesota Department of Transportation. https://lrrb.org/pdf/201121.pdf.

paths. These types of conflicts typically result in rear-end or sideswipe crash types. Conflict maps for generic intersections are shown in **Figure 10**.

Figure 10: Standard Intersection Conflict Types



Source: Intersection Treatments Policy (MnDOT, September 2011)

Conflict points can be reduced or adjusted by changing intersection geometry and restricting or rerouting specific movements. The conflict points for passenger vehicles of each publicly accessible intersection along the Highway 10 corridor were summarized for each alternative. Each alternative was compared via a conflict reduction metric, produced by measuring the weighted total of existing conflict points to the reduction due to the alternative improvement.

Mobility

The metrics used to evaluate mobility along the corridor are shown in **Table 3**, along with the metric units and analysis tool for each. The specific metrics are described in detail in the following section.

Table 3: Evaluation Criteria and Process – Mobility

Metric	Units	Analysis Tool
Intersection Peak Hour Delay (Weekday PM): Key Intersections[3]	LOS	VISSIM
Queue Length Analysis (Maximum and average mainline left-turn): Key Intersections[3]	Feet	VISSIM
Queue Length Analysis (Maximum and average side-street approach): Key Intersections[3]	Feet	VISSIM
Vehicle Hours Traveled (VHT)	VHT and % change from No-Build	VISSIM
Additional Trip Length	VMT and % change from No-Build	VISSIM
Total Daily Delay	Hours	VISSIM
AM Peak Delay	Seconds per vehicle	VISSIM
PM Peak Delay	Seconds per vehicle	VISSIM
Planning-Level Capacity Check	Pass/fail – acceptable v/c ratio	FHWA Cap-X

Intersection Peak Hour Delay

The first sub-category in Mobility is the intersection peak hour delay. Delay was estimated for each alternative using VISSIM software. Eleven (11) key intersections[3] were analyzed for this sub-category, based on existing ADT and Level of Service (LOS). The intersection delay refers to control delay for vehicles stopped at an intersection. The LOS was estimated for the selected intersections based on the delay. The metric used for comparison in this category is LOS analyzed for the weekday PM peak hour.

Queue Length Analysis

The second metric sub-category in mobility is the queue analysis. Maximum and average queue lengths for specific movements were produced through VISSIM simulation. The metrics used for this comparison are the maximum and average mainline left-turn queue lengths, and the maximum and average side-street approach queue length. The queue lengths were analyzed for the same key intersections selected for the intersection peak hour delay sub-category. These results were compared between the future no-build scenario and each alternative.

Total Vehicle Hours Traveled

The third mobility sub-category is the total vehicle hours traveled. VISSIM results will also produce a sum of the total vehicle hours traveled (VHT) along the corridor for each alternative, as a measure of delay. VHT is a metric of the total hours that vehicles travel a specified distance in a specified amount of time. For this report, the VHT

[3] Eleven (11) key intersections were selected for Mobility analysis, due to high existing volumes and poor LOS. These intersections include Highway 24 (Main Avenue), Mill Street, Henry Street, 75th Avenue, 60th Street (CR 60), 45th Avenue SE (CR 65), 32nd Street SE (CSAH 3), Minnesota Boulevard (MN 301), 12th Street (CSAH 7), Birch Street, and 15th Avenue SE.

measures the vehicle hours traveled in one day along the full corridor. This metric is presented as total VHT for each alternative, and the percent change from no-build.

Additional Trip Length

The fourth sub-category of mobility is the measure of additional trip length related to access modifications for the build alternatives. Several of the proposed alternatives involve restricting and rerouting turn movements at key intersections. The additional trip length is measured as changes in vehicle miles traveled (VMT). VISSIM results also produce a sum of the total VMT along the corridor. This metric is presented as total VMT for each alternative, and the percent change from no-build.

Total Delay

The fifth sub-category of mobility is the total delay. VISSIM results produce a sum of daily delay, as well as hourly delay throughout the study period. This metric is presented as total daily delay, AM peak hour delay, and PM peak hour delay, in seconds per vehicle for each alternative.

Planning Level Capacity Check

The sixth and final sub-category of mobility is the planning-level capacity check. This measure is produced using the Federal Highway Administration's (FHWA) Capacity Analysis for Planning of Junctions (Cap-X) tool. The Cap-X tool was developed using Microsoft Excel and is designed to evaluate peak volume and lane configuration inputs to provide planning capacity assessment at intersections along the corridor. The Cap-X results were compared between alternatives.

Access

The metrics used to evaluate access along the corridor are shown in **Table 4**, along with the metric units and analysis tool for each. The specific metrics are described in detail in the following section.

Table 4: Evaluation Criteria and Process – Access

Metric	Units	Analysis Tool
Density	Score (1 - best; 5 - worst)	MnDOT Policy Comparison
Local Connectivity	Score (1 - best; 5 - worst)	Design Audit
Bicycle and Pedestrian Access – Parallel to TH 10	Score (1 - best; 5 - worst)	Design Audit
Bicycle and Pedestrian Access – Crossing TH 10	Score (1 - best; 5 - worst)	Design Audit
Heavy Vehicle Impacts	VMT	VISSIM

Access Density

The first sub-category of the access category is density. Standard MnDOT policy for access spacing and geometry was reviewed to measure how each alternative meets the requirements. MnDOT's *Access Management Manual* states that Highway 10 between the Sherburne and Benton County line in St. Cloud and Highway 24 in Clear Lake is classified as a non-interstate freeway or expressway (Category 1AF), with speeds between 55-65 mph. Based on MnDOT policy within the study area, the Highway 10 corridor should have no more than one full-movement intersection per mile. This would result in no more than eleven full-movement intersections in the study area. On a non-interstate freeway transitioning to full-access control (Category 1AF) the MnDOT *Access Management Manual* states, “driveways should not be permitted if reasonably convenient and suitable alternative access is available”. The manual notes that driveways and new driveways may be allowed based on an understanding that alternative access will be required in the future. The evaluation for each alternative was scored (5 – worst; 1 – best) on a measure of fully meeting the access standards, varying degrees of partially meeting standards or failing to meet standards with the following details:

- 1 – Fully Meets Standards: No more than 11 full-access intersections and no driveway access in the study corridor.
- 2 – Good Improvement to Standards (not fully met): No more than 11 full-access intersections and restricted-access driveways combined in the study corridor.
- 3 – Moderate Improvement to Standards (not fully met): No more than 25 full-access intersections and 10 restricted-access driveways in the study corridor.
- 4 – Slight Improvement to Standards (not fully met): No more than 25 full-access intersections and 15 restricted-access driveways in the study corridor.
- 5 – No improvement to standards from existing conditions.

Local Connectivity

The second sub-category of access is a measure of local connectivity. In this setting, local connectivity refers to how accessible key locations and routes are from local networks. Local connectivity is related to the ability to arrive at a local destination from a variety of routes. A roadway network with strong local connectivity transfers local traffic from origins and destinations onto lower functionally classified roads before connecting to arterials and highways. Direct access to mobility-focused roadways initially seems beneficial, as it reduces trip length. However, uncontrolled low volume roadways with direct access to arterials have poor safety performance. This is especially true with high-volume arterials, like Highway 10. Each alternative was evaluated on a scale relative to local connectivity, as explained below:

- Majority of destinations accessible only though direct connection to Highway 10
- Majority of destinations accessible through local routes that are only connected to Highway 10
- Majority of destinations accessible via a local network.

Bicycle and Pedestrian Access

Bicycle and pedestrian access was scored by two sub-categories: along and across Highway 10. Access along Highway 10 depends on the presence of a continuous separate facility connected to places or origins and destinations. Access across Highway 10 depends on the legality and crossing facility type. When a highway facility is converted to a freeway through closure of local roadway intersection and no substitute infrastructure is provided, pedestrian and bicycle crossing at grade becomes illegal. However, freeways greatly improve the safety of the remining legal crossings at intersections. Bicycle and pedestrian access was scored based on these criteria.

Heavy Vehicle Impacts

The final metric of the access category is heavy vehicle impacts. This metric was evaluated similarly to additional trip lengths, but in the context of heavy vehicles primarily serving industrial land use zones along the corridor. Vehicle miles traveled (VMT) was measured for only heavy vehicles using VISSIM software. The heavy vehicle VMT was compared between each alternative.

Cost and Impacts

The metrics used to evaluate cost and impacts along the corridor are shown in **Table 5**, along with the metric units and analysis tool for each. The specific metrics are described in detail in the following section.

Table 5: Evaluation Criteria and Process – Cost and Impacts

Metric	Units	Analysis Tool
Preliminary Cost	$	Cost Estimate
Wetland impacts	Acres	Impacted land
Farmland impacts	Acres	Impacted land
Irrigator impacts	Count of impacted irrigators	Impacted land
Floodplain impacts	Acres	Impacted land
Cultural resource impacts	Count of impacted sites	Impacted land
Section 4(f) involvement	Count of impacted sites	Impacted land
New ROW	Acres	Impacted land
Relocations	Count	Impacted land

Preliminary Cost

The first major impact metric is preliminary cost. This metric is an estimate of the total construction and implementation costs. The cost of each alternative was compared. This cost estimate does not include right-of-way, engineering, or environmental costs. Preliminary cost estimate reports are provided in **Appendix 4C**.

Environmental Impacts

The second impact metric estimates the environmental impacts. Several subcategories of environmental impacts were analyzed and are summarized below.

- **Wetland impacts**: This metric focuses on delineated wetlands that are anticipated to be impacted for each alternative. The metric will be displayed in acres of impacted land.
- **Farmland impacts**: This metric focuses on farmlands that are expected to be impacted. The metric will be displayed in acres of impacted land.
- **Irrigator impacts**: This metric focuses on irrigators that are expected to be impacted, as these systems are difficult and expensive to adjust. The metric will be displayed as the number of impacted irrigators.
- **Floodplain impacts**: This metric focuses on floodplains that are anticipated to be impacted. This metric will be displayed in acres of impacted land.
- **Cultural resource impacts**: This metric refers to impacted sites that are eligible for historical and archaeological preservation. The metric was compared with the number of impacted sites.

- **Section 4(f) involvement**: The metric refers to properties that are publicly-owned parks, recreation areas, and wildlife or waterfowl refuges, or any publicly- or privately-owned historic site listed or eligible for listing on the National Register of Historic Places. Relevant properties were identified and given a preliminary assessment of the potential impact from the data available and preliminary layouts. The metric used for evaluation will be presented as a list of potential 4(f) properties and the anticipated impact categorized as "none", "de minimis", "temporary", "exception", "permanent", "incorporation", or "constructive".

Right-Of-Way Impacts

The third impact metric estimates the right-of-way impacts. Two subcategories of right-of-way impacts were analyzed and are summarized below.

- Acres of new right-of-way: This metric refers to the total acres of new right-of-way that is likely to be acquired for the layouts. The metric will be displayed in acres.
- Number of relocations: This metric refers to the number of properties that will likely need to be relocated for each layout. Relocations are very costly and disruptive to residents. The metric will be displayed in number of properties likely to be relocated.

Additional Considerations

The metrics used to evaluate additional along the corridor are shown in **Table 6**, along with the metric units and analysis tool for each. The specific metrics are described in detail in the following section.

Table 6: Evaluation Criteria and Process – Additional Considerations

Metric	Units	Analysis Tool
Public Engagement	Percent favored	Survey Results
Maintenance and Operations	Score (1 - best; 5 - worst)	Expected changes to O & M

Public Engagement

The first additional metric identified is public engagement. A survey was distributed online via the Highway 10 Corridor Study website. Respondents were asked to select their top two alternative designs. For the alternatives analysis, the results for each alternative were presented as a percentage of total respondents that selected that alternative as one of their top two choices, out of all six concept alternatives.

Maintenance and Operations

The second and final additional metric is maintenance and operations. Costs, including time and equipment, necessary to maintain each alternative were estimated and compared.

Results

The goal of this step in the corridor study process is to evaluate a range of alternative designs and select one alternative for each cost level. A benefit-cost analysis for each alternative was also conducted and is described in the next section of this report. The comparison matrix was the primary tool used to carry out this screening process, offering a comparison of the alternatives for each of the value categories. The complete comparison matrices are shown in their respective categories below. The results of this process are described for each category below. The complete comparison matrix can be found in **Appendix 4B**.

Safety

All safety metric results are shown in **Table 7**.

Potential conflicts resulting from SSAM analysis show a minor increase in conflicts for Low-Cost alternative A, and a reduction in potential conflicts for Low-Cost alternative B and both Mid-Cost alternatives. The greatest potential conflict reduction was observed in Mid-Cost alternative B, with a 25% reduction in potential conflicts.

The methodology for the vehicle safety evaluation included a risk factor analysis in the form of a questionnaire. The ratings ranged from 1 to 5, with 1 being the most desirable for safety and 5 being the least desirable. Results of the risk factor analysis are shown in **Table 8**. The average score for this metric is also presented in **Table 7**.

Acceleration lane evaluation results show existing corridor geometry ranked at a 5 (worst), as most major intersections on the corridor are side-street stop-controlled, requiring heavy vehicles to accelerate considerably when turning onto Highway 10. Low-Cost alternative A was ranked at a 2, due to the inclusion of several acceleration lanes for turning movements onto Highway 10. Low-Cost alternative B and both Mid-Cost alternatives were ranked at a 3, as each of these alternatives include U-turns in addition to the acceleration lanes for turning movements. U-turns require additional acceleration movements. Both High-Cost alternatives were ranked at a 1, as all intersections are reduced to several interchanges with on and off ramps at each interchange.

Conflict point analysis showed significant reduction in conflict points for all alternatives. Low-Cost alternative B showed the least amount of reduction (64%) as compared to existing conditions. High-Cost alternative A and High-Cost alternative B resulted in the highest conflict point reduction, with 89% and 90% reduction, respectively.

Table 7: Alternatives Analysis Results – Safety

Metric	Units	No-Build	Low-Cost A	Low-Cost B	Mid-Cost A	Mid-Cost B	High-Cost A	High-Cost B
SSAM – Total Network	Percent change	-	-8%	-12%	20%	5%	X	X
SSAM – Mainline	Percent change	-	3%	-9%	-19%	-25%	X	X
Risk Factor Analysis	Score (1 - best; 5 - worst)	4.7	2.5	2.8	2.7	2.3	1.2	1.2
Acceleration Lane Evaluation	Score (1 - best; 5 - worst)	5	2	3	3	3	1	1
Conflict Point Analysis	Percent change	-	-66%	-64%	-85%	-79%	-89%	-90%

Table 8: Risk Factor Analysis

Category	No Build	Low-Cost A	Low-Cost B	Mid-Cost A	Mid-Cost B	High-Cost A & B
Number of Intersections	**5** 35 intersections	**4** 19 intersections	**4** 15 intersections	**2** 5 intersections	**2** 7 intersections	**1** 3 interchanges
Traffic Signals	**3** 2 existing traffic signals	**3** Maintains 2 existing traffic signals	**3** Maintains 2 existing traffic signals	**5** Adds a traffic signal mid corridor	**3** Maintains 2 existing traffic signals	**1** No signals directly on TH 10 mainline
Minor Approach Direct Left Turns	**5** Full-access intersections	**2** Left turns receive a dedicated acceleration lane	**4** Left turns re-routed to U-turn locations	**3** Intersections consolidates, left turns re-routed to U-turn locations	**3** Intersections consolidates, left turns re-routed to U-turn locations	**1** Left turns re-routed to interchange with controlled access to TH 10
Acceleration Lanes/Ramp	**5** No acceleration lanes	**2** Acceleration lanes adjacent to the median for all vehicles	**3** Acceleration lanes on outer roadway edge used by heavy trucks	**3** Acceleration lanes on outer roadway edge used by heavy trucks	**3** Acceleration lanes on outer roadway edge used by heavy trucks	**1** Acceleration occurs on ramps which provides physical separation
Median Design & Openings	**5** Traversable median with many openings	**3** Cable median barrier with more than 10 openings	**3** Cable median barrier with more than 10 openings	**2** Cable median barrier with less than 10 openings	**2** Cable median barrier with less than 10 openings	**2** Cable median barrier with less than 10 openings
Roadside Hazards	**5** Existing conditions show opportunity for improvement	**1** Improvements to ditch slopes, clear zone, shoulder width, etc.	**1** Improvements to ditch slopes, clear zone, shoulder width, etc.	**1** Improvements to ditch slopes, clear zone, shoulder width, etc.	**1** Improvements to ditch slopes, clear zone, shoulder width, etc.	**1** Improvements to ditch slopes, clear zone, shoulder width, etc.
Average	**4.7**	**2.5**	**3.0**	**2.7**	**2.2**	**1.3**

Mobility

The worst LOS result of the key intersections is displayed in **Table 9** for each alternative. The no-build scenario experiences the worst operations, with LOS E at 32nd Street SE. Both Low-Cost alternatives, and Mid-Cost alternative A experience the next-worst LOS, with LOS D at Highway 24, 45th Avenue SE, and 15th Avenue SE. Mid-Cost alternative B resulted in the best LOS, with LOS B at Highway 24, and 12th Street.

The worst queue lengths of the key intersections are displayed in **Table 9** for each alternative. The worst queue lengths were experienced at each of the signalized intersections (Highway 24 and 15th Avenue SE) at either end of the corridor. The worst mainline left-turn queue length was seen in Low-Cost alternative B (261 feet at 15th Avenue SE), and the worst side-street queue length was also seen in Low-Cost alternative B (1000 feet at Highway 24). Both Mid-Cost alternatives had the best queue length results.

Vehicle hours traveled (VHT) is a metric that represents the total amount of time vehicles are spending on the corridor. All alternatives increased the total VHT on the corridor, due to access closure and rerouting. The highest VHT value was estimated for Mid-Cost alternative A, with 6,679 vehicle hours traveled. The lowest VHT was estimated for Low-Cost alternative A, with 6,266 vehicle hours traveled.

Detailed mobility results from VISSIM analysis can be found in **Appendix 4D**.

Table 9: Alternatives Analysis Results – Mobility

Metric	Units	No-Build	Low-Cost A	Low-Cost B	Mid-Cost A	Mid-Cost B	High-Cost A	High-Cost B
Intersection Peak Hour Delay (Weekday PM): Key Intersections[4]	LOS	E	D	D	D	B	X	X
Queue Length Analysis – Mainline Left-Turn **Average Queue (Maximum Queue)** Key Intersections[4]	Feet	38 (191)	37 (198)	57 (261)	9 (152)	34 (232)	X	X
Queue Length Analysis – Mainline Side-Street Approach **Average Queue (Maximum Queue)** Key Intersections[4]	Feet	211 (979)	281 (998)	286 (1000)	74 (480)	76 (468)	X	X
Vehicle Hours Traveled	VHT (% change)	5987	6266 (4.7%)	6322 (5.6%)	6679 (11.6%)	6422 (7.3%)	X	X
Additional Trip Length	VMT (% change)	335,734	340,886 (1.5%)	342,572 (2.1%)	363,628 (8.3%)	355,729 (6.0%)	X	X
Total Daily Delay	Hours	41	43	44	45	38	X	X
AM Peak Delay	Seconds per vehicle	42	44	45	44	38	X	X
PM Peak Delay	Seconds per vehicle	54	58	59	53	46	X	X
Planning-Level Capacity Check	Pass/fail - acceptable v/c ratio	X	X	X	X	X	Pass	Pass

Access

Access density results show High-Cost alternatives ranking the highest, as all intersections along the corridor are condensed into several interchanges. Each Low-Cost alternative was ranked at 5, as the majority of existing intersections remain with these alternatives.

Local connectivity results are similar to access density. Reducing the intersection access to Highway 10 encourages traffic to utilize local and service roads in the surrounding network. Additional service roads are included in each

[4] Key intersections include Highway 24 (Main Avenue), Mill Street, Henry Street, 75th Avenue, 60th Street (CR 60), 45th Avenue SE (CR 65), 32nd Street SE (CSAH 3), Minnesota Boulevard (MN 301), 12th Street (CSAH 7), Birch Street, and 15th Avenue SE.

alternative, with fewer service roads in each Low-Cost alternative and more service roads in each High-Cost alternative.

Both Low-Cost alternatives scored the worst (5) regarding bicycle and pedestrian access parallel to Highway 10. No shared-use paths are included in the Low-Cost alternatives. Service roads included in these alternatives are limited and designed for trucks and heavy vehicles, and do not include bicycle or pedestrian facilities. Additional service roads included in the Mid- and High-Cost alternatives caused them to score slightly better (4), as service roads are marginally safer options for bicycles than the shoulder of Highway 10.

The Low- and Mid-Cost alternatives scored the worst (5) regarding bicycle and pedestrian access crossing Highway 10. The restriction of several intersections and access points along the corridor improve safety for bicycles and pedestrians, but considerably reduce access crossing the corridor. The High-Cost alternatives scored slightly higher (4), as grade-separated crossings provide safe access across the corridor. However, closing all other accesses and converting the corridor to a freeway makes crossing illegal at locations that were previously available.

Heavy vehicle impacts were presented as vehicle miles traveled, counted for heavy vehicles only. Heavy vehicle impact results show the highest impact on Mid-Cost alternative A of 940 vehicle-miles traveled, and the lowest impact on Low-Cost alternative A of 133 vehicle-miles traveled. Mid-Cost alternative A reduces the number of intersections and includes U-turns throughout the corridor for restricted left-turn movements, which contributes to additional distances traveled that are required to complete trips on the corridor. Low-Cost alternative A keeps the most access locations, compared to the other five alternative designs, and provides acceleration lanes to access the Highway 10 corridor.

Table 10: Alternatives Analysis Results – Access

Metric	Units	No-Build	Low-Cost A	Low-Cost B	Mid-Cost A	Mid-Cost B	High-Cost A	High-Cost B
Density	Score (1 - best; 5 - worst)	5	5	4	2	3	1	1
Local Connectivity	Score (1 - best; 5 - worst)	5	4	4	2	3	1	1
Bicycle and Pedestrian Access – Parallel to TH 10	Score (1 - best; 5 - worst)	5	5	5	4	4	4	4
Bicycle and Pedestrian Access – Crossing TH 10	Score (1 - best; 5 - worst)	5	5	5	5	5	4	4
Heavy Vehicle Impacts	VMT	-	133	233	940	697	X	X

Cost and Impacts

Preliminary costs for each alternative naturally adhere to the cost-level titles of each alternative. Between both Low-Cost alternatives, Low-Cost alternative B had a lower cost, ranging from $25M to $29M. Between the Mid-Cost alternatives, Mid-Cost alternative B had the lower cost, ranging from $38M to $43M. Between the High-Cost alternatives, High-Cost alternative A had a lower cost, ranging from $120M to $136M. High-Cost alternative B had the highest cost over all alternatives, ranging from $143M to $161M.

The results of each of the environmental impacts are discussed below, and details of the environmental impacts are provided in **Appendix 4E**.

- **Wetland impacts**: Based on the US Fish and Wildlife National Wetland Inventory (NWI) data, wetlands are located along all alternatives, with both High-Cost alternatives having the most wetland acreage crossed, and both Low-Cost alternatives having the least. The types of wetlands impacted vary, mainly ditch but with some larger wetland areas crossed. To accurately identify wetland impacts, the alternative(s) determined to be carried forward in future environmental analysis will require a field wetland delineation to determine wetland boundaries.
- **Farmland impacts**: Utilizing US Geological Survey (USGS) Soil Survey mapper, prime farmland and farmland of statewide importance were identified within all alternatives. Based on the current acres of impacts noted by alternatives in **Table 11**, none of the alternatives exceed the 10-acre threshold of direct/indirect conversion per linear mile per the Farmland Protection Policy Act. Conversion of farmlands will need to be revisited in future environmental analysis for alternatives carried forward.
- **Irrigator impacts**: A review of aerial imagery dated from 2021 identified several pivot irrigation systems that would be impacted by the High-Cost alternatives, and Mid-Cost alternative A. No irrigators were impacted for either Low-Cost alternative, or for Mid-Cost alternative B.
- **Floodplain impacts**: A review of alternatives in comparison to Federal Emergency Management Agency (FEMA)'s floodplain maps (FIRM Panels 27141C0, 185F 11/16/2011; 27141C0041F 11/16/2011; 27009C0259E 8/16/2011) for this area identified all alternatives to be within "Zone X" or minimal flood hazard. The alternatives do not reside in a 100-year floodplain.
- **Cultural impacts**: The majority of the alternatives analyzed avoid previously identified cultural resources based off a literature review completed in Summer 2022 but are located adjacent to these areas. High-Cost alternative A and Mid-Cost alternative A do come near a previously recorded artifact scatter and structure, with Mid-Cost A also coming near a previously recorded lithic scatter. Once it is determined which alternative(s) are to be carried forward for detailed environmental analysis, consultation with the Minnesota State Historic Preservation Office will be necessary to determine the level of cultural clearance required for the project.
- **Section 4(f) involvement**: A review of the Minnesota Department of Natural Resources (MN DNR)'s Recreation Compass, as well as a review of land uses within the corridor, identified the Sand Prairie Wildlife Management Area (WMA) to be crossed by Mid-Cost alternative A, High-Cost alternative A, and High-Cost alternative B. Per the MN DNR site for the WMA, the Sand Prairie WMA is approximately 650 acres and is the first WMA to be designated as an Environmental Education Area, with numerous local school and college students visiting and studying ecosystems in the WMA. There are also opportunities for wildlife viewing, nature studying, and hiking. If these alternatives were to be carried forward for further environmental analysis, a separate Section 4(f) study may be required.

Both Low-Cost alternatives, as well as Mid-Cost alternative B, had the lowest acres of new right-of-way required. Low-Cost alternative B had the least, with approximately 28 acres of new right-of-way. High-Cost alternative B had the highest, with 187 acres. Mid-Cost alternative A and High-Cost alternative A had comparable acres of new right-of-way, with 145 acres and 142 acres, respectively. No relocations were required under either Low-Cost alternative. Seven relocations were required under High-Cost alternative B, and five relocations were required under High-Cost alternative A.

Table 11: Alternatives Analysis Results – Cost and Impacts

Metric	Units	No-Build	Low-Cost A	Low-Cost B	Mid-Cost A	Mid-Cost B	High-Cost A	High-Cost B
Preliminary Cost	$	-	$27M - $30M	$25M - $29M	$46M - $52M	$38M - $43M	$120M - $136M	$143M - $161M
Wetland impacts	Acres	-	1	1	112	1	14	14
Farmland impacts	Acres	-	1	1	6	6	4	7
Irrigator impacts	Count of impacted irrigators	-	0	0	4	0	4	8
Floodplain impacts	Acres	-	0	0	0	0	0	0
Cultural resource impacts	Count of impacted sites	-	0	0	2	0	1	0
Section 4(f) involvement	Count of impacted sites	-	0	0	1	0	1	1
New ROW	Acres	-	31	28	145	55	142	187
Relocations	Count	-	0	0	2	1	5	7

Additional Considerations

Results from the public engagement survey showed primary support for both High-Cost alternatives, and the least support for both Low-Cost alternatives. The differences in preference between the two alternatives of each category were minor. 48% of respondents selected High-Cost alternative B and 47% of respondents selected High-Cost alternative A as one of their two top choices. 18% of respondents selected Low-Cost alternative B, 17% of respondents selected Low-Cost alternative A, and 6% of respondents preferred no change to the corridor.

Both High-Cost alternatives are expected to have the least amount of operations and maintenance costs, with Low-Cost alternatives are expected to have the highest. Any future reconstruction of bridges was not considered in the operations and maintenance costs for High-Cost alternatives.

Table 12: Alternatives Analysis Results – Additional Considerations

Metric	Units	No-Build	Low-Cost A	Low-Cost B	Mid-Cost A	Mid-Cost B	High-Cost A	High-Cost B
Public Engagement	Survey Results	6%	17%	18%	35%	30%	47%	48%
Maintenance and Operations	Score (1 - best; 5 - worst)	-	5	4	2	3	1	1

Summary of Results

Table 13 shows a generalized, high-level summary of each alternative. Each metric category is scored (5 – worst; 1 – best) based on all results described above.

Table 13: Summary of Alternatives Analysis Results

Metric Category	No-Build	Low-Cost A	Low-Cost B	Mid-Cost A	Mid-Cost B	High-Cost A	High-Cost B
Safety	5	3	3	2	2	1	1
Mobility	3	3	3	3	2	1	1
Access	4	4	4	4	4	3	3
Cost and Impacts	1	1	1	4	2	4	5
Additional Considerations	5	5	4	2	3	1	1
AVERAGE	**4**	**3**	**3**	**3**	**3**	**2**	**2**

Benefit-Cost Analysis

Methodology

The Benefit-Cost Analysis (BCA) follows guidance set forth by MnDOT's Planning and Programming Group, as well as the "User Benefit Analysis for Highways", provided by AASHTO (August 2003). It should be noted that this methodology differs from the MnDOT Highway Safety Improvement Program (HSIP) methodology. The HSIP methodology applies different crash reduction factors to different types and severities of crashes, whereas the BCA methodology applied in this study uses one crash reduction for each severity level and applies to all crash types.

Crash reduction factors (CRFs) were developed for each severity level on each alternative BCA. **Table 14** shows the sources and methodology for each CRF, which was applied only to a specific crash type.

Table 14: Crash Reduction Factor Methodology

Applicable Crash Type	Crash Reduction Factor Methodology
Crossing/Right Angle	Conflict Point Analysis results – average reduction percentage of turning conflict points and crossing conflict points.
Rear-End (at a signal)	Average number of existing rear-end crashes at a signal (using historical crash rates along the corridor), multiplied by the number of signals in the alternative.
Rear-End (not at a signal)	*No crash reduction factor applied.*
Merging and Sideswipe Passing	Conflict Point Analysis results – reduction percentage of merging/diverging conflict points.
Head On and Sideswipe Opposing	Crash Modification Factor – Install a Median Barrier (CMF ID: 974)
Lane Departure – Right	Crash Modification Factor – Widening the Shoulder (CMF ID: 7758) Crash Modification Factor – Improve the Ditch Slopes (CMF ID: 4129)
Other	*No crash reduction factor applied.*

The CRFs were then applied to the respective crash types, and a weighted average CRF was determined for each severity level. These CRFs were used in the BCA to determine safety benefits. Right-of-way, engineering, and environmental costs were not included in the BCA, as the study is at the planning level. These costs will be identified once a preferred alternative is selected, funded, and moved into project development.

Results

A Benefit-Cost Analysis was performed for each alternative, with construction costs assuming 15% contingency and 30% contingency. **Table 15** summarizes all benefit and cost amounts, with construction costs assuming 30% contingency to remain conservative. Any benefit-cost ratio greater than 1.0 is considered economically justified (as the benefits will outweigh the costs), and alternatives with greater benefits will have a higher benefit-cost ratio. Details of the Benefit-Cost Analysis are provided in **Appendix 4F**.

Table 15: Benefit-Cost Total for Project Life

Benefit-Cost Total for Project Life	Low-Cost A	Low-Cost B	Mid-Cost A	Mid-Cost B	High-Cost A	High-Cost B
VHT Benefits	***$ -445 M***	***$ -52 M***	***$ -108 M***	***$ -68 M***	$ 35 M	$ 35 M
VMT Benefits	***$ -13 M***	***$ -17 M***	***$ -71 M***	***$ -51 M***	***$ -71 M***	***$ -71 M***
Crash Reduction Savings	$ 148 M	$ 147 M	$ 118 M	$ 150 M	$ 217 M	$ 216 M
TOTAL BENEFITS	$ 91 M	$ 78 M	***$ -61 M***	$ 32 M	$ 181 M	$ 180 M
Construction Costs	$ 30 M	$ 29 M	$ 52 M	$ 43 M	$ 136 M	$ 161 M
Maintenance Costs	$ 1 M	$ 2 M	$ 3 M	$ 2 M	$ 2 M	$ 2 M
Remaining Capital Value	$ -10 M	$ -10 M	$ -18 M	$ -15 M	$ -58 M	$ -68 M
TOTAL COSTS	$ 21 M	$ 21 M	$ 37 M	$ 30 M	$ 80 M	$ 95 M
Benefit-Cost Ratio	**4.29 - 4.82**	**3.78 - 4.24**	**-1.87 - -1.66**	**1.04 - 1.17**	**2.26 - 2.55**	**1.91 - 2.15**

It is important to note that VHT benefits for both Low-Cost and Mid-Cost alternatives, as well as all VMT benefits, are negative. Access management along the corridor for each alternative requires significant rerouting of most movements, which leads to an increase in vehicle-hours traveled and vehicle-miles traveled. VHT is not negative for both High-Cost alternatives, as the alternatives are freeways, which reduce travel time. With VHT and VMT benefits being negative, the only benefit for the alternatives results from crash reduction savings.

In the case of Mid-Cost alternative A, the crash reduction savings is not enough to offset the negative VHT and VMT benefits. Thus, the total benefits are negative as well, and the benefit-cost ratio is also negative. Mid-Cost alternative B has a benefit-cost ratio just greater than 1.0, meaning that the benefits barely outweigh the costs. The High-Cost alternatives have the next-best benefit-cost ratios, as their crash reduction savings are the highest, and these alternatives do not experience negative VHT benefits. However, freeway conversion and grade-separated interchanges included in the High-Cost alternatives have much higher construction costs, which ultimately lower the benefit-cost ratio. Both Low-Cost alternatives have the highest benefit-cost ratio, with the lowest construction and maintenance costs, and relatively high crash reduction savings.

Final Alternatives Refinement

Final Screening

Following the Alternative Analysis results and considerable feedback from the corridor study Technical Advisory Committee (TAC), it was decided that both Mid-Cost alternatives would be removed from further consideration. Benefit-cost analysis results showed that both Mid-Cost alternatives would have negative mobility impacts, with increases in both vehicle miles traveled and vehicle hours traveled. Safety benefits for the Mid-Cost alternatives were not enough to offset the increases, resulting in unfavorable BCA ratios.

Alternatives Consolidation

Through the evaluation process, Low-Cost alternatives A and B were combined for a recommended hybrid Low-Cost alternative C. Similarly, the High-Cost alternatives were also combined into a hybrid High-Cost alternative C. The alternatives were combined for the following reasons with the following considerations:

- Low-Cost Alternative C
    - Both Low-Cost alternative A and Low-Cost alternative B scored similar in the technical analysis.
    - Low-Cost alternative A addresses concerns with heavy truck acceleration using the modified continuous-T intersection design, which was important for intersections serving the adjacent aggregate mining and processing operations.
    - Low-Cost alternative B provided full access to all turn movements at the intersection with RCI designs which was important for the county road intersections.

- High-Cost alternative C
    - Both High-Cost alternative A and High-Cost alternative B scored similar in the technical analysis.
    - The interchange near St. Cloud was preferred in High-Cost alternative B because it provided better spacing from the Highway 23 interchange.
    - The interchange near Clear Lake was preferred in High-Cost alternative A because it maintained the access across Highway 10 within its existing location and would not disrupt existing community connections.
    - All other areas were already similar in design between High-Cost alternatives A and B.

The final descriptions of Low-Cost alternative C and High-Cost alternative C are below and shown in **Figure 11** and **Figure 12**, respectively. Detailed layouts of each of the consolidated alternatives are available in **Appendix 4G**.

- **Low-Cost Alternative A: Acceleration Lane Corridor**
    - This alternative includes the implementation of both modified continuous-T intersections and several RCIs along the corridor. The modified continuous-T intersections restrict left turns off of Highway 10 and instead allows left turns onto Highway 10 with an acceleration lane. The RCI intersections feature the restriction of left-turn and minor through movements at an intersection and reroute these movements to U-turns located downstream of the intersection. This alternative will keep 15 or 16 intersections along the 10-mile corridor depending on what is selected for 32nd Street SE and the Traveler Information Center (currently undecided between Low-Cost alternative A and Low-Cost alternative B). A new service road will be included parallel to Highway 10 from 32nd Street SE to the Traveler Information Center. This alternative will remove crossings and access points along the corridor, as well as reduce left-turn movements at existing intersections.
- **High-Cost Alternative C: Hybrid Interchange Locations**
    - This alternative includes three grade-separated interchanges and an overpass. The number of intersections along the corridor will be reduced to five. The intersection located in St. Cloud will be moved approximately one half-mile south along Highway 10 and the intersection at Highway 24 in Clear Lake remain at its existing location. Both intersections will also be converted to a grade-separated interchange. An interchange will be constructed north of 45th Avenue SE (CR 65) and an overpass will be constructed at 60th Street SE.

Figure 11: Recommended Low-Cost Alternative C

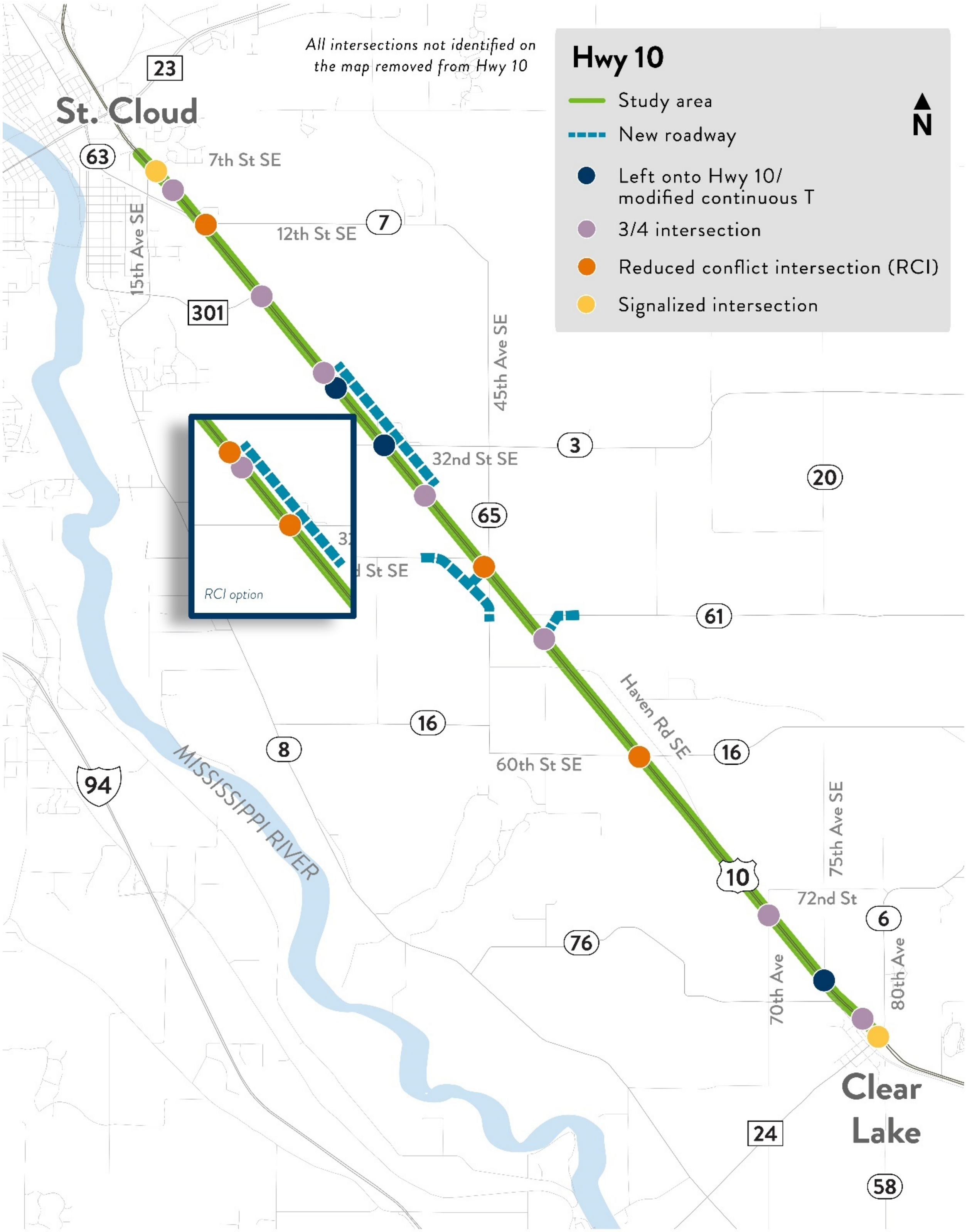


Figure 12: Recommended High-Cost Alternative C

Recommendations

It is recommended that **Low-Cost alternative C** and **High-Cost alternative C** continue for additional analysis, as described in the Implementation Plan section (Chapter 5) of this corridor report. Two alternatives are recommended at different cost levels to provide alternatives based on future funding possibilities. The two corridor alternatives were split into segments and analyzed as separate buildable pieces to determine immediacy of need. Independent recommendations will also be provided, regardless of the ultimate corridor alternative selection. The process and results of the Implementation Plan will be described in the following chapter of this report.

Hwy 10 Corridor Study

HIGHWAY 10 CORRIDOR STUDY
CHAPTER 5: IMPLEMENTATION PLAN

September 2023

DEPARTMENT OF TRANSPORTATION

Prepared by KLJ

Table of Contents

List of Figures

List of Tables

Appendix

Introduction

This implementation plan is the conclusion of a technical analysis of Trunk Highway (TH) 10 in Sherburne County, Minnesota. The project extends from the intersection of Highway 24 (Main Avenue) in Clear Lake, MN to the intersection of 15th Avenue SE in St. Cloud, MN. The corridor vision is to develop a safe, efficient, and accessible highway for all users with destinations along, across, or through Highway 10 between Highway 24 in Clear Lake and 15th Avenue SE in St. Cloud. The purpose of this report is to document phasing and funding strategies for the project improvements to be successfully implemented for the recommended alternatives from the Alternatives Analysis section of the report. A chronology for the proposed infrastructure and facility investments will be explored in this report with the goal to bring immediate benefits and value to the communities, while building toward the ultimate corridor vision. The following document defines the Recommended Alternatives and explores and explains pathways to funding and implementation.

Recommended Alternatives

A variety of alternatives were developed and analyzed to meet the purpose and need goals of the corridor. Six distinct alternatives met these goals and were moved into layout development. Initial concept layouts of the six alternatives are available in **Appendix 4A**. Final concept layouts of the two recommended alternatives are available in **Appendix 4G.** The alternatives described below were progressed after high-level screening into alternatives refinement and ultimately detailed evaluation.

Lower-Cost alternatives were focused on intersection improvements that could be completed primarily within the existing right-of-way. Lower-Cost alternatives include:

- Lower-Cost Alternative A: Acceleration Lane Corridor
  - This alternative includes the implementation of several modified continuous-T intersections. This intersection design restricts left turns off of Highway 10 and instead allows left turns onto Highway 10 with an acceleration lane. This alternative will remove crossings and access points along the corridor, as well as reduce left-turn movements at existing intersections. This alternative will keep 19 intersections along the 10-mile corridor. A new service road will be included parallel to Highway 10 from 32nd Street SE to the Traveler Information Center. Local trips will be directed to local roads with this alternative.
- Lower-Cost Alternative B: Reduced Conflict Intersection (RCI)[1] Corridor
  - This alternative includes the implementation of several RCIs along the corridor. RCIs feature the restriction of left-turn and minor through movements at an intersection and reroute these movements to U-turns located downstream of the intersection. RCIs are designed to reduce the

[1] Reduced Conflict Intersections (RCIs) include J-turns, 3/4 intersections, median U-turn (MUT) intersections, restricted crossing U-turn (RCUT) intersections, etc.

frequency and severity of angle crashes. This alternative will also remove crossings and access points, reduce left-turn movements, and include a new service road from 32nd Street SE to the Traveler Information Center. This alternative will keep 15 intersections. Local traffic will be directed to make U-turns along the corridor.

Medium-Cost alternatives were focused on the consolidation of intersections and the development of more local connections. Medium-Cost alternatives include:

- Medium-Cost Alternative A: Greater Consolidation
  - This alternative was developed to reduce the amount of turns at the intersections along the corridor. The number of intersections will be reduced to five. This alternative adds a signalized RCI in the middle of the corridor to accommodate consolidated traffic. Local roads will be built as well to divert trips from Highway 10. This alternative includes five miles of service roads to the east of Highway 10 and 3.5 miles to the west. The intersections of 32nd Street SE and Minnesota Boulevard will be closed.
- Medium-Cost Alternative B: Lesser Consolidation
  - This alternative includes two miles of service roads to the east of Highway 10. This alternative will close all but seven intersections along the corridor. Local traffic will be diverted to local roads, but less so than Mid-Cost alternative A.

Higher-Cost alternatives involved a full grade-separated freeway design to accommodate the future APO Beltway.

- Higher-Cost Alternative A: Existing Interchange Locations
  - This alternative includes three grade-separated interchanges and an overpass. The number of intersections along the corridor will be reduced to five. The intersections of Highway 10 and Highway 24 in Clear Lake and Highway 10 and 15th Avenue SE in St. Cloud will be converted to an interchange at their existing locations, an interchange will be constructed north of 45th Avenue SE (CR 65), and an overpass will be constructed at 60th Street SE.
- Higher-Cost Alternative B: Displaced Interchanges Locations
  - This alternative also includes three grade-separated interchanges and an overpass, and the number of intersections will be reduced to five. The intersection located at Highway 24 in Clear Lake will be moved approximately one mile north, and the intersection at 15th Avenue SE in St. Cloud will be moved approximately one half-mile south. Both intersections will also be converted to a grade-separated interchange. An interchange will be constructed north of 45th Avenue SE (CR 65) and an overpass will be constructed at 60th Street SE. Feedback from study partners indicated that the interchange location at the south end of the corridor in this alternative would not be acceptable to Clear Lake.

Following the Alternative Analysis results and considerable feedback from the corridor study Technical Advisory Committee (TAC), it was decided that **both Medium-Cost alternatives would be removed from further consideration**. Benefit-cost analysis results showed that both Medium-Cost alternatives would have negative mobility impacts, with increases in both vehicle miles traveled and vehicle hours traveled. Safety benefits for the Medium-Cost alternatives were not enough to offset the increases, resulting in unfavorable BCA ratios.

Through the evaluation process, **Lower-Cost alternatives A and B were combined for a recommended hybrid Lower-Cost alternative C** option shown in **Figure 1.** In the technical analysis, both Lower-Cost alternatives A and B scored similar to one another in benefits. The alternatives were combined in a way that addresses concerns for heavy truck turn movements at specific locations as well as providing full access at county road locations.

Similarly, **the Higher-Cost alternatives were also combined into a hybrid Higher-Cost alternative C**, represented in **Figure 2.** The technical analysis results were also very similar for both Higher-Cost alternatives A and B because they are very similar in design. It should be noted that the types of interchanges shown in the figures may be subject to change through preliminary design if Higher-Cost alternative C is selected for construction and funded.

- Lower-Cost alternative C: Acceleration Lane Corridor
  - This alternative includes the implementation of both modified continuous-T intersections and several RCIs along the corridor. The modified continuous-T intersections restrict left turns off of Highway 10 and instead allows left turns onto Highway 10 with an acceleration lane. The RCI intersections feature the restriction of left-turn and minor through movements at an intersection and reroute these movements to U-turns located downstream of the intersection. This alternative will keep 15 or 16 intersections along the 10-mile corridor depending on what is selected for 32nd Street SE and the Traveler Information Center (currently undecided between Low-Cost alternative A and Low-Cost alternative B). A new service road will be included parallel to Highway 10 from 32nd Street SE to the Traveler Information Center. This alternative will remove crossings and access points along the corridor, as well as reduce left-turn movements at existing intersections.
- Higher-Cost alternative C: Hybrid Interchange Locations
  - This alternative includes three grade-separated interchanges and an overpass. The number of intersections along the corridor will be reduced to five. The intersection located in St. Cloud will be moved approximately one half-mile south along Highway 10 and the intersection at Highway 24 in Clear Lake remain at its existing location. Both intersections will also be converted to a grade-separated interchange. An interchange will be constructed north of 45th Avenue SE (CR 65) and an overpass will be constructed at 60th Street SE.

Figure 1: Recommended Lower-Cost Alternative C

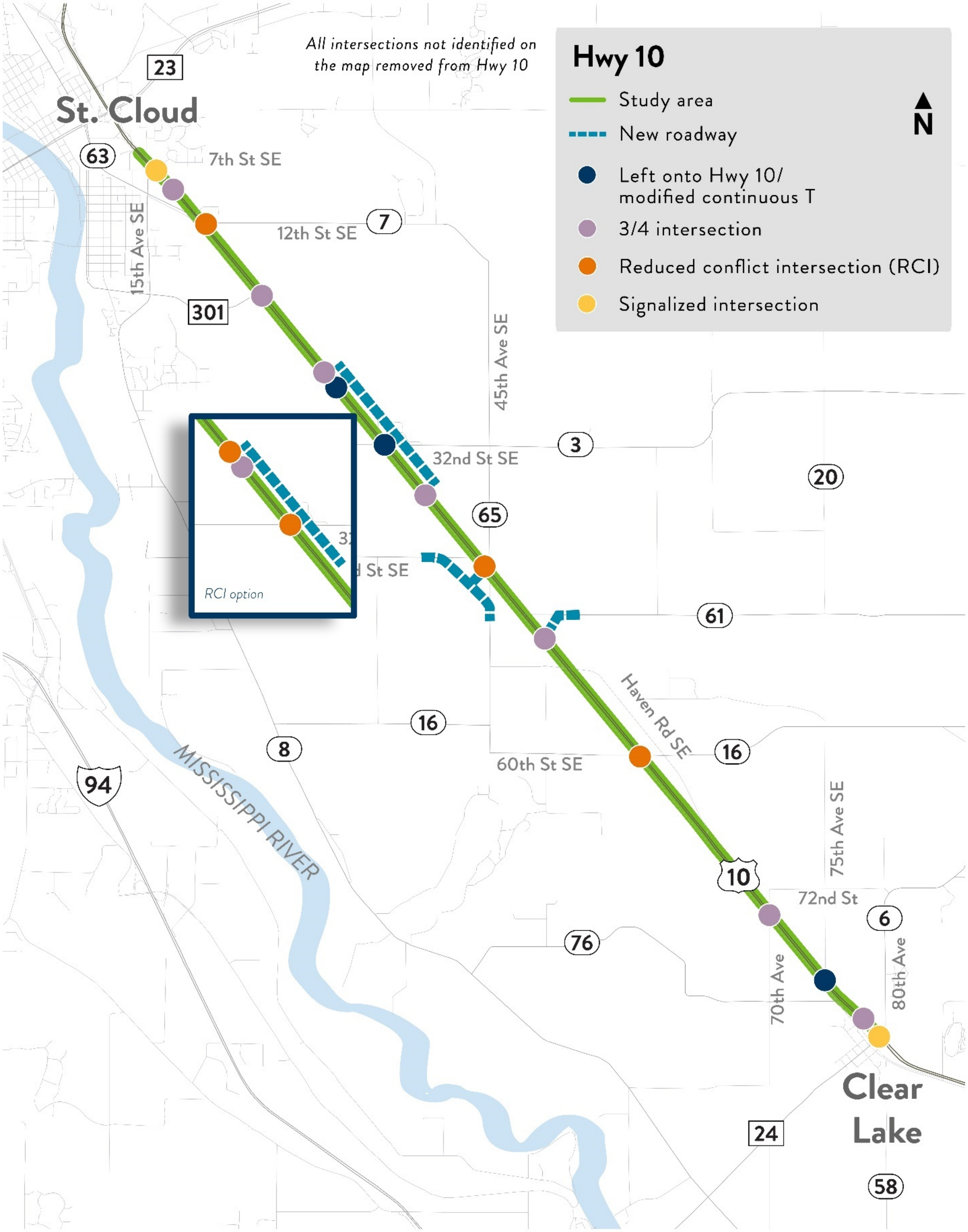


Figure 2: Recommended Higher-Cost Alternative C

Funding Strategies and Opportunities

In terms of this project, "Lower-Cost" refers to concepts that are fiscally restrained to a budget that MnDOT would potentially be able to fund internally through standard state-run programs. The Lower-Cost alternatives were designed to be constructable with current funding scenarios. Lower-Cost alternatives still address the longer-term needs identified for the corridor and demonstrate a high return-on-investment. Typically, they are less complex and can be implemented quicker than higher-cost alternatives, which tend to require additional planning, environmental review, and engineering. They also differ from Higher-Cost alternatives as they fall short of addressing some of the more visionary goals for the corridor. "Higher-Cost" for this project refers to more serendipitous funding that comes from a unique source of money or grant that is applied for or awarded specifically for the project from a one-time source of money. The Higher-Cost alternatives were designed to be constructable with the best-case funding scenarios. The preliminary cost estimate for the recommended Lower-Cost alternative C is approximately $28 - $30 million. The preliminary cost estimate for the recommended Higher-Cost alternative C is approximately $140 - $160 million. Right-of-way, engineering, and environmental costs are not included in this cost estimate, as the study is at the planning level. These costs will be identified once a preferred alternative is selected, funded, and moved into project development.

Opportunities for funding require a high level of organization and timing to be successful. Regardless of which funding scenario (Lower-Cost or Higher-Cost) is pursued for the project, the timing of applicable funding programs and grants will require a high degree of coordination to ensure a successful project implementation. The following lists options to pursue funding for the project:

- **The Highway Safety Improvement Program (HSIP):** HSIP is a Federal DOT program administered through MnDOT. The program funds cost-effective construction safety projects aimed at achieving a significant reduction in traffic fatalities and serious injuries on public roads.
- **Section 164 Funds:** MnDOT Office of Traffic Safety and Technology (OTST) solicits and manages the program statewide. Section 164 federal funds are used to conduct Highway Safety Improvement Program eligible activities with 10% match required. HSIP projects are required to be included in the State Transportation Improvement Program (STIP).
- **MnDOT Local Partnership Program (LPP):** The LPP is a state-funded program intended to pay for a portion of Trunk Highway eligible construction project costs, and up to eight percent of the construction engineering costs.
- **Corridors of Commerce:** Corridors of Commerce is a program that is funded by the Minnesota State Legislature. The program provides additional highway capacity on segments where there are currently bottlenecks in the system and to improve the movement of freight and reduce barriers to commerce.
- **Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant**: The RAISE Discretionary Grant program is a federal program that provides the opportunity for the DOT to invest in road, rail, transit, and port projects that promise to achieve national objectives. RAISE can provide capital funding directly to any public entity, including municipalities and counties, MPOs, or others.
- **Multimodal Projects Discretionary Grant (MPDG):** MPDG provides federal financial assistance to projects of national or regional significance, as well as to projects to improve and expand the surface

transportation infrastructure in rural areas. The MPDG grant program is split into the INFRA, MEGA, and RURAL categories. The Highway 10 corridor would likely be most successful in the INFRA and RURAL categories.

  - **INFRA** - INFRA projects will improve safety, generate economic benefits, reduce congestion, enhance resiliency, and hold the greatest promise to eliminate supply chain bottlenecks and improve critical freight movements.
  - **RURAL** - The Rural Surface Transportation Grant Program was created to improve and expand the surface transportation infrastructure in rural areas to increase connectivity, improve the safety and reliability of the movement of people and freight, and generate regional economic growth and improve quality of life.

- **Infrastructure Investment and Jobs Act (IIJA):** Funding from the IIJA is expansive in its reach, addressing energy and power infrastructure, access to broadband internet, water infrastructure, and more. Some of the new programs funded by the bill could provide the resources needed to address a variety of infrastructure needs at the local level. The most applicable IIJA programs for the Highway 10 corridor funding are the Safe Streets & Roads for All program and the Reconnecting Communities Pilot Program.
  - **Safe Streets & Roads for All** - Safe Streets and Roads for All provides funding to support local initiatives to prevent death and serious injury on roads and streets, commonly referred to as ‘‘Vision Zero’’ or ‘‘Toward Zero Deaths’’ initiatives. Funds can be awarded for both planning efforts and construction costs. An Action Plan is a requirement for construction grant funding, and eligible projects include those focused on non-roadway modes of transportation, roadway intersections, construction of new roadways used for motor vehicles and non-motorists, creation of additional lanes, maintenance to maintain state of good repair, and development of a transportation safety plan.
  - **Reconnecting Communities Pilot Program** - Reconnecting Communities Pilot Program provides funding to restore community connectivity by removing, retrofitting, or mitigating highways or other transportation facilities that create barriers to community connectivity, including to mobility, access, or economic development. Funds can be awarded for both planning efforts and construction costs. Eligible activities for planning grants include public engagement, planning and feasibility studies, and preliminary engineering. Eligible activities or projects for construction funding include design and environmental studies, predevelopment, and preconstruction, permitting, removal, retrofit, mitigation or replacement of an eligible facility that restores community connectivity. Projects must be consistent with a state or local transportation plan.
- **Regional Solicitation for Fixing America’s Surface Transportation Act (FAST Act) Funds / Minnesota Highway Freight Program (MHFP):** The FAST MHFP is a federally funded program with project funding awarded by MnDOT. The grant program is designed to improve safety, mobility, and the needs of the state’s freight transportation system at a local level.
- **Transportation Economic Development Program (TED):** Administered by MnDOT, the TED program provides competitive grants (historically every other year) to support construction projects on state highways that provide measurable economic benefits including job creation and retention.
- **Trunk Highway Bonds:** Bonds that are intended to be used for transportation improvements on trunk highways but can also be used on local roadways if they benefit a trunk highway.

- **General Obligation Bonds:** Bonds used to fund local improvement projects. General Obligation Bonds can be utilized on local components of transportation projects but cannot be spent on Trunk Highway construction.
- **Local Roads Improvement Program (Bond Request):** This is a competitive solicitation process to have a project included in a state bonding bill and is intended to pay for public facility construction or reconstruction projects with local, regional, or statewide significance.

Project Partners

MnDOT is the owner of Trunk Highway 10 and is frequently looked to for developing the design and delivering the project. Other potential project leaders are Sherburne County, the City of St. Cloud, and the St. Cloud Area Planning Organization (APO). Key project partners for the success of funding and construction would include some combination of Sherburne County, the City of St. Cloud, the City of Clear Lake, Haven Township, Clear Lake Township, and the St. Cloud APO. Additionally, there are many businesses in the area that have been engaged as part of this corridor study and have provided important feedback for the design to support their business operations. Continuing to engage these businesses and maintain support of the selected alternative would assist the next steps of the project implementation.

Implementation

The Implementation Plan defines up to seven phase segments for Lower-Cost alternative C and up to four phase segments for Higher-Cost alternative C. The technical rankings were developed considering prioritization of segments that would provide the most benefit to user safety first.

In addition to the phasing segment plans, the corridor was evaluated for improvements that could be funded and easily implemented immediately to improve safety. These recommendations will be discussed at the end of the report as independent improvements. These improvements are independent of the pursued funding scenario and should be implemented as soon as possible. Multimodal needs and opportunities have also been identified throughout the corridor and are not dependent on any specific alternative.

Alternative Phasing

The importance of phasing improvements can be key to project success. This section of the report discusses the potential seven phase segments for Lower-Cost alternative C (**Figure 3**) and four phase segments for Higher-Cost alternative C (**Figure 4**). The segment cost and priority as shown in **Figure 3** and **Figure 4** are discussed in the following sections.

Hwy 10 Corridor Study

Figure 3: Lower-Cost Alternative C Potential Project Segments

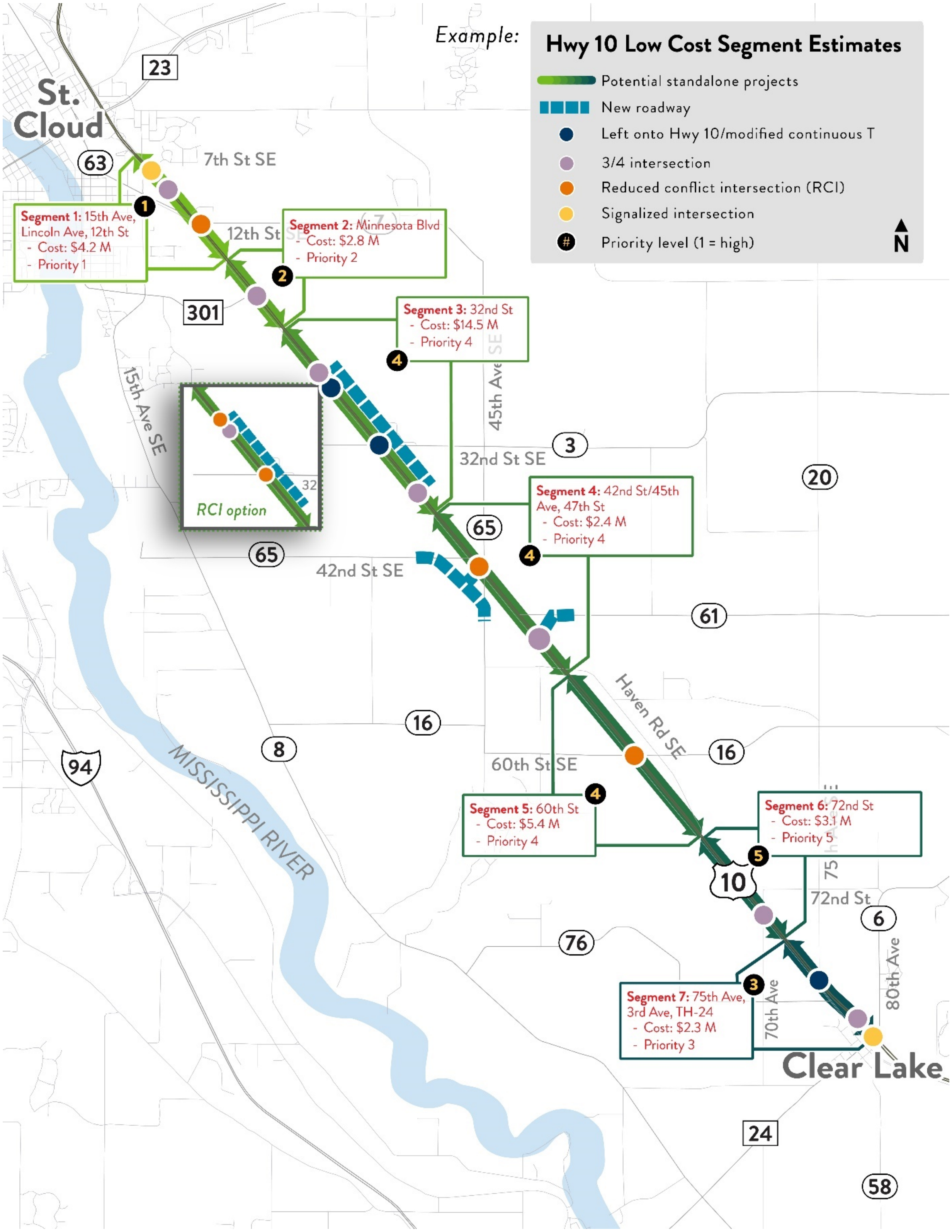


Figure 4: Higher-Cost Alternative C Potential Project Segments

Technical Segment Ranking

Methodology

MnDOT provided the following list of considerations for phasing as part of the corridor study scope:

- Immediacy of Need
- Construction Feasibility
- Percent/Amount of improvement life consumed before improvement is replaced by subsequent work
- Ability to leverage other planned regional and/or local improvements
- Private investment opportunities
- Ability to leverage planned private improvements (adjacent development opportunities)
- Power to fund through federal funding applications or other funding mechanisms
- Logical sequencing of segments to avoid the creation of downstream bottlenecks and/or safety problems

The key consideration identified in the technical analysis was immediacy of need regarding user safety. While all criteria are important, the study identified no measurable difference between the individual segments regarding the identified criteria other than immediacy of need. This criterion was demonstrated by the expected monetary safety benefit for each potential construction phase segment. The monetary values relate to the immediacy of the safety need on the corridor because they incorporate the crash history data.

To calculate the safety benefit (immediacy of need), the Highway Safety Improvement Program (HSIP) Benefit-Cost worksheet was used to evaluate the safety benefits of each segment of the alternatives with appropriate Crash Modification Factors (CMFs). The CMFs were applied to the crash history, which was corrected through individual crash review to maximize the accuracy of the analysis earlier in the corridor study. The following lists the assumptions made for the analysis to obtain the expected safety benefits. **All crashes at 45th Avenue SE (CR 65) and 42nd Street SE were not included in the expected safety benefit as they will be addressed by the 2024 Sherburne County RCI project. The cost of the county project is also excluded.**

- All crashes are in included in the crash history cost.
- All type “Other” crashes were removed from expected safety benefit as it is unclear if the alternatives would address those crashes.
- Run-off-road and head-on crashes were excluded from expected safety benefit as they will or could be addressed with independent improvements prior to alternative construction.
- The cost used for fatalities in this analysis was calculated as twice the incapacitating crash cost (K = 2A).
- (Lower-Cost alternative C only) – All signal-related crashes were excluded from the safety benefits as the intersection control is not changing.
- All angle, merging, and diverging crashes were reduced with a project-specific CMF, developed from the conflict point analysis that was completed in the Alternatives Analysis.
- (Lower-Cost alternative C only) – Rear-end collisions not occurring at signals were reduced by a combined CMF for providing left and right-turn lanes. No applicable CMF was found to address crashes reduced by implementing an acceleration lane. Providing left and right-turn lanes were assumed to provide the same

benefit as acceleration lanes. A review of MnDOT's *Median Acceleration Lane Study* (2002) validated the CMF used in this study, showing that intersections with median acceleration lanes have 70% fewer rear-end crashes than intersections without median acceleration lanes. MnDOT's *Median Acceleration Traffic Study* (2017) was also reviewed and was found to focus primarily on fatal and serious injury crashes. The study did not specifically address rear-end and same-direction sideswipe crash types. Therefore, the results of this study were not included in this analysis.

- (Higher-Cost alternative C only) – All rear-end collisions were reduced by the inverse of a CMF 234: Install a Traffic Signal (Major Road Speed Limit At Least 40 MPH). Since the Higher-Cost alternatives will be removing signals directly on Highway 10 and shifting the conflict points to lower speed and volume ramp terminals, this was deemed a conservative CMF to apply for rear-end collisions, with the potential for even more safety benefit than showed in the analysis.
- For the project cost, a 30% contingency was applied to the base-cost estimate.
- For the project cost, a 20% inflation was applied to the base-cost estimate.
- Values are rounded in the table for ease of understanding.

More information on the analysis and HSIP BCA results is available in **Appendix 5A** (Lower-Cost alternative C) and **Appendix 5B** (Higher-Cost alternative C).

Segment Ranking Results

Based on the methodology explained above, the results to guide the technical ranking for expected safety benefit (immediacy of need) are shown in **Table 1** for Lower-Cost alternative C, and **Table 2** for Higher-Cost alternative C.

Table 1: Lower-Cost Alternative C Phasing Safety Technical Results

Segment	Historic Yearly Crash Cost	Expected Safety Yearly Benefit	Construction Cost
1 (15th Ave, Lincoln Ave, 12th St) St. Cloud Corridor End	$1.1M	$165,000 16% reduction	$4.2M
2 (Minnesota Blvd)	$314,000	$153,000 49% reduction	$2.8M
3 (32nd St)	$593,000	$69,000 12% reduction	$14.5M
4 (42nd St/45th Ave, 47th St)	$351,000	$0 N/A	$2.4M
5 (60th St)	$680,000	$72,000 11% reduction	$5.4M
6 (72nd St)	$93,000	$43,000 46% reduction	$3.1M
7 (75th Ave, 3rd Ave, TH 24) Clear Lake Corridor End	$1.1M	$93,000 9% reduction	$2.3M

Table 2: Higher-Cost Alternative C Phasing Safety Technical Results

Segment	Historic Yearly Crash Cost	Expected Safety Yearly Benefit	Construction Cost
1 (15th Ave Interchange Area) St. Cloud Corridor End	$1.1M	$625,000 57% reduction	$34.1M
2 (New Interchange location and 42nd St Interchange Area)	$1.3 M	$369,000 29% reduction	$83.6M
3 (60th St Overpass Area)	$624,000	$52,000 8% reduction	$9.5M
4 (TH 24 Interchange Area) Clear Lake Corridor End	$1.2 M	$509,000 43% reduction	$33.6M

Based on the technical information in **Table 1**, the Lower-Cost alternative C phasing should consider the following order based on overall expected safety benefit:

1. Segment 1 (15th Avenue SE, Lincoln Avenue SE, 12th Street)
2. Segment 2 (Minnesota Boulevard)
3. Segment 7 (75th Avenue, 3rd Avenue, Highway 24)
4. Segments 3, 4 and 5 (32nd Street SE, 42nd Street SE/45th Avenue SE, 47th Street SE, 60th Street)
   - These segments have similar benefits and could be done in any order between them.
5. Segment 6 (72nd Street)

Based on the technical information in **Table 2**, the Higher-Cost alternative C phasing should consider the following order based on overall expected safety benefit:

1. Segment 1 (15th Avenue SE Interchange Area)
2. Segment 4 (Highway 24 Interchange Area)
3. Segment 2 (New Interchange location and 42nd Street SE Interchange)
4. Segment 3 (60th Street Overpass Area)

Logical sequencing as mentioned in the MnDOT considerations may suggest completing the project in a linear manner. If a consistent, one-end-to-the-other project approach is desired, both the Lower-Cost and Higher-Cost alternatives should be constructed starting at the north end of the corridor (St. Cloud) and work towards the south end of the corridor (Clear Lake).

Independent Improvement Recommendations

Potential improvements that were independent of the corridor-wide alternative were also identified during the course of the study. These improvements are lower-cost safety improvements that could be implemented in full or in part. The following is a list of potential improvements that could be funded and easily implemented in the short-term to improve safety. No work outside of MnDOT right-of-way is anticipated to be required to implement these potential improvements. These improvements are independent of the funding scenario and should be considered for implementation as soon as possible.

15th Avenue SE Recommendations

The 15th Avenue SE traffic signal is relatively new, therefore recommended improvements at this location were identified that do not require major reconstruction of pavement or replacement of underground equipment.

- **Upgrade all signal heads with retroreflective backplates.**
- **Upgrade the 15th Avenue SE approaches with flashing yellow arrows** (FYA) and the appropriate yellow and red intervals. The VISSIM modeling showed minimal benefit implementing the FYA at 15th Avenue SE but the safety benefit from going from a 5-head protected/permissive to a 4-head FYA is anticipated to provide a reduction in left-turn crashes on the minor approaches at 15th Avenue SE. The flashing yellow arrow allows the controller the flexibility to optimize lead-lag operations which helps to reduce operational impact and serve the higher volume movements first and reduce vehicle conflict. Minor FYA should be implemented during all peaks except on Fridays. More details about the potential benefits and timing details used to model this improvement can be found in **Appendix 5C**.
- **Coordinate the traffic signal with E St. Germain Street** during the peak hours of traffic. A cellular connection is possible if a physical connection is unavailable. A fiber connection is anticipated to be installed with the upcoming Highway 10/Highway 23 interchange project, which the signals will be connected with.

Trunk Highway 24 Recommendations

The Trunk Highway 24 traffic signal was originally constructed in 1996 and rehabilitated in 2010. With a 30-year replacement cycle, this signal would be scheduled to be reconstructed in 2026. While the signal is not currently programmed, consideration should be given to advancing the replacement to incorporate the following recommended improvements. These improvements could also be implemented independent of or included with a Highway 10 corridor project.

- **Upgrade all signal heads with retroreflective backplates.**
- **Change split phasing to traditional phasing with lane reconfiguration.** The signal timing would change from a split phase to an overlapping leading left phase and the lane configuration of the eastbound Highway 24 approach would change to two left-turn lanes and a shared through/right-turn lane. This improvement is expected to improve operations at Highway 24 for the Weekday and Sunday peaks with minimal benefits during the Friday scenario. More details about the potential benefits and timing details used to model this improvement can be found in **Appendix 5C**. Autoturn templates verified that a WB-62 and an opposing passenger vehicle can utilize the turn lanes simultaneously. A WB-62 versus a WB-62 turn template should be checked in the future due to high truck volume concerns.

  - **(NOT RECOMMENDED) OPTION: Upgrade the Trunk Highway 24 approaches with flashing yellow arrows** (FYA) and the appropriate yellow and red intervals. Since the westbound traffic volumes are low at this location, it may be beneficial to run the westbound as protected-permissive with a flashing yellow arrow. Typically, dual left-turn lanes are run as protected-only in Minnesota but due to the circumstances and volumes of this intersection, a flashing yellow arrow could be beneficial for traffic operations and safety. FYA should be implemented during all peaks except on Fridays. This option is not recommended due to heavy vehicle usage and stopping concerns.
- **(NOT RECOMMENDED) Actuated green overlap right-turn arrows on Highway 10**. More information about why this alternative was not recommended is available in **Appendix 5C**.
- **Widen the roadway at the rail crossing on the southeast leg***.* Widening the roadway at the rail crossing would allow agriculture equipment to cross Highway 10 at the Highway 24 signal instead of the existing location at 70th Avenue. Prior to a quiet zone project, agricultural equipment previously crossed Highway 24 at this location and preferred it due to shorter trip length and safer crossings.

Table 3 provides more detail on the independent improvements for the 15th Avenue SE and Trunk Highway 24 traffic signals and the technical recommendations for implementation.

Table 3: Independent Improvement Considerations – 15th Avenue SE and Trunk Highway 24 Traffic Signals

Improvement	Benefits	Challenges	Cost	Implementation	Consideration
Retroreflective Backplates (Both)	Improves the visibility of the signal system	Minor signal modification	Very Low	Maintenance forces or negotiated contract	Implement concurrent with other Lower-Cost signal improvements
15th Ave Minor Approach Flashing Yellow Arrows	Reduced left-turn crashes	Signal Controller may not support	Low	Maintenance forces or negotiated contract	Implement concurrent with other Lower-Cost signal improvements
15th Ave Signal Coordination with E St Germain St (peak hours)	Improved traffic operations	Minor signal modification, retiming, and coordination with St Germaine	Low to Moderate	Maintenance forces or negotiated contract	Implement in near future or with TH 10/TH 23 Interchange project
TH 24 – Remove split phasing with lane reconfiguration (with or without flashing yellow arrow option)	Improved traffic operations	Significant signal modification. Lane shift across the intersection for EB through movement	Moderate	Maintenance forces, negotiated contract, Signal Replacement contract	Lane shift across intersection for EB through vehicles, increased delay for EB right-turners
TH 24 – Widen the roadway at the rail crossing	Improved crossing for agricultural equipment	Railroad coordination	Moderate	Negotiated contract, include with Signal Replacement contract	Design with agricultural equipment as the design vehicle

Corridor-Wide Improvements

The following lists roadway improvements that should be considered for the entire length of the corridor. Significant hazards occur within and outside the clear zone. Hazards include trees, in-slopes, back-slopes, and driveway cross-slopes. Serious and fatal crashes have occurred related to some of these hazards. A Metro District Study found that severe and fatal crashes occurred on hazards up to 120 feet from the edge line. Hazards related to the nearby BNSF tracks were assessed but deemed infeasible to address on the current alignment.

- Clear Zone and Roadside Improvements
    - Clear vegetation and fixed objects within and near the clear zone.
    - Slope assessment and correction
    - Guardrail and low-tension cable assessment and correction.
- Cable Median Barrier – Programmed for 2023 construction throughout study limits.

Unsignalized Intersection Improvements

The following lists unsignalized intersection improvements that should be considered at all unsignalized intersections along the corridor.

- Improved intersection lighting
    - Based on a review of crash history and traffic volumes, the assessment should begin with the Minnesota Boulevard, 32nd Street SE, and 60th Street intersections.
- Reduce intersection skew on the westbound approaches of 32nd Street SE, 47th Street SE, Haven Road SE, and 60th Street
    - Recommended to be constructed through roadway widening and re-striping as opposed to roadway re-alignment.
- Minnesota Boulevard – extend southbound right-turn lane
    - Minnesota Boulevard provides access to the Minnesota Correctional Facility. The current traffic attempting to make a southbound right-turn overflows the right-turn lane creating unsafe traffic operations. The turn lane should be extended. The extension distance should be determined through observations of correctional facility shift changes and train events coinciding.

Table 4 provides more detail on the independent improvements for the corridor-wide and unsignalized locations and the technical recommendations for implementation.

Table 4: Independent Improvement Considerations – General

Improvement	Benefits	Challenges	Cost	Implementation	Consideration
Clear Zone and Roadside Improvements *(Corridor-Wide)*	Reduces severity of run-of-road crashes (29% of crash history)	Some fixed objects may be difficult to remove	Low	Maintenance forces or negotiated contract	Efforts should be made to consider major hazards within the right-of-way to identify high risk objects for drivers traveling high speeds
Install Center Cable Median Barrier *(Corridor-Wide)*	Reduces head on crashes	Intersection sight distance	Funded	Project Letting	Programmed in CHIP for 2023
Improved Intersection Lighting	Increased visibility at intersections at nighttime and alert mainline drivers to presence of intersection	Source of power	Moderate	Maintenance forces, negotiated contract, or IDIQ	Consider future intersection design for pole placement
Reduce Intersection Skew	Improves sight lines between major and minor approaches	Right-of way may become difficult to acquire in certain locations	Moderate	Maintenance forces or negotiated contract	Fixed RR crossings limit applicability
Extend southbound right-turn lane at Minnesota Boulevard	Increases storage of right-turn lane and prevents queuing onto mainline TH 10	Traffic impacts to eastbound mainline	Moderate	Maintenance forces or negotiated contract	Observations for length of turn lane extension should occur when a shift change and train event overlap

Intelligent Transportation System (ITS) Recommendations

The following section lists ITS improvements that should be considered for early implementation along the corridor. ITS deployments throughout the state assist with traffic management and providing real-time traveler information to the public. The installation of these deployments will set the groundwork for the state to provide travel time information to river crossings, as well as key destinations. In addition to the equipment listed below, Highway Rail Intersection monitoring equipment should be analyzed and applied as appropriate along the corridor.

- Trunk Fiber Throughout the Corridor
    - Design and construct trunk fiber along the extent of the corridor between Highway 24 on the eastern end and the existing splice vault at the Highway 23 and 15th Avenue SE intersection on the western end.
    - This includes all infrastructure required including vaults, splice enclosures, fiber optic pigtails, etc.
- Closed-Circuit Television (CCTV) Cameras
    - Design and construct cameras at major intersections along the corridor. Connect the cameras to trunk fiber via fiber optic pigtail connections.
- Dynamic Message Signs (DMS)
    - Design and construct a DMS for westbound traffic east of 32nd Street SE. The DMS will convey incident alerts, general messages, truck parking, and travel time information. Connect this new DMS and the existing DMS to the fiber optic network.
- Detection
    - Design and construct detection stations at 1.0 to 1.5 mile spacing along the corridor to support traffic operations and travel time calculations. Connect the detection using the fiber network.

Multimodal Opportunities

The following is a list of potential improvements specific to bike and pedestrian travel. These potential improvements are independent of the funding scenario and alternative selected. Some identified pedestrian improvements may conflict with current or future signal operations. The 15th Avenue SE traffic signal recommendations are considered more immediate items for existing multimodal needs that should be considered with the other traffic signal recommendations made in **Table 3.** The shared-use paths and grade separated crossings are more focused on pedestrian and multimodal connectivity and the future needs and opportunities for the corridor.

- **15th Avenue SE intersection**
    - Add an ADA compliant sidewalk connection to Culver's and the Kwik Trip driveway in the southwest corner of the intersection.
    - Extend pedestrian walk phase to allow a single-phase crossing of Highway 10
    - Use high visibility crosswalks (ladder type)

- **Highway 24 intersection**
  - Extend the pedestrian walk phase to allow a single-phase crossing of Highway 10 and add a signal phase and crosswalk for pedestrians on the northern leg. Install ADA compliant ramps, ADA compliant cross slopes, and countdown timers with the new crosswalk.
  - Use high visibility crosswalks (ladder type).
- **Shared-Use Path[2] (Figure 5)**
  - **Preferred Trail**: Add a shared-use path the full length of the corridor on the east side and from 15th Avenue SE to Minnesota Boulevard on the west side.
  - **Recreation Area Connection**: Add a shared-use path to the west side of Highway 10, from Minnesota Boulevard to George Friedrich Park.
- **Grade-Separated Crossings (Figure 5)**
  - Add a grade separation at the **15th Avenue SE intersection** for pedestrians and bicyclists.
  - Add a grade separation at **Minnesota Boulevard**, connecting the west and east sides of the shared-use path with the Sand Prairie Wildlife Management Area. Given the proximity to the railroad and County Ditch No. 3, the high water table, and the highway cross-section width, the grade separation for this location will likely be most successful as an overpass.

[2] If the shared-use path shown in **Figure 5** is constructed before Higher-Cost alternative C is planned and implemented (should grade-separation be ultimately selected for this corridor), the path may be moved or removed. Additional planning and studies may be necessary to determine alternate alignments away from Highway 10, which would require collaboration with applicable jurisdictions.

Figure 5: Future Multimodal Improvement Options

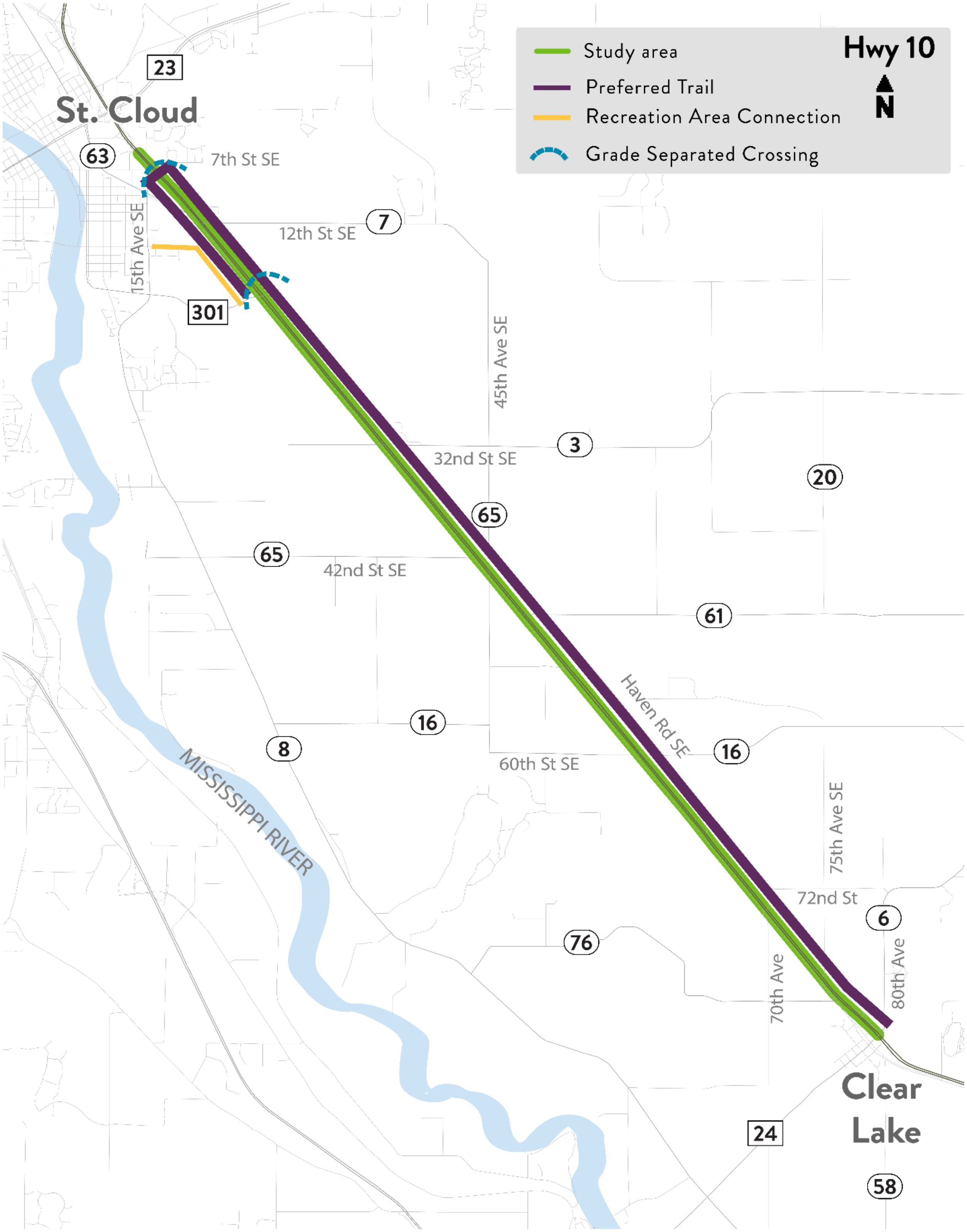


Table 5: Independent Improvement Considerations – Multimodal

Improvement	Benefits	Challenges	Cost	Implementation	Consideration
High visibility crosswalk (15th Ave & TH 24 traffic signals)	Improved crossing experience and visibility to motorists	No significant challenges	Low	Maintenance forces or negotiated contract	Increased maintenance
15th Ave sidewalk to local businesses in southeast corner of intersection	Encourages crossing to the south side of 15th Ave at the traffic signal	No significant challenges	Moderate	Coordinate with City	Local Jurisdiction
15th Ave pedestrian signal timing	Improved crossing experience and safety	No significant challenges	Moderate	Maintenance Forces	Slightly increased vehicle delay
TH 24 pedestrian signal timing with added signal phase for pedestrians on the northern leg (add north leg marked crossing)	Improved crossing experience	Moderate reconstruction of traffic signal	Moderate	Negotiated Contract	Additional vehicle delay, crossing dual left turns
Preferred Trail	Increased pedestrian connectivity along TH 10	Feasibility study/work needed	Very High	Local or DNR partnership	High cost and impact
Recreation Area Connection	Connection to recreational areas for pedestrians and bikes in the area	Feasibility study/work needed	High	Local Led Project	ROW challenges
Minnesota Blvd Grade Separated Crossing	Safest facility to cross TH 10	Feasibility study/work needed	Very High	Project letting	Limited connections to location, BNSF RR
15th Ave Grade Separated Crossing	Safest facility to cross TH 10	Feasibility study/work needed	Very High	Project letting	Future Interchange location, ROW needs

Project Development and Scoping

MnDOT projects are planned and funded through several statewide planning documents, including (but not limited to) the Capital Highway Investment Plan (CHIP), and the State Transportation Improvement Plan (STIP).

The CHIP details plans for capital highway investments for the next ten years, specifically for the state highway network. Projects described in the CHIP are at the planning level, with funding needs identified. Projects are scored and selected by MnDOT based on project needs and goals, which prioritize safety improvements, mobility and capacity expansion, and rehabilitation and replacement of existing infrastructure. The CHIP is updated yearly to remove projects that are being constructed, adjust project schedules, and add new planned projects.

MnDOT's committed construction program is detailed in the STIP, which represents the first four planning years of the CHIP. The STIP includes all state and local transportation projects that are using federal highway and/or federal transit funding, as well as projects that require action by the Federal Highway Administration (FHWA) or the Federal Transit Authority (FTA). The majority of funding for projects included in the STIP come from FHWA, FTA, or from the Minnesota state trunk highway fund. Projects detailed in the STIP must include funding plans using current revenues, as the STIP is a document that is fiscally constrained based on available funding. Available STIP funding is allocated to each MnDOT district based on the condition of infrastructure within the district, the respective network size, and use of the system.

Projects that are closer to construction (one to four years away) are detailed in the STIP, with funding plans included with the project description. Projects that are at planning level (five to ten years away from construction) are detailed in the CHIP. Significant public and stakeholder involvement is conducted by MnDOT before projects reach CHIP or STIP stages. MnDOT works closely with Area Transportation Partnerships (ATPs), which include representatives from MnDOT, Metropolitan Planning Organizations (MPOs), Regional Development Commissions (RDCs), counties, cities, tribal governments, special interests, and the public. The ATPs ultimately provide representation for each of Minnesota's eight districts. Input from ATPs are vital to project success, to ensure that stakeholders are being adequately represented and informed about project impacts. The results of this study will ultimately impact the CHIP and STIP planning and funding phases regarding Highway 10.

Summary

This implementation plan is the conclusion of a technical analysis of Trunk Highway (TH) 10 in Sherburne County, Minnesota. The purpose of this report is to document phasing and funding strategies for the proposed project improvements. A chronology for the proposed infrastructure and facility investments was explored, as well as independent improvements with the goal to bring immediate benefits and value to the communities, while building toward the ultimate corridor vision. The following paragraphs summarize the improvements and recommended pathways to funding and implementation.

The alternatives were created from the project beginning with cost as a consideration. The Lower-Cost alternatives were designed to be constructable with current funding scenarios, although MnDOT currently has no available funding for any alternative. The Higher-Cost alternatives for the project were designed to be constructable with unique sources of money or grants that would likely be applied for or awarded specifically for the project from a one-time source of money. The Medium-Cost alternatives were designed to target a cost range in between the Low- and Higher-Cost alternatives. The alternatives analysis eliminated two Medium-Cost alternatives from the recommendations, due to low benefit/cost results. The two Lower-Cost alternatives scored similarly in the technical analysis but had different benefits when considering public engagement. As a result of the technical analysis, public outreach, and Technical Advisory Committee (TAC) input, the recommended alternative became a combined hybrid option, Lower-Cost alternative C, that addresses U-turn concerns for heavy trucks on the northwest end of the corridor and access concerns at county roads. Similarly, the Higher-Cost alternatives scored similar in the technical analysis. These alternatives were consolidated into Higher-Cost alternative C based on input from the TAC. Higher-Cost alternative C interchanges were selected to understand feasibility and cost but are subject to change through preliminary design. The preliminary cost estimate for the recommended Lower-Cost alternative C is $30 million. The preliminary cost estimate for the recommended Higher-Cost alternative C is $160 million.

The Implementation Plan defines up to seven phase segments for Lower-Cost alternative C and up to four phase segments for Higher-Cost alternative C. The phasing technical rankings were developed considering prioritization of phase segments that would provide the most benefit to user safety, first relating to the MnDOT consideration for immediacy of need. Based on the technical information analysis, the Lower-Cost alternative C phasing should be completed in the following order: Segment 1, Segment 2, Segment 7, Segments 3 through 5 (constructed in any order between them), and Segment 6. Based on the technical information analysis, the Higher-Cost alternative C phasing should be completed in the following order: Segment 1, Segment 4, Segment 2, and Segment 3. However, logical sequencing as mentioned in the MnDOT considerations may suggest completing the project in a linear manner. In this case, both the Lower-Cost and Higher-Cost scenarios should be constructed starting at the north end of the corridor (St. Cloud) and work towards the south end of the corridor (Clear Lake).

In addition to the phasing/sequencing analysis, the Highway 10 corridor was evaluated for improvements that could be funded and easily implemented immediately to improve safety. These improvements are independent of the funding scenario and include the following:

- **15th Avenue SE Traffic Signal**:
    - Implement flashing yellow arrows on the minor approaches.
    - Upgrade all signal heads with retroreflective backplates.
    - Install high visibility crosswalk markings.
    - Extend pedestrian walk phase to allow a single-phase crossing of Highway 10.
- **Highway 24 Traffic Signal:**
    - Upgrade all signal heads with retroreflective backplates.
    - Install high visibility crosswalk markings.
    - Extend pedestrian walk phase to allow a single-phase crossing of Highway 10.
    - Remove split phasing on Highway 24 with lane reconfiguration.
    - Widen roadway at the rail crossing on the southeast leg of the Highway 24 intersection.
        - ADA and Pedestrian Preference Option: Add a signal phase for pedestrians on the northern leg (add north leg marked crossing).
- **Lane Departure Hazard Mitigation the full length of the corridor**.
- **Install Cable Median Barrier the full length of the corridor (already funded and planned).**
- **Improved intersection lighting** (applicable unsignalized locations).
- **Reduce Intersection Skew** (applicable unsignalized locations).
- **Extend southbound right-turn lane at Minnesota Boulevard.**

Multimodal recommendations were also considered for the corridor in addition to the recommendations at the traffic signals. The multimodal improvements are recommended to be considered independent of the alternatives and are not considered immediate action items.

- Consider adding an ADA compliant sidewalk connection at 15th Avenue SE to Culver's and the Kwik Trip driveway in the southeast corner of the intersection.
- A shared-use path should be considered the full length of the corridor on the east side of Highway 10, and from 15th Avenue SE to Minnesota Boulevard on the west side.
- A lower-cost shared-use path should be considered on the west side of Highway 10 from Minnesota Boulevard to George Friedrich Park.
- A grade-separated crossing should be considered at the 15th Avenue SE intersection.
- A grade-separated crossing should be considered at Minnesota Boulevard.

Next Steps

Independent Safety Improvements

At the time of completion of this corridor study, the project has additional awarded funding that is available to use for immediate improvements separate from the full corridor alternatives. The funding available is approximately $800,000 and must be encumbered by 2025. Based on the independent improvement recommendations, the following list is the technical recommendation for how the remaining funds could be used to bring immediate benefit to the corridor, while the funding is being secured for implementation of either Lower-Cost alternative C or Higher-Cost alternative C.

- Clear Zone and Roadside Improvements (Corridor Wide) – negotiated contracts up to $250,000 each
  - Clear vegetation
  - Slope correction/protection
  - Fix approach cross slopes with anticipation of pipe work
- 15th Avenue SE Signal Improvements – negotiated contract or maintenance forces
  - Signal re-construction and re-timing
  - High visibility crosswalk markings
- Highway 24 Signal Improvements – negotiated contract, maintenance forces, or let project
  - Remove split phasing on Highway 24 with lane reconfiguration, signal reconstruction, and re-timing with restriping and signing work
  - High visibility crosswalk markings
  - Widen roadway at the rail crossing on the southeast leg of the Highway 24 intersection
  - Option: Add an ADA compliant pedestrian crossing to the north leg
- Minnesota Boulevard Intersection Improvements – negotiated contract or maintenance forces
  - Extend southbound right-turn lane
  - Improve intersection lighting
  - Mitigate east leg intersection skew with roadway widening and re-striping as opposed to roadway re-alignment

Alternatives Implementation

The remaining steps for the Highway 10 corridor project include securing funding, completing environmental review and design, construction, and operations and maintenance.

- Secure funding
  - Transportation projects in Minnesota can be funded from various funding sources. The project team will need to use the technical analysis from this report to advocate for funding from applicable sources. Once the level of funding is secured final design can begin on either Lower-Cost alternative C or Higher-Cost alternative C.
- Environmental and Design

    - Environmental and Design takes the concept and parameters established in the corridor study and develops a project through environmental review and detailed design, culminating in the construction plan set, designer's cost estimate, and special provisions.
- Construction
    - Construction includes the physical and administrative processes of building the transportation facility specified in the plans. The project manager must keep the construction process in mind during project development to ensure the project can be constructed safely and efficiently, while minimizing impacts to communities, natural resources, and cultural resources.
- Operations and Maintenance
    - Operations and maintenance is the phase when the facility is open to travelers. During this phase, MnDOT monitors and optimizes facility performance and addresses condition issues. Throughout project development, the project manager must make decisions that will support safe and efficient operation and maintenance of the transportation facility.