Marshall Area Highway 23 Safety Assessment

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Overview of Assessment

Highway 23 was constructed as a bypass around the urban area of Marshall to allow through traffic to flow with fewer interruptions, to reduce congestion through town, and in doing so, reduce conflict points and competing uses of highway users. Since the bypass was constructed, development has expanded to the bypass, and in several locations east of the bypass, creating increased cross traffic of Highway 23. As the surrounding land use and development continue to evolve, so will the traffic patterns and the amount of traffic on Highway 23.

The Minnesota Department of Transportation (MnDOT) and its partners, the City of Marshall, Lyon County, and the Marshall Area Transportation Group, completed a safety assessment along Highway 23 through Marshall from County Road 33 to County Road 7. Also included was a segment of Highway 19 from Highway 23 east approximately one-half mile. The graphic below shows the assessment area.

The impetus for this assessment was to better identify and document locations along the corridor that may benefit from highway improvements, particularly with respect to safety.

This document summarizes the overall assessment process, the public and stakeholder engagement conducted, the purpose and need for improvements, and includes prioritized recommendations for safety improvements to be implemented as funding becomes available. With this assessment complete, the assessment partners can begin pursuing funding opportunities to address the priorities for the Highway 23 corridor.

Purpose of Assessment

The purpose of the Highway 23 safety assessment was to:

- Evaluate the current and future performance of Highway 23 through Marshall;
- Facilitate discussion between local partners, stakeholders, and the public;
- Provide a list of opportunities and recommendations, and establish priorities to improve the safety of Highway 23; and
- Develop a common vision to identify, prioritize, and design future safety improvements.

Goals of Assessment

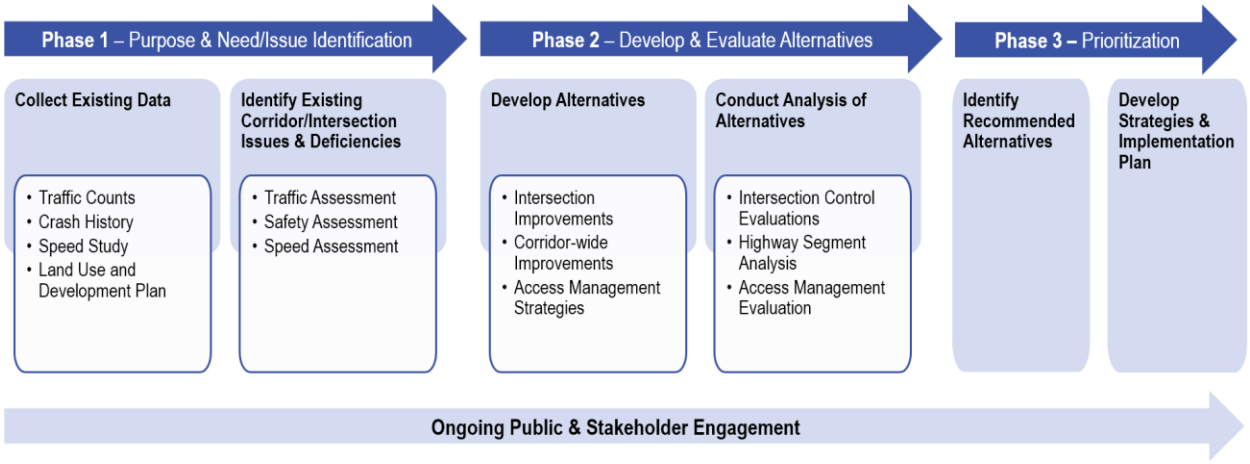
To address the purpose of this assessment the following goals were established at the onset of the overall assessment and were key in the decision-making process:

- **Goal 1:** Improve the safety of the Highway 23 and Highway 19 corridor segments.
- **Goal 2:** Accommodate current and future traffic demands as urbanization continues along Highway 23 in Marshall.
- **Goal 3:** Improve accessibility and connectivity for all modes (e.g. cars, trucks, pedestrians, bicycles, transit).
- **Goal 4:** Prioritize improvements to develop a plan for managing the Highway 23 corridor.

Key to achieving these goals was incorporating a comprehensive public and stakeholder engagement process throughout the assessment to gather input, educate, and gain support for the safety improvement strategies.

Assessment Process

The overall assessment was conducted in three phases as illustrated and described below:



Phase 1 included the identification of the purpose and need for the assessment. This was done by collecting and evaluating how many vehicles travel the corridor, the history of crashes, and the speeds at which drivers are currently driving. This also included understanding how Highway 23 currently functions with respect to all users and how current land uses and future development are expected to change its performance.

Public engagement was incorporated into Phase 1 to assist in identifying issues, concerns and priorities along the Highway 23 corridor.

Phase 2 included the development and evaluation of alternatives to improve safety. Individual safety improvement strategies were identified to address the current issues and concerns. These strategies were then used to developed alternatives for specific locations along Highway 23 and for the overall corridor. Detailed technical analyses were completed to determine the potential effectiveness of the safety improvement alternatives.

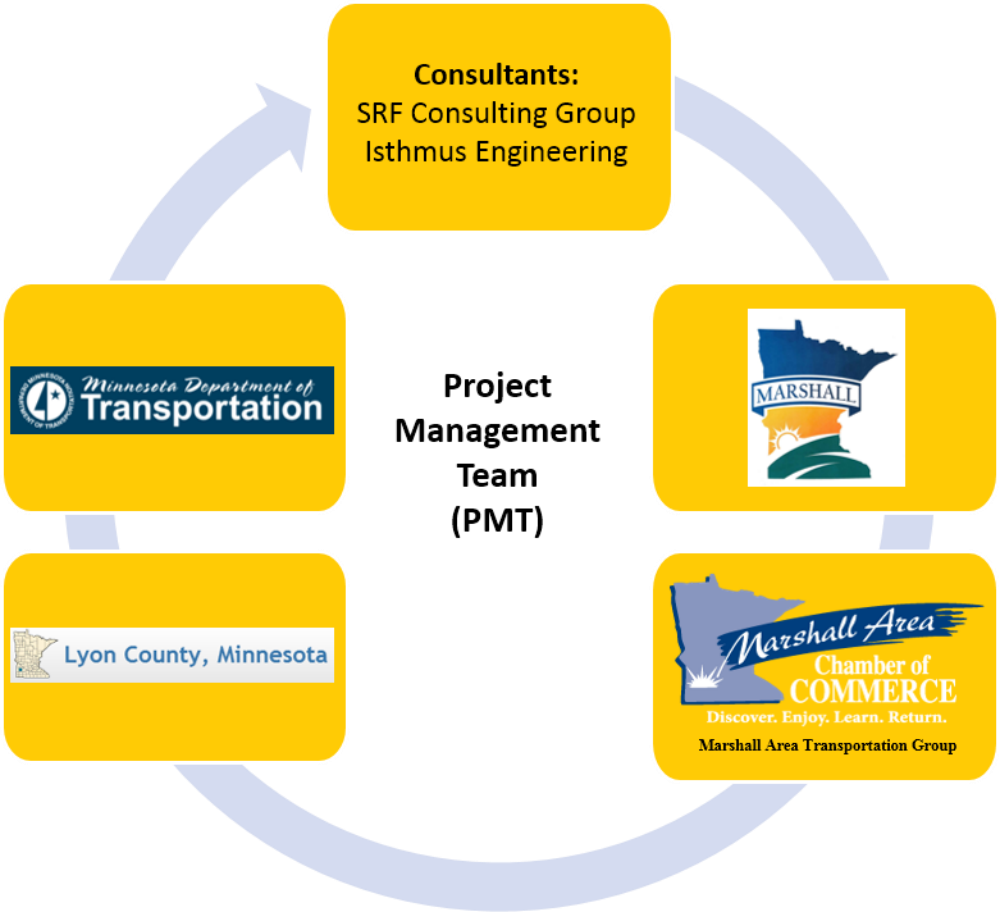
Public engagement was incorporated into Phase 2 to educate the community on the various "tools in the toolbox" that can be used to address the issues and concerns, as well as their effectiveness in improving safety.

Phase 3 concluded the assessment by identifying recommended safety improvement alternatives and the prioritization of improvements thereby developing a plan for implementation over time. Alternatives were ranked based on their potential effectiveness and locations were prioritized based existing safety issues.

Public engagement was incorporated into Phase 3 to influence the prioritization of locations to implement improvements.

Project Management Team

A Project Management Team (PMT) was established to help guide the safety assessment. The PMT was comprised of individuals representing engineering, planning, public affairs, economic development, city, county, and state interests. This included a consultant team along with representatives from various agencies and organizations.



The PMT helped guide the assessment process and provide oversight for all aspects of the assessment, including; 1) scheduling, coordination, and conducting public engagement; 2) review and development of draft materials and presentations to targeted stakeholder groups; 3) and shaping recommendations.

Public & Stakeholder Engagement

MnDOT, its partners, and the consultant team initiated the public and stakeholder engagement process in January 2016. The purpose of this comprehensive process was to establish and maintain ongoing dialogue with local stakeholders and the general public in each of the three phases of the decision-making process.

At the onset of the assessment a Public Participation Plan (PPP) was drafted that outlined the implementation of outreach strategies and activities by identifying the purpose of the outreach (what and why), the targeted audience (who), the timeframe (when and where), and the intended outcome (goal). The PPP acted as a living document and was regularly updated to reflect stakeholder and public input received, and remained consistent with the outreach principles, goals, and objectives as described below.

Principles

The assessment team developed outreach strategies that were designed around the following three principles:

- **Meaningful:** A clear intent and purpose was determined for each outreach activity by communicating how input would be implemented throughout the process and in the final vision for the corridor.
- **Inclusive:** All engagement activities and products were accessible to stakeholders and the public regardless of age, ethnicity, language, income, or mobility.
- **Tailored:** Outreach activities were inclusive and specific to local and cultural preferences.

Goals

The assessment team was committed to implementing thoughtful, effective, and convenient outreach activities to ensure stakeholders and the public were well informed and had a legitimate and transparent process to provide their input to meet the following goals:

- Inform and educate stakeholders and the public about the background of Highway 23 and the purpose of the safety assessment;
- Provide opportunities for interested parties to identify issues, concerns and priorities;
- Obtain meaningful public input to incorporate as part of the recommended alternatives; and
- Conduct proactive and transparent outreach.

Objectives

To achieve these goals the following objectives for public engagement were established:

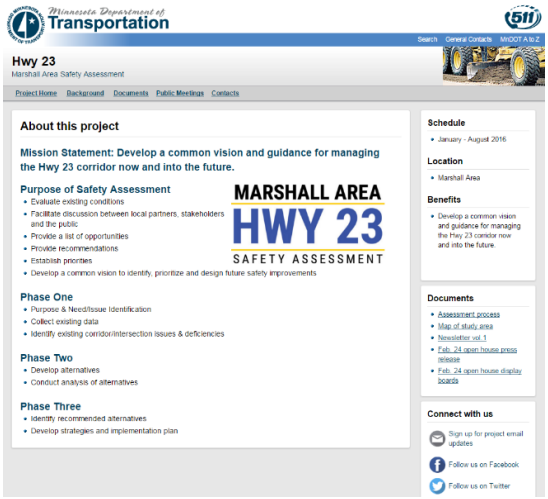
- Provide education through both face-to-face and online engagement activities;
- Explain how and when stakeholders and the general public can participate in the process; and
- Explain how the public's input would be incorporated in the draft and final recommendations.

Public Engagement Strategies

A range of public participation opportunities were offered throughout the assessment process using an integrated approach, which focused on providing both in-person and online engagement. These various opportunities enabled the assessment team to establish credibility within the Marshall community at the onset of the assessment while simultaneously designing a transparent and inclusive process.

Assessment Website

MnDOT hosted and maintained the assessment website. Web users were able to stay informed of the assessment's purpose, progress, and schedule, review key documents and materials, learn about upcoming public engagement activities, and locate contact information for project managers. The website had 1,904 unique page views throughout the course of the assessment.



Pop-Up Community Events

Two pop-up community events were held in Marshall. These were designed to engage stakeholders and the public in places they work, live, and play. Rather than expect them to come to us, we decided to meet them where they already are. The goal of each event was to introduce the safety assessment, explain its purpose, and interact with a wide range of participants by asking each of them about their unique experiences using Highway 23.

This informal, face-to-face exchange created two-way dialogue and feedback from participants to help inform the assessment team's understanding of which specific corridor locations were a concern. This verbal feedback was documented by filling out a written comment card or completing a brief paper survey provided. A half-page flyer detailing the assessment overview and contact information was also distributed.

Marshall Radio Home Show:

This event was selected due to its high visibility as an effort to reach both local and regional users of Highway 23 in Marshall. Boards were on display with background information on the assessment. Aerial photos of the corridor were used to discuss and take note of verbal comments at specific locations. The assessment partners staffing the meeting interacted with attendees, receiving both verbal and written comments throughout the session.

YMCA Bike Safety Event:

The event served as an opportunity to reach a large demographic of Highway 23 users and provide awareness about the assessment as many attendees noted they had not heard about it before. This event directly related to the purpose and goal of the assessment, which aims to improve safety throughout the corridor. Handouts and paper copies of the first survey were distributed.

Focus Group Meetings

Focus group meetings held throughout the assessment were a key component to building positive working relationships within the community by understanding the wide interests and concerns of Highway 23 users, in addition to fostering community buy-in for the future safety recommendations. These meetings were intended for a small group to dive deeper into common issues to identify areas of opportunity along the Highway 23 corridor, as well as to allow participants to share their own personal experience in an open and relaxed atmosphere.

Focus groups:

- Freight and local businesses
- Law enforcement and EMS
- Marshall Public Schools and SMSU
- Underrepresented populations
- Bicycle and pedestrian advocacy groups

Targeted Community Presentations

To further take advantage of engaging established organizations and committees in the Marshall community, presentations to four targeted stakeholder groups were held during the assessment process. These presentations allowed the team to build trust with each group by proactively addressing any key concerns and issues, including possible constraints and opportunities of the corridor, while simultaneously educating members about the assessments purpose and goals.

Community presentations:

- Marshall Area Transportation Group
- Marshall City Council and Lyon County Board of Commissioners
- Adult Community Center
- Living Word Lutheran Church

Public Open Houses

Four open houses were held at key milestones during the assessment. The purpose of these public meetings were to share information about the various elements within the assessment and to solicit input on major issues facing local and regional users of Highway 23 through Marshall that need to be addressed in the final implementation plan. In total, over 120 people signed in at the four public open house events. The open houses were held in the Community Room at the Marshall-Lyon County Public Library.

Each open house was set up as an informal, drop-in style event with display boards dispersed around the perimeter of the room. Attendees could view any display board depending on their topic of interest. All informational materials shared at the open house were made available on the assessment website. After signing in, an overview handout of the assessment and comment form were distributed to each attendee. Assessment staff were available to help answer questions, address concerns, and collect input from attendees.

The first public open house in February 2016 was held early in the assessment process as a means of introducing the assessment, outlining its process moving forward, and explaining how the public can provide their input. This open house also served as the first opportunity for the assessment team to hear directly how the current design and function of Highway 23 impacts residents and community members. Verbal or written feedback was collected and provided a solid foundation of information that helped guide the future direction for the assessment process.

Topics from Open House #1:

- Assessment overview
- Goals and objectives
- Schedule
- Assessment process
- Importance and role of public and stakeholder engagement
- Review of recent corridor improvements

The second public open house in April 2016 served as an opportunity to re-engage attendees by providing an update on the assessment, as well as engage new attendees who previously had not been involved, discuss input received thus far through public outreach activities, review data collection efforts (traffic counts, safety history, and corridor speeds), learn about strategies for addressing previously identified issues and concerns, and discuss next steps. A short formal presentation was given two times during the open house.

Topics from Open House #2:

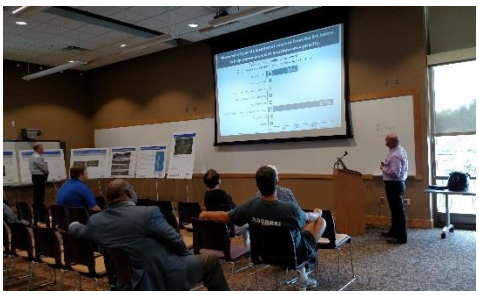
- Traffic, safety, and speed assessments
- Land use and future growth changes
- "Tools in the Toolbox" available to address safety issues and concerns

The third public open house held in June 2016 served as an opportunity to discuss and review how speed limits are set, the decision-making process behind reducing posted speed limits, and specific strategies identified for addressing safety issues and concerns at specific locations. A formal presentation covering this material was given.

Topics from Open House #3:

- Setting speeds limits and reducing speeds
- Potential safety strategies to implement at seven specific locations
- Identification of priority areas of concern and corridor locations

As part of the presentation, open house attendees were able to provide their feedback through interactive polling. Attendees were asked to identify their number one and number two concerns along the corridor among four choices listed. They were asked to do the same to help determine priority intersections among seven choices listed. Attendees were also able to answer those same questions through a "dot exercise" on an adjacent display board or by completing a paper questionnaire as an alternative to the interactive poll. All questions were identical those asked as part of the assessment's second survey.



The fourth public open house was the culmination of data collection, analysis, and public engagement efforts. A formal presentation was given, which highlighted the analysis of alternatives, including intersection control evaluations, highway segment analysis, and evaluation of access management strategies. A recap of public engagement activities and feedback was provided. Recommendations for improvements were presented along with the prioritization of locations for improvements along Highway 23. The presentation was streamed in real-time on the City of Marshall's Facebook page.

Topics from Open House #4:

- Results from survey #1 and survey #2
- Safety improvement strategies
- Recommended corridor improvements
- Other ongoing safety strategies
- Project development and delivery process

The assessment team used various forms of notification to invite people to the open house events:

Email Announcements:
The assessment team developed an email distributition list. Email announcements were sent a couple of weeks before each open house as well as a reminder email the day before or day of the event.

e-Newsletters:
Three online newsletters were developed to provide an update about the assessment's status and highlight the purpose and details of each open house

Social Media:
MnDOT and the City of Marshall published Facebook posts and tweets on Twitter to encourage people to attend the open houses and provide feedback either in-person or online. MnDOT ran Facebook ads to promote the fourth open house.

Press Releases:
A press release was sent to various media outlets prior to each open house and posted on the MnDOT assessment website.

Radio Spots:
Marshall's local radio station KMHL ran radio spots to promote each open house.

Marshall Community Access:
An interview conducted on Marshall's Community Access Channel was used to promote the assessment and upcoming engagement events.

Traditional Media Outreach

MnDOT and the assessment team coordinated meeting notices, media advisories/press releases, and updates regarding assessment progress with local media outlets, including the Marshall Independent. The local newspaper published several stories about the assessment, which included interviews with assessment team members.

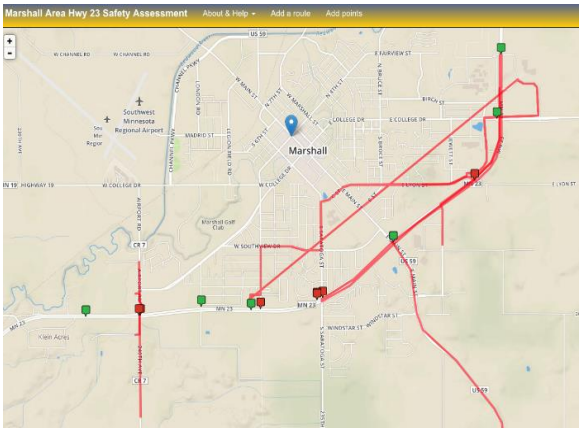
Marshall Community Access Channel

The assessment team was interviewed as part of the Marshall Community Access Channel's Marshall News & Views segment. The purpose of this outreach was to build awareness of the study among a broader demographic within the Marshall community who may have not have heard about or been involved in the process, the public input received thus far, and discuss next steps after assessment activities are completed.

Surveys

To better understand the needs of the Marshall community and how the corridor currently functions, and to identify problem spots and areas of opportunity, two surveys were conducted during the assessment. The surveys were primarily completed online using SurveyMonkey or WikiMapping.

The first survey was conducted using WikiMapping which is an online mapping tool (as shown in the graphic on the right) where users placed pins at specific locations indicating problem spot areas (red) or area of opportunity (green). Users could also provide written comments at each location to further explain why they placed that certain pin. This was an easy-to-use online tool that helped create discussion surrounding the corridor that was interactive and visually engaging. The first survey was embedded in the WikiMapping tool. Approximately 80 online survey responses were received through WikiMapping.



Information gathering was the intent of the first survey and aided the assessment team in understanding who uses the Highway 23 corridor through Marshall, the roads and routes they use to get to their destinations, and the safety challenges they face as a result. Survey questions included:

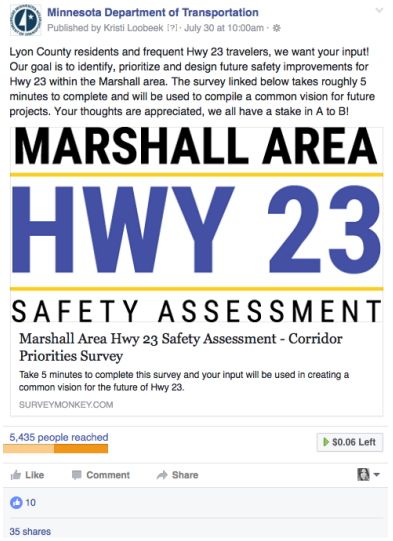
- Rate your satisfaction with how Hwy 23 meets your personal needs.
- What do you see as the top 3 critical issues for Hwy 23 in Marshall?
- What is the best way to communicate with you?
- Demographic questions (zip code and age)
- How did you hear about the assessment?

The second survey, administered via SurveyMonkey, centered on pairing down the feedback received from survey #1 by narrowing the lens, asking participants to identify their top two areas of concerns and top two priority locations along the corridor. Demographic questions were included again to help the team understand if a quality cross-section of local and regional users were providing input.

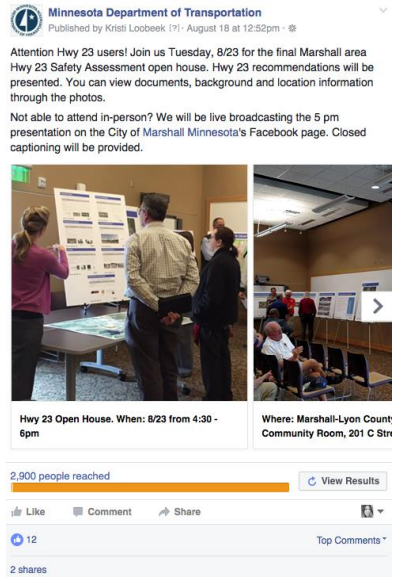
Paper copies of both surveys were made available at appropriate in-person engagement activities. The online component of each survey allowed stakeholders and the public a convenient opportunity to provide feedback, especially if they were unable to attend in-person activities.

Social Media

Social media outlets, such as Facebook and Twitter, were used to increase visibility of the assessment and engagement activities including the open house and online surveys. In addition, social media was used to direct users to the assessment website for additional information, including meeting materials. Promoting engagement activities through these popular online outlets provided an additional opportunity for stakeholders and the public to stay engaged with the assessment and share their voice.



Targeted Facebook ads were used to promote the second survey in an effort to determine priority areas of concern and locations. Facebook ads were also used to promote the fourth open house where safety improvement recommendations were presented.



The targeted Facebook ad promoting the second survey ran for less than three days and reached almost 6,000 people, increased the total number of completed surveys by 295%, and was shared by 35 people with their various networks.

The second Facebook ad campaign encouraged people to attend the final open house to learn about the safety improvements being recommended as a result of this assessment. Content also included promotion of the formal presentation being streamed using Facebook Live.

Both Facebook ads targeted users 18-65+ years of age who lived within 40 miles of Marshall.

The following three graphics summarize the input received and the results of both surveys.

WHAT WE HEARD

MARSHALL AREA HWY 23 SAFETY ASSESSMENT

Pedestrians and Bicycles

- Need to improve pedestrian and bicycle connections at major intersections

Safety at intersections

- Need to improve intersection design; intersections don't feel safe during morning and event traffic peaks

Land Use and Future Growth

- Hwy 23 no longer functions as bypass; need to plan for future growth

Driver Behavior

- Local and regional users drive the corridor differently

Access to, from, and across Hwy 23

- Cross traffic and high speeds pose a risk to drivers and pedestrians/bicyclists

Travel Speeds

- Drivers don't obey posted speed limits

SURVEY #1 - INFO GATHERING

Purpose: to understand issues, concerns and priorities of stakeholders and the public along the Highway 23 corridor.

253

people responded to the survey

TOP 3

Critical issues for Hwy 23 in Marshall

1. Future growth (increased traffic)
2. Driver Behavior
3. Crossing Hwy 23 (delays)

Best outlets to share info

newsletter	website	mail	email	social media
19.35%	22%	22.17%	72.58%	20.96%

44.66%

moderately satisfied with how Hwy 23 currently functions

Age of Responders

18 - 25	4.43%
26 - 34	16.12%
35 - 44	23.79%
45 - 54	26.2%
55 - 64	25%
65+	4.03%

Top 4 zip codes:

Marshall
Lynd
Ghent
Balaton

SURVEY #2 - CORRIDOR PRIORITIES

Purpose: to gather input from stakeholders and the public regarding priorities along the Hwy 23 corridor.

459

people responded to the survey

Age of Responders

18 - 25	8.49%
26 - 34	18.35%
35 - 44	26.02%
45 - 54	19.17%
55 - 64	15.06%
65+	12.87%

Top 3 zip codes:

Marshall
Cottonwood
Lynd

Top Concerns Along Highway

Travel speeds along Hwy 23	24.4%
Safety at intersection	45.31%
Access to, from and across Hwy 23	25.05%
Safety for pedestrians and bicyclists	5.22%

Travel speeds along Hwy 23	19.91%
Safety at intersection	34.79%
Access to, from and across Hwy 23	31.72%
Safety for pedestrians and bicyclists	13.56%

Priority Location of Concerns

Hwy 23/CR 7	34.53%
Hwy 23/4th St	8.01%
Hwy 23/Hwy 59/Canoga Park Dr.	13.53%
Hwy 23/Lyon St/ Clarice St	15.46%
Hwy 23/Hwy 19	11.04%
Hwy 23/Tiger Dr/Commencement Blvd.	13.25%
Hwy 23/CR 33	4.14%

Hwy 23/CR 7	16.29%
Hwy 23/4th St	15.74%
Hwy 23/Hwy 59/Canoga Park Dr.	12.7%
Hwy 23/Lyon St/ Clarice St	16.02%
Hwy 23/Hwy 19	15.74%
Hwy 23/Tiger Dr/Commencement Blvd.	14.36%
Hwy 23/CR 33	9.11%

Setting Speed Limits & Reducing Speeds

Throughout the public and stakeholder engagement process the assessment team heard concerns regarding travel speeds along Highway 23. It was often suggested that the posted speed limit should be lowered along Highway 23 to make the roadway safer, but the team also heard that the posted speed limit is too low.

Research has shown that there is little change in the speed pattern after a change in the posting of a speed limit. Several speed zoning studies have been conducted throughout Minnesota. Results of the studies indicate that changing the posted speed limit has little or no impact on driver speeds. Drivers select their speed based on the characteristics of the roadway. According to *Designing Roads that Guide Drivers to Choose Safer Speeds* (Connecticut Cooperative Highway Research Program, November 2009), "Drivers slow down where the road feels 'hemmed in' or there is noticeable street activity…they speed up where the road feels 'wide open' or street activity is less noticeable." When the Highway 23 bypass around Marshall was designed and constructed, it was intended to server higher travel speeds.

Speed Zoning Studies

Study Location	Before	After	Sign Change +/- mph	85% Before	85% After	Change mph
T.H.65	40	30	-10	34	34	0
T.H.65	50	40	-10	44	45	+1
Anoka CSAH 1	45	40	-5	48	50	+2
Anoka CSAH 24	30	45	+15	49	50	+1
Anoka CR 51	40	45	+5	45	46	+1
Henn CSAH 4	50	40	-10	52	51	-1
Nobles Ave	30	35	+5	37	40	+3
62nd Ave N	35	30	-5	37	37	0
Miss. St	30	35	+5	39	40	+1

Illustrated below are roadway conditions in four Minnesota communities along with the posted speed limit. The conditions range from a 30 mph roadway with raised median, curb and gutter, sidewalk, trees, and close building set-backs to a 55 mph roadway with a grass median, wide paved shoulders and buildings that do not front the highway. These differing conditions influence the speed at which drivers will drive.

Hwy 169 – St. Peter
Posted Speed = 30 mph

Hwy 23 – Spicer
Posted Speed = 40 mph

Hwy 371 – Baxter
Posted Speed = 50 mph

Hwy 23 – Marshall
Posted Speed = 55 mph

To effectively lower driver speeds, the roadway characteristics will need to be changed. According to the *Effects of Raising and Lowering Speed Limits on Selected Roadway Sections* (Federal Highway Administration, January 1997), "Changing posted speed limits alone, without additional enforcement, educational programs, or other engineering measures, has only a minor effect on driver behavior."

Phase 1 – Assessment Purpose & Need

Existing corridor and intersection issues and deficiencies were identified early on to assist the assessment team in informing the public from an engineering perspective. Technical analyses were completed to assist in the identification of the purpose and need for the assessment. The process to complete this included reviewing the existing corridor and access issues, collecting and evaluating how many vehicles travel the corridor, the history of crashes, and the speeds at which drivers are currently driving. This also included understanding how Highway 23 currently functions with respect to all users and how current land uses and future development are expected to change its performance.

Existing Corridor & Access

The Highway 23 corridor within the assessment area is a four-lane divided highway with turn-lanes at key locations. The posted speed limit is 65 mph west of the assessment area, 55 mph within the assessment area, and 60 mph north of the assessment area. The Highway 23/Hwy 59 and Highway 23/Highway 19 intersections are controlled by traffic signals. A J-Turn intersection was constructed at Highway 23/Saratoga Street during 2015. All other intersections are side-street stop controlled where drivers need to select a gap in Highway 23 traffic prior to accessing Highway 23. In 2014 a Rural Intersection Conflict Warning System (RICWS) was installed at County Road 7.

Access to major corridors play a critical role in the safety and operations of the facility. A high density of access locations along a given segment of roadway can have an impact on safety and vehicle operations, such as travel times and delay. MnDOT's guidelines regarding access spacing can be found in the *Access Management Manual* (MnDOT, January 2008). A review of the access spacing along the Highway 23 corridor found that the following three locations are spaced too close to adjacent intersections and do not meet MnDOT access spacing guidelines based on the current function of Highway 23.

Access to frequent along Highway 23:

- Lyon Street to Clarice Avenue
- Highway 59 to Canoga Park Drive
- Canoga Park Drive to Spruce Lane

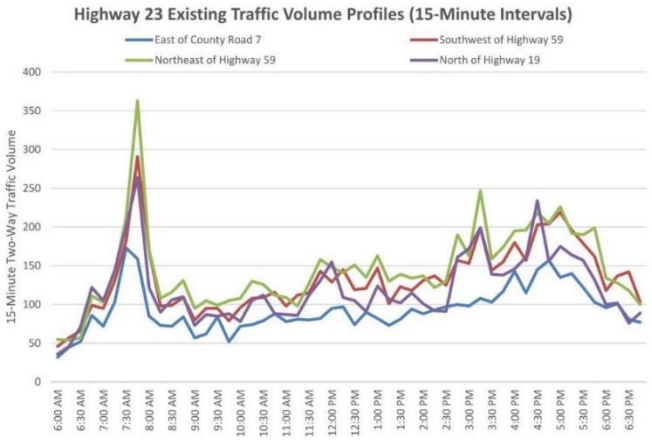
Throughout the public and stakeholder engagement process the assessment team heard concerns on how the current intersections are designed. Originally constructed as a bypass, the median along Highway 23 is wide, as shown in the photo below at County Road 7, which is creating confusion for drivers. This concern was taken into consideration later on in the assessment process when identifying strategies to improve safety.

Looking north at Highway 23 and CR 7.

Traffic Assessment

The amount of traffic using Highway 23 was determined by counting vehicles during the weeks of January 11, 2016 and January 25, 2016. These weekday 13-hour turning movement counts were used to establish morning and afternoon peak hour conditions and to estimate the amount of traffic that uses Highway 23 on an average day.

Using this information, an existing traffic assessment was completed for each of the intersections within the assessment area. The traffic assessment evaluated each intersection based on the amount of delay that drivers experience while driving through or across the intersection. Based on industry standards, the average delay that is experienced during the morning and evening peak periods is acceptable. However, as shown in the graphic to the right there is a sharp peak that occurs at 7:45 a.m., which coincides with shifts starting at 8:00 a.m. and school start times. As a result, drivers at some intersections experience longer delays for a short time in the morning.



In addition to the existing intersection traffic assessment, a future year 2040 traffic assessment was completed. This assessment used forecasted volumes that took future growth and changes in land use into consideration. Even with the anticipated growth and changes in land use, the existing roadway is expected to be able to accommodate traffic in the year 2040. However, as traffic volumes increase, the sharp peak occurring at 7:45 a.m. is expected to increase, causing drivers at some intersections to experience longer delays in the morning.

Safety Assessment

The Minnesota Crash Mapping Analysis Tool (MnCMAT) was used to obtain the crash history for the years 2010 through 2014. This data included the type of crash that occurred, when and where, the severity of, and contributing factors to the crash, and other useful information.

During the years 2010 through 2014, prior to the reconstruction of the Saratoga Street intersection, 137 crashes were reported:

- 30% of crashes were right angle
- 24% of crashes were rear end
- 15% of crashes were side-swipe passing

As a result, five intersections were identified as higher crash locations.

Higher crash locations along Highway 23:

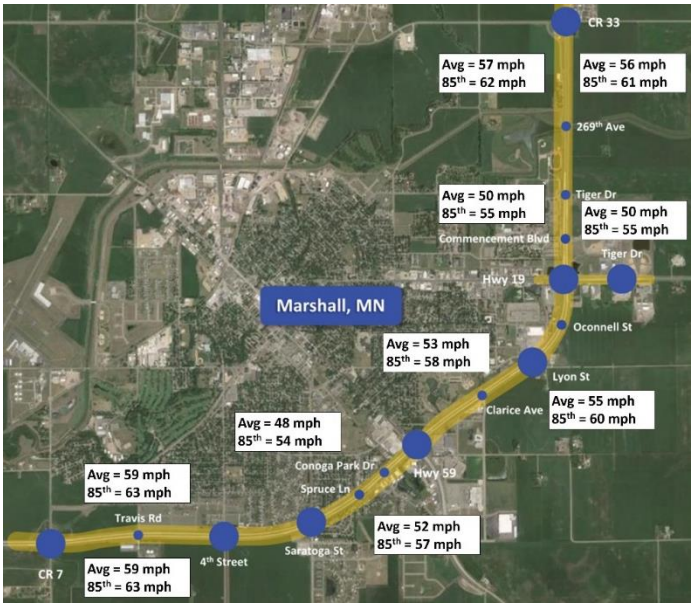
- County Road 7
- Saratoga Street*
- Highway 59
- Lyon Street
- Highway 19

*J-Turn constructed in 2015

Speed Assessment

The speed at which drivers are currently driving was determined in February 2016, using radar equipment at five locations along Highway 23.

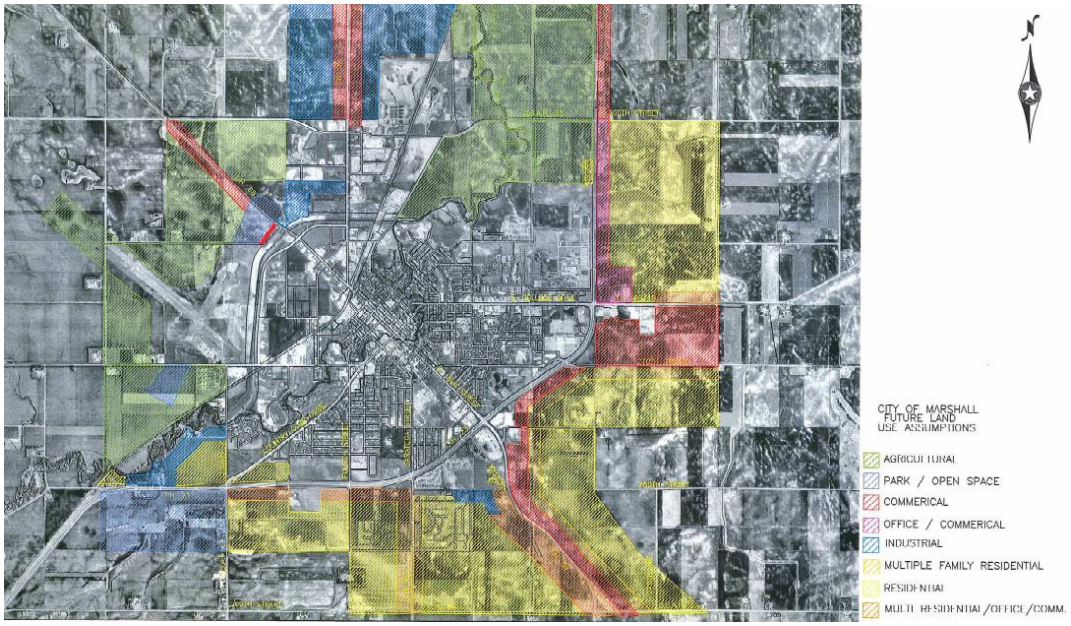
Based on the data collected the average and 85th percentile speeds were determined (see graphic on the right). The 85th percentile speed is the speed in which most (85%) of drivers are traveling at or below. If the 85th percentile is close to the posted speed limit, it is a good indication that the speed limit is set appropriately. Generally, the speed limit is posted near the 85th percentile speed.



Existing and Future Land Uses

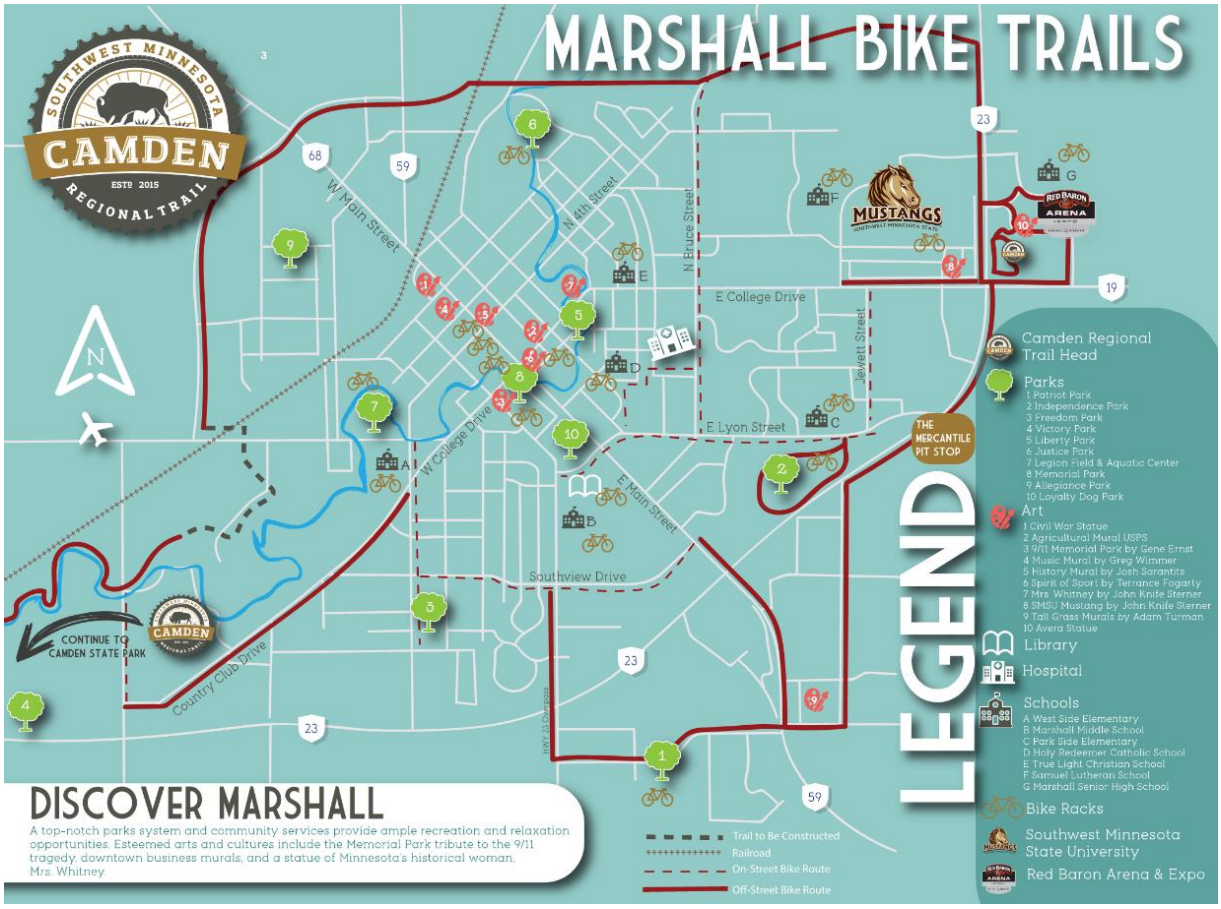
Highway 23 was constructed as a bypass around the urban area of Marshall to allow through traffic to flow with fewer interruptions, to reduce congestion through town, and in doing so, reduce conflict points and competing uses of highway users. Since the bypass was constructed, development has expanded to the bypass, and in several locations east of the bypass, creating increased cross traffic of Highway 23.

Moving forward, the majority of development in Marshall is expected to occur across the bypass both south and east of Highway 23 as shown below, with the largest concentration near the Marshall Senior High School with the future Camden Market retail and entertainment district. As development occurs, the number of drivers and their routes using Highway 23 will change.



Pedestrian & Bicycle Facilities

The Highway 23 corridor currently has two at-grade crossings for pedestrians and bicyclists located at the signalized Highway 59 and Highway 19 intersections. Painted crosswalks are provided at both intersections. A pedestrian/bicycle overpass was constructed at Saratoga Street in 2015 and an underpass was constructed at Commencement Boulevard in 2011. The graphic below provided by the City of Marshall illustrates existing on-street and off-street bike routes and planned future trails.



Phase 2 – Development & Evaluation of Alternatives

After completion of the traffic, safety, and speed assessment, coupled with a solid understanding of the existing corridor, intersection issues and deficiencies, and concerns from the community, alternatives were developed and evaluated to improve safety along the Highway 23 corridor. The first step in this process was to identify and evaluate potential alternatives for each key location along Highway 23. The next step was to evaluate how the different alternatives work together and develop corridor plans that best address the issues and concerns.

Safety Improvement Strategies

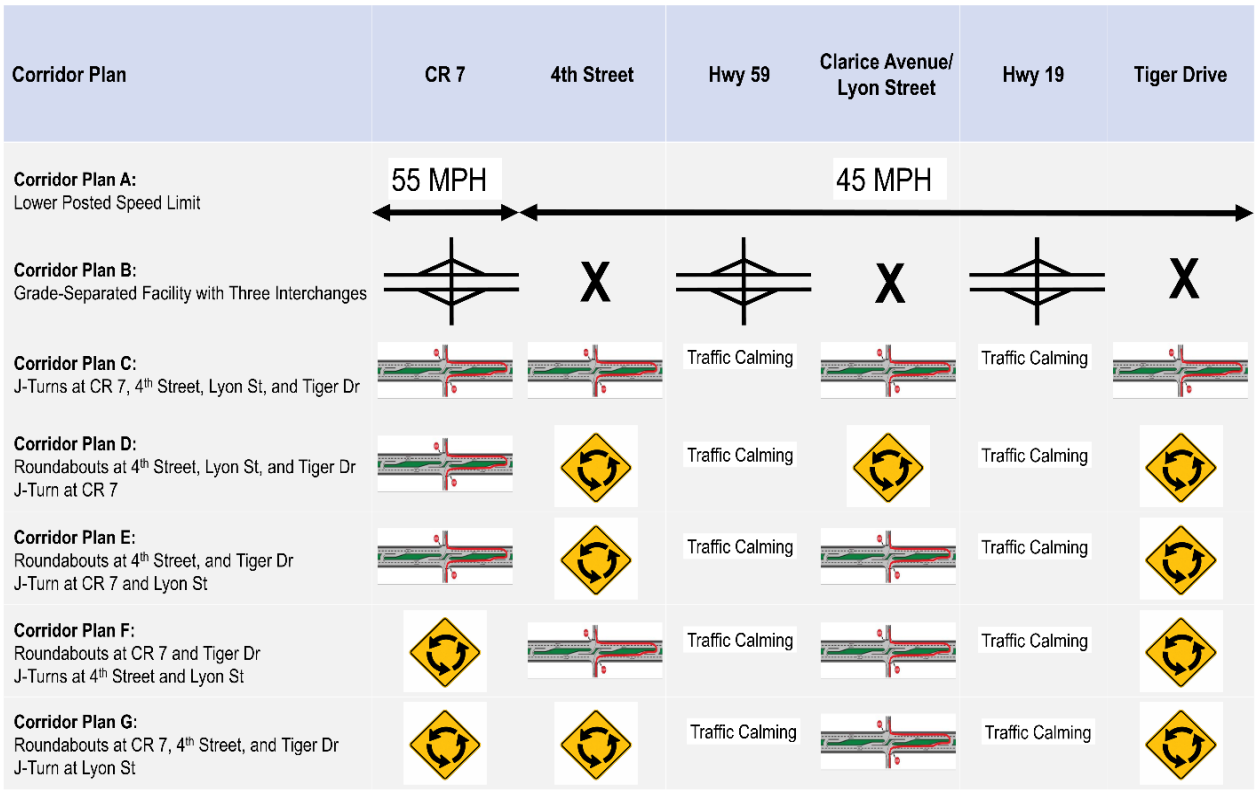
To develop alternatives individual safety improvement strategies were initially identified. Using a combination of the alternatives and strategies is the most effective way to improve safety. Below summarizes the "Tools in the Toolbox" that were considered to improve safety.

- **Roadway Design:** Strategies includes making physical changes to the roadway or obstructions to improve safety.
- **Access Management:** Strategies are used to limit the number of opportunities where vehicles can conflict with each other. An increase in conflicts can result in an increase in crashes.
- **Intersection Control:** Strategies include making improvements to how the intersections are controlled (i.e. stop control, traffic signal, J-Turn, roundabout, etc.).
- **Roadside Environment:** Strategies are used to convey a change in environment to drivers.
- **Signing and Pavement Markings:** Strategies include providing appropriate information or signing to motorists regarding the environment in which they are traveling.
- **Education & Enforcement**: Strategies can be used to educate motorists on the dangers of speeding and distracted driving.

Detailed technical analyses were completed to determine the potential effectiveness of the safety improvement alternatives and their ability to improve safety and reduce corridor travel speeds.

Corridor Improvement Plans

Seven corridor improvement plans were developed using a combination of the above intersection alternatives throughout the corridor. Consideration was given to how the intersection alternatives interact at the corridor level. The assessment team initially reviewed two corridor plan options ranging from just lowering the speed limit to removing all access points and constructing interchanges at County Road 7, Highway 59, and Highway 19. Next, the assessment team reviewed five corridor plan options with a combination of intersection improvements which included J-Turns and roundabouts.



Throughout the public and stakeholder engagement process, the assessment team heard concerns regarding travel speeds along Highway 23. It was often suggested that the posted speed limit should be lowered along Highway 23 to make the roadway safer. Corridor Plan A was included in order to compare it to other alternatives.

In addition to comments regarding travel speeds and speed limits along the corridor, it was often suggested that interchanges should be constructed through Marshall. Corridor Plan B was included as an option in order to evaluate the benefits and cost effectiveness of interchanges.

Roundabouts and J-Turns were considered as intersection alternatives because they address the safety issues currently observed (i.e. both strategies address right angle and opposing left-turn crashes). In addition to addressing safety, when placed strategically, roundabouts can reduce travel speeds along the Highway 23 corridor and provide for safer at-grade pedestrian crossings.

Corridor Plans C through G incorporate raised medians (with potential landscaping) at the Highway 59 and Highway 19 intersections to improve pedestrian and bicycle safety and to help calm speeds.

Comparison of Corridor Improvement Plans

The corridor plans were evaluated based on both areas of concern identified through public involvement and the technical analyses completed. The purpose of the evaluation was to determine the potential effectiveness of the plans. The areas of concern include: 1) travel speeds along Highway 23; 2) safety at intersections; 3) access to, from, and across Highway 23; and 4) safety for pedestrians and bicyclists. In addition, project cost was taken into consideration when comparing the corridor plans. The graphic below summarizes the comparison of the corridor plans. The red dots indicate the improvements that do not meet the objectives of the assessment. The yellow dots show improvements that do meet the objectives and the green dots identify the improvements that best meet the assessment issues and concerns.

Corridor Plan	Reduces travel speeds along Hwy 23?	Improves safety at intersections?	Improve safety of access to, from and across Hwy 23?	Improves safety for pedestrians and bicyclists?	Estimated Project Cost
Corridor Improvement Plan A: Lower Posted Speed Limit	🔴	🔴	🔴	🔴	$
Corridor Improvement Plan B: Grade-Separated Facility with Three Interchanges	🔴	🟢	🟢	🟢	$$$$$
Corridor Improvement Plan C: J-Turns at CR 7, 4th Street, Lyon St, and Tiger Dr	🟡	🟢	🟢	🔴	$$$
Corridor Improvement Plan D: Roundabouts at 4th Street, Lyon St, and Tiger Dr J-Turn at CR 7	🟢	🟢	🟢	🟡	$$$
Corridor Improvement Plan E: Roundabouts at 4th Street and Tiger Dr J-Turn at CR 7 and Lyon St	🟢	🟢	🟢	🟡	$$$
Corridor Improvement Plan F: Roundabouts at CR 7 and Tiger Dr J-Turns at 4th Street and Lyon St	🟢	🟢	🟢	🟡	$$$
Corridor Improvement Plan G: Roundabouts at CR 7, 4th Street, and Tiger Dr J-Turn at Lyon St	🟢	🟢	🟢	🟢	$$$

🔴 Does not meet objective
🟡 Acceptably meets objective
🟢 Best meets objective

$ = <$5M
$$$ = $5M-$10M
$$$$$ = $60M-$80M

While the cost for just lowering the posted speed limit is low, it does not address any of the four areas of concern (i.e. reduce travel speeds, improve intersection and access safety, and improve safety for pedestrians and bicyclists). Previously noted research has shown that just lowering the posted speed limit without changing the character of the roadway will not adequately address the issues and concerns.

Adding interchanges to Highway 23 through Marshall addresses three of the areas of concern but is estimated to cost between $60M-$80M, making this option not cost effective. Additionally, this option would impact numerous businesses (i.e. require relocation) along Highway 23 due to the access closures and frontage/backage road systems needed to allow local Marshall traffic to access Highway 23.

The remaining options fall within the same range of $5M-$10M, but address the concerns in different ways. Corridor Plan C has the potential to reduce travel speeds along the corridor, but it doesn't improve pedestrian and bicycle crossing safety. Corridor Plans D through F have the best potential for reducing travel speeds along the corridor and they acceptably improve safety for pedestrians and bicyclists. Corridor Plan G has the best potential for reducing travel speeds along the corridor and best opportunity to improve safety for pedestrian and bicyclists long-term, depending on development patterns.

Phase 3 – Recommendations & Implementation Plan

The assessment was concluded by identifying recommended safety improvement plans, followed by prioritizing the improvements to develop a plan for implementation now and in the future. Alternatives were ranked based on their potential effectiveness and locations were prioritized based on existing safety issues and input received through the public and stakeholder engagement process.

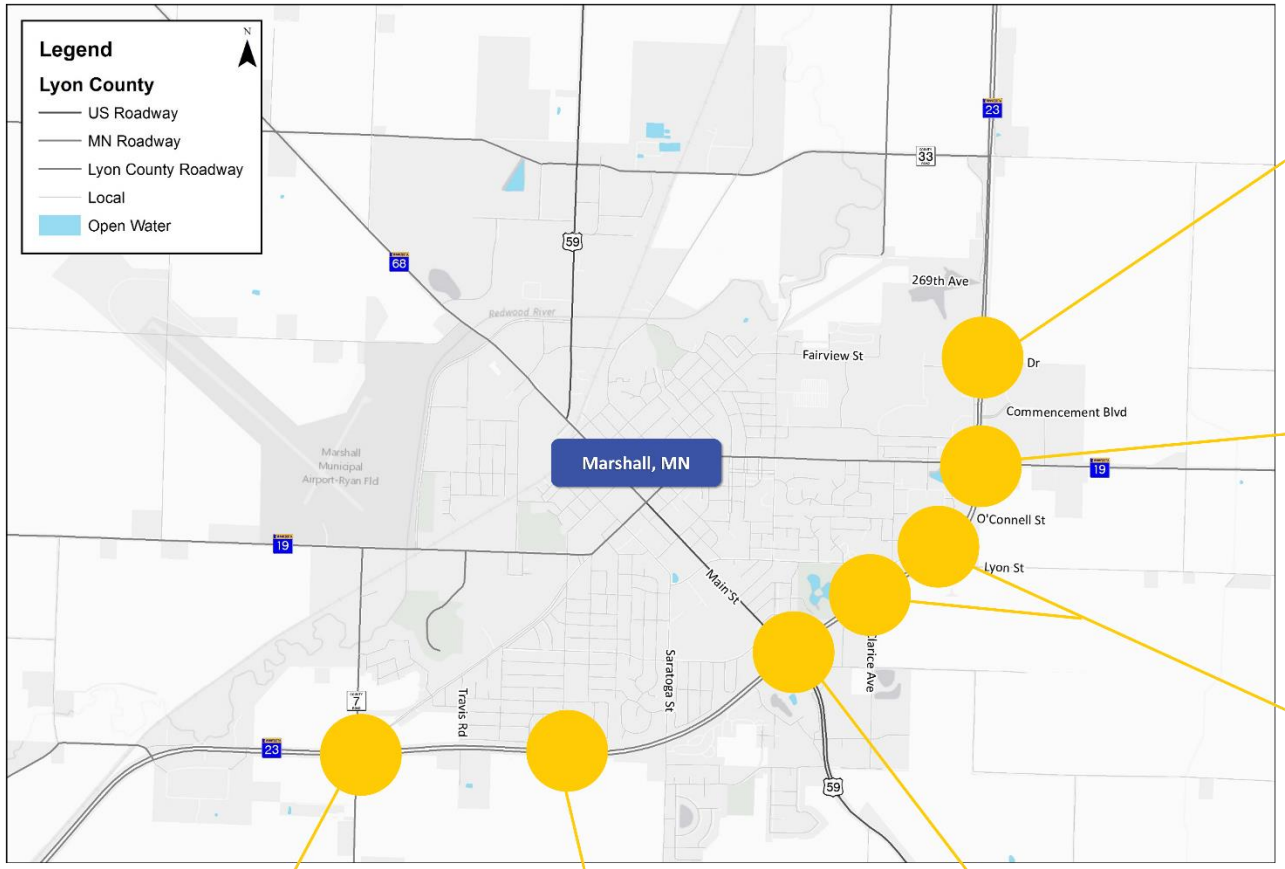
Recommendations

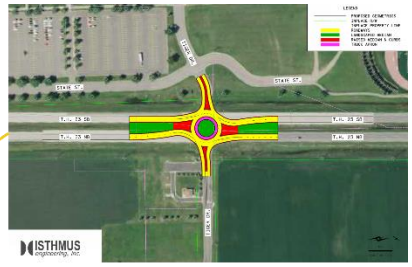
Based on the detailed technical evaluation comparing expected safety benefits, potential impacts to traffic, including the ability of the improvement to accommodate trucks, and cost, while incorporating public input, Corridor Improvement Plan E is recommended by the project partners to begin the process of pursuing funding.

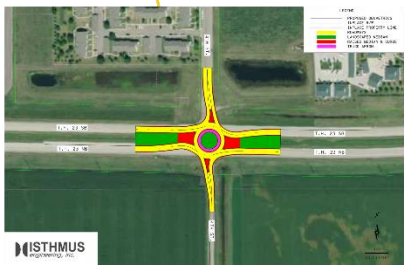
The recommended plan includes book-ending the commercial area of the corridor with roundabouts at 4th Street and Tiger Drive, and constructing a J-Turn at Lyon Street and at County Road 7, while incorporating traffic calming measures at Highway 59 and at Highway 19. Additionally, potential future access restrictions and local roadway changes at various locations, and low-cost/high-benefit strategies described later in this report, will supplement the overall plan. The recommended corridor plan addresses the safety concerns at County Road 7 and Lyon Street, while introducing roundabouts and other traffic calming measures to the corridor to calm traffic and lower travel speeds. The roundabouts can also serve as at-grade crossings for pedestrians and bicyclists at 4th Avenue and at Tiger Drive. A summary of the plan, and detailed conceptual drawings for each intersection, are shown on the following pages along with descriptions on how the improvements address the areas of concern for Highway 23 through Marshall.

A roundabout was considered at County Road 7, but the primary truck turning patterns at this intersection are from the east and the west on Highway 23 to the north on County Road 7, and from the north on County Road 7 to the west on Highway 23. From that perspective, the J-Turn will address the existing median design concerns and still easily accommodate the primary truck movements. Long-term, a roundabout at County Road 7 would provide a safer at-grade crossing for pedestrians and bicycles, but there are other ways to address those needs at this location (i.e. potential future grade-separation) given the proximity of housing developments to this intersection. Installing an at-grade crossing at County Road 7 near-term without additional nearby development would only encourage pedestrians and bicyclists to travel along Highway 23 until they reach the County Road 7 intersection. Based on the expected safety improvement and associated costs, a J-Turn, which can be further refined to reduce costs compared to the roundabout, is recommended by the assessment team.

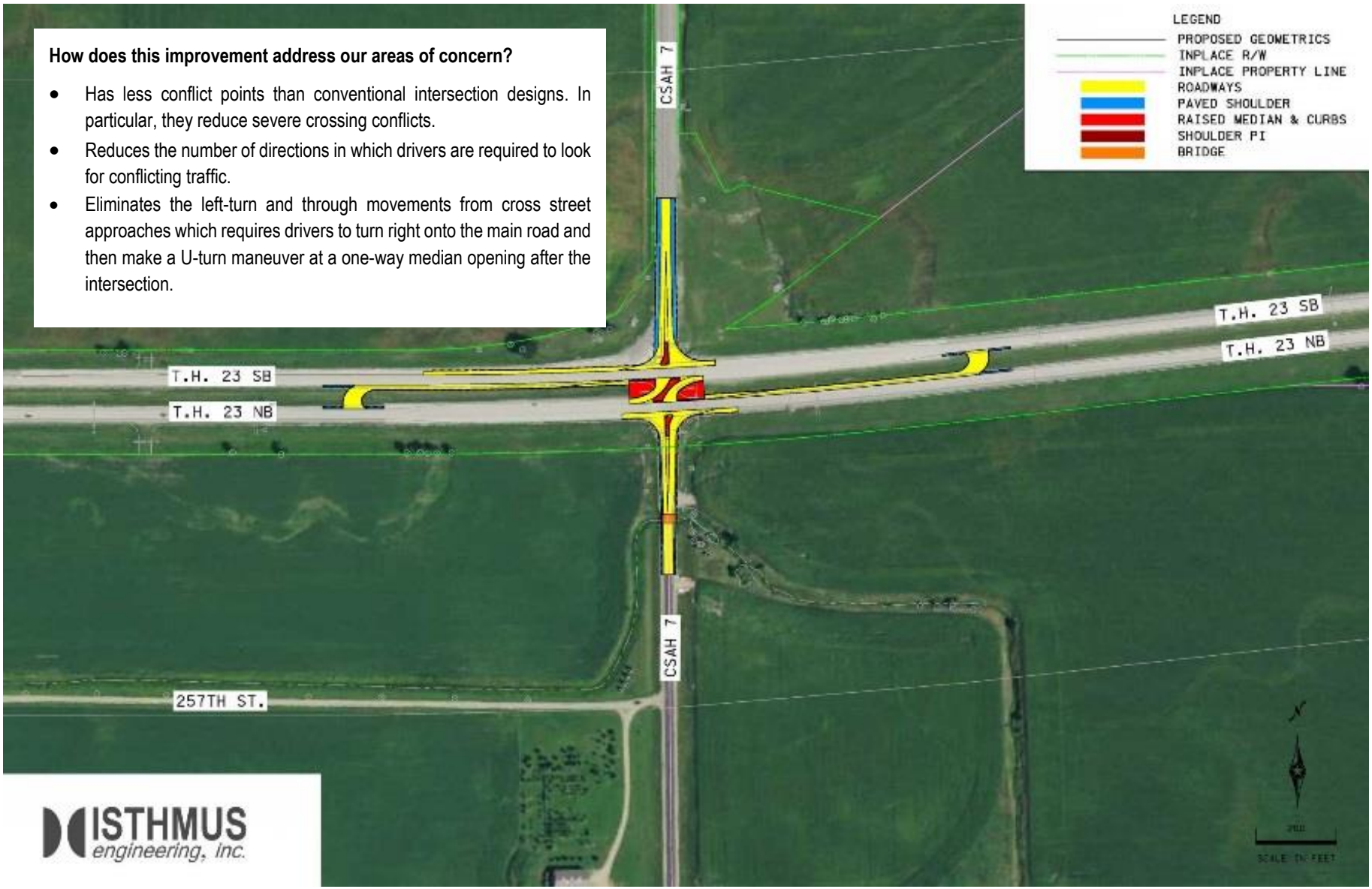
Recommended Corridor Improvement Plan E







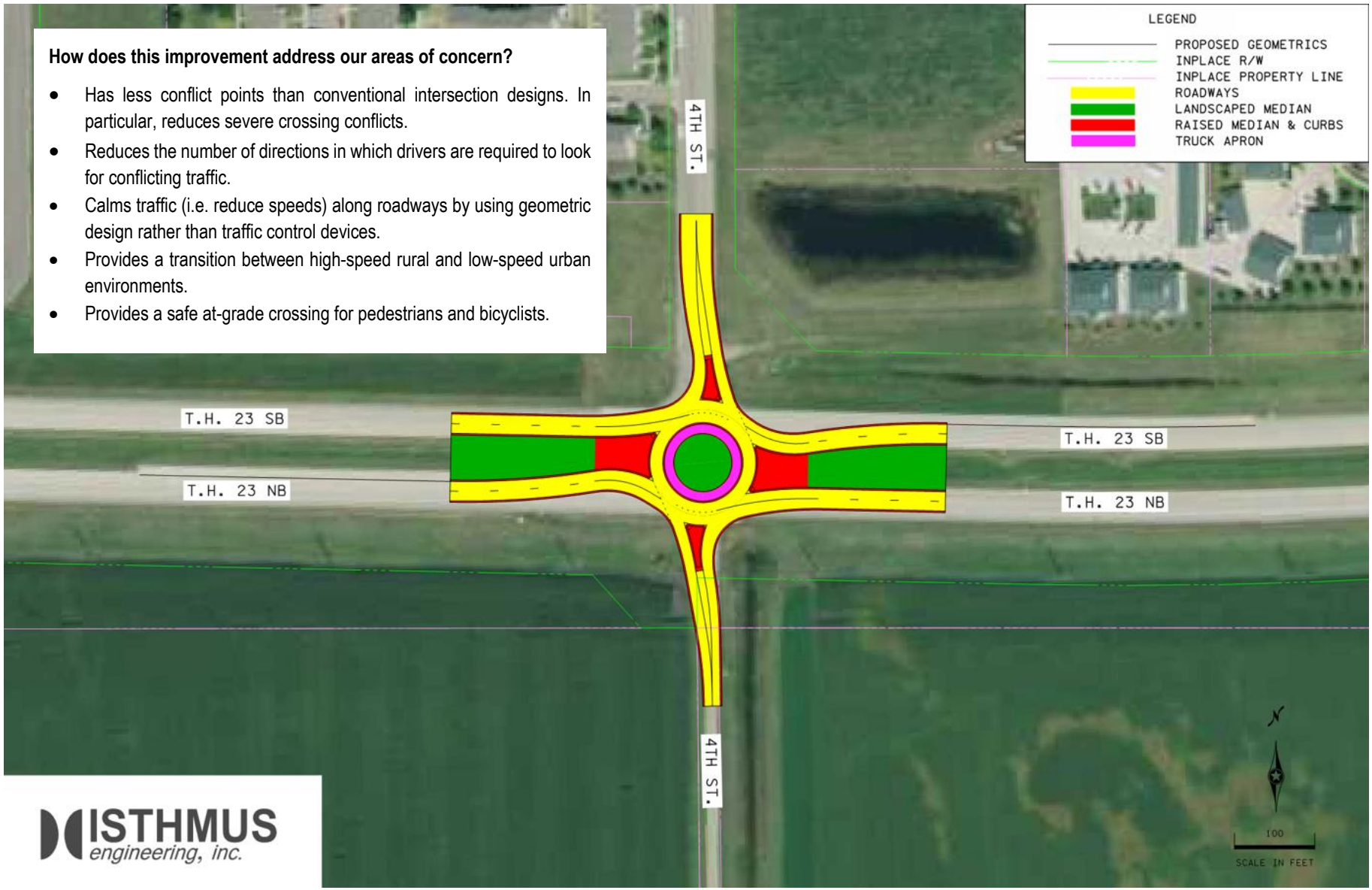
Highway 23 and County Road 7 – J-Turn



Highway 23 and 4th Street – Roundabout

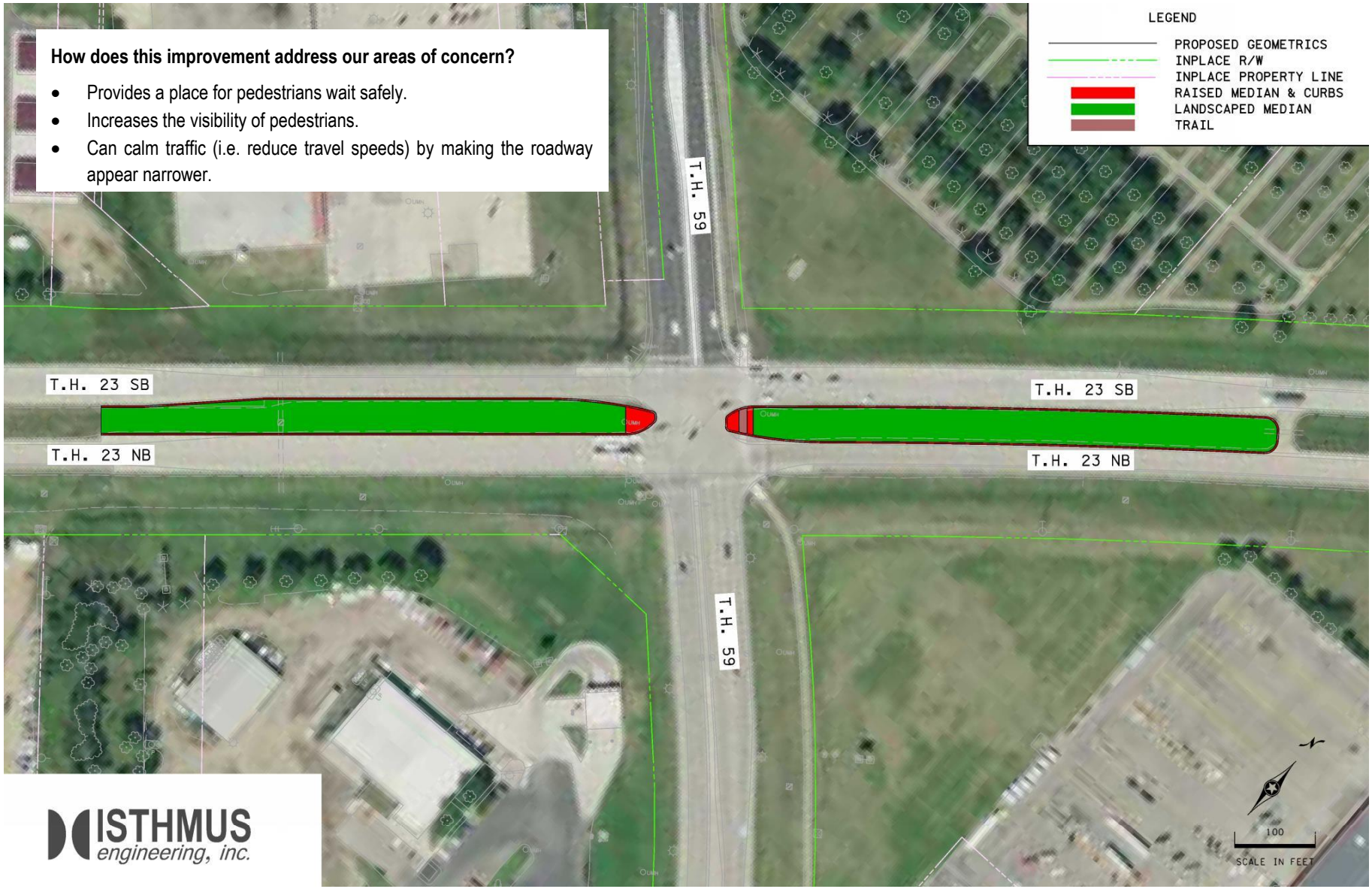
How does this improvement address our areas of concern?

- Has less conflict points than conventional intersection designs. In particular, reduces severe crossing conflicts.
- Reduces the number of directions in which drivers are required to look for conflicting traffic.
- Calms traffic (i.e. reduce speeds) along roadways by using geometric design rather than traffic control devices.
- Provides a transition between high-speed rural and low-speed urban environments.
- Provides a safe at-grade crossing for pedestrians and bicyclists.



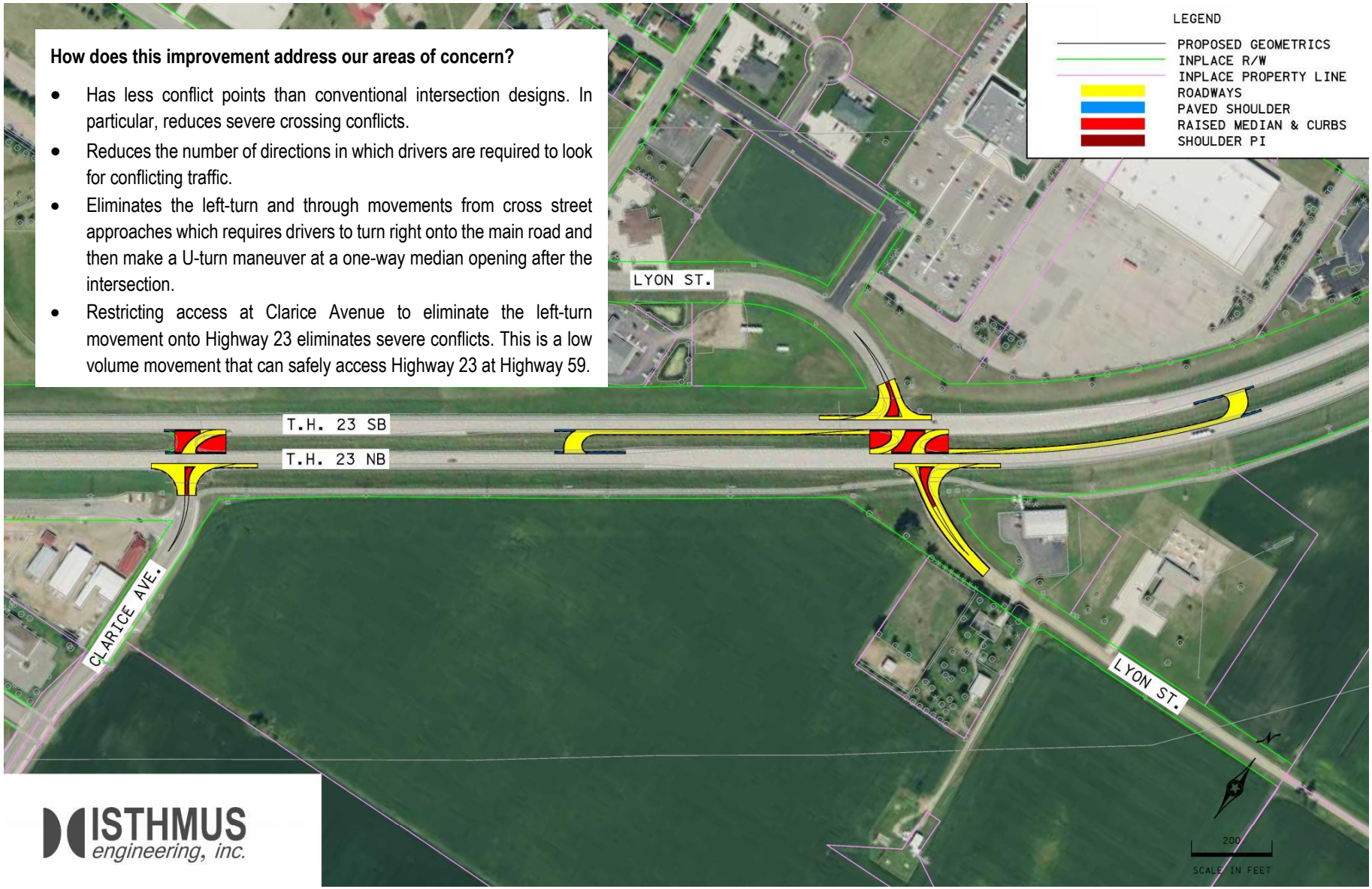
ISTHMUS engineering, inc.

Highway 23 and Highway 59 – Raised Center Median (Traffic Calming)



ISTHMUS engineering, inc.

Highway 23 and Lyon Street – J-Turn

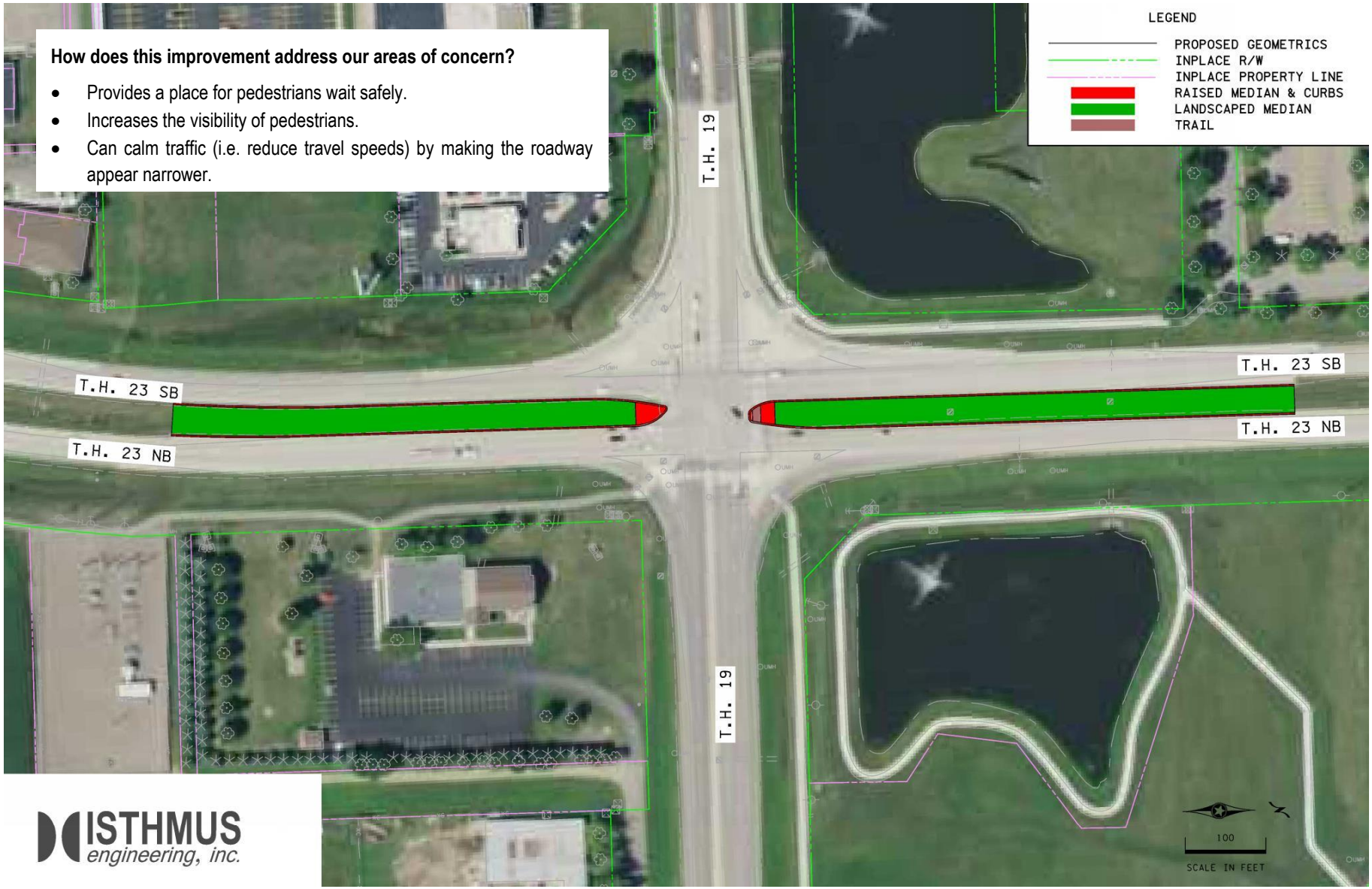


How does this improvement address our areas of concern?

- Has less conflict points than conventional intersection designs. In particular, reduces severe crossing conflicts.
- Reduces the number of directions in which drivers are required to look for conflicting traffic.
- Eliminates the left-turn and through movements from cross street approaches which requires drivers to turn right onto the main road and then make a U-turn maneuver at a one-way median opening after the intersection.
- Restricting access at Clarice Avenue to eliminate the left-turn movement onto Highway 23 eliminates severe conflicts. This is a low volume movement that can safely access Highway 23 at Highway 59.

ISTHMUS engineering, inc.

Highway 23 and Highway 19 – Raised Center Median (Traffic Calming)



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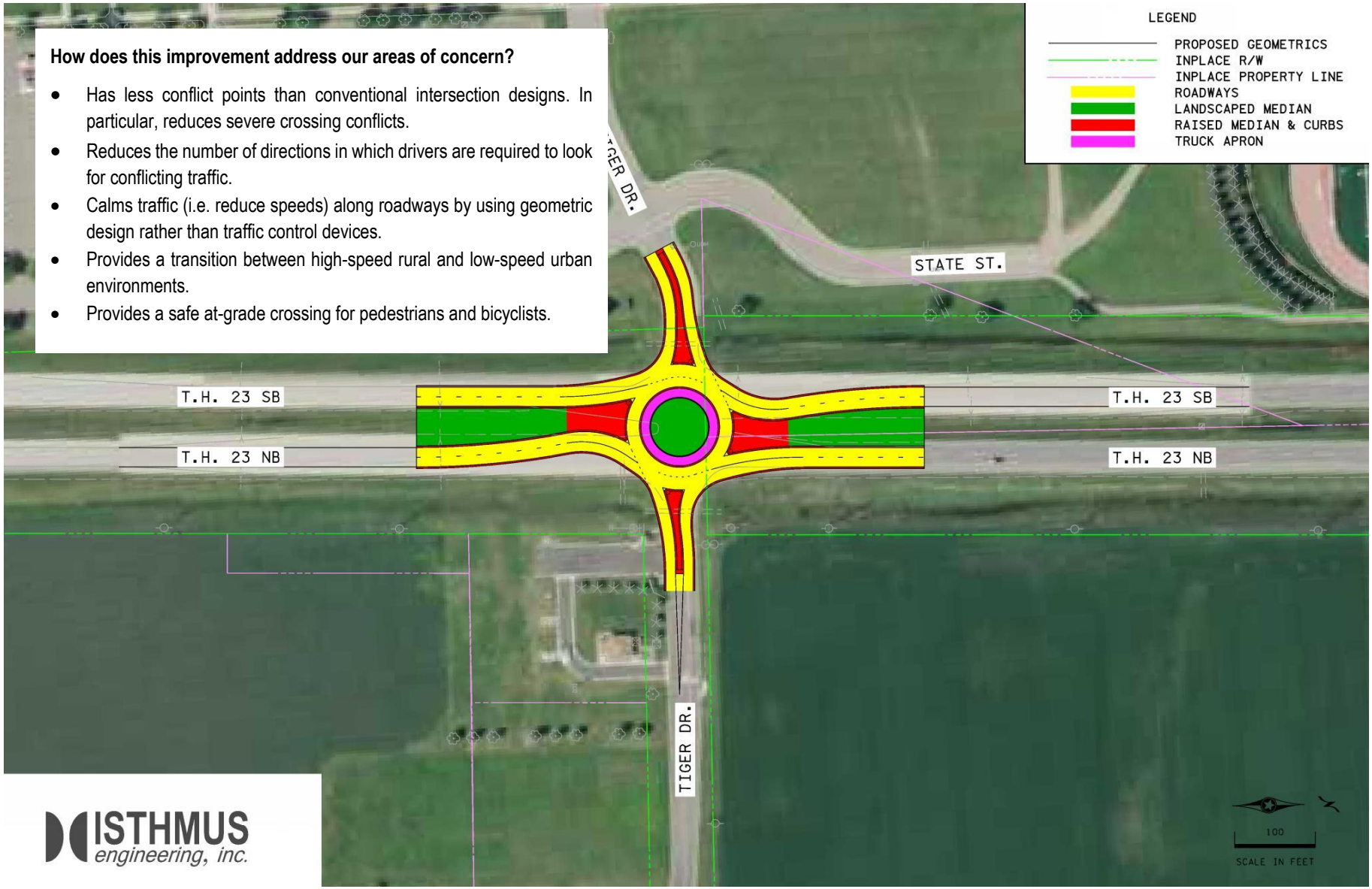
Highway 23 and Tiger Drive – Roundabout



How does this improvement address our areas of concern?

- Has less conflict points than conventional intersection designs. In particular, reduces severe crossing conflicts.
- Reduces the number of directions in which drivers are required to look for conflicting traffic.
- Calms traffic (i.e. reduce speeds) along roadways by using geometric design rather than traffic control devices.
- Provides a transition between high-speed rural and low-speed urban environments.
- Provides a safe at-grade crossing for pedestrians and bicyclists.

ISTHMUS engineering, inc.

There are other corridor-wide ongoing safety improvement strategies that can be implemented as needed or together with the above corridor plans. These improvements are illustrated to the right.

ENGINEERING:

- (ES) Install advanced signing for reduced speed ahead
- (SC) Install trees and landscaping along Hwy 23 to serve as speed calming measures
- (SC) Strategically locate driver feedback signs to assist with speed calming
- (SC) Review posted speed limit in conjunction with highway characteristic changes

Speed Calming = SC
Enhanced Signing = ES

Advanced Signing

Driver Feedback Signs

ENFORCEMENT:

- Work with law enforcement to enhance enforcement of posted speed limit

Enforcement Campaign

EDUCATION:

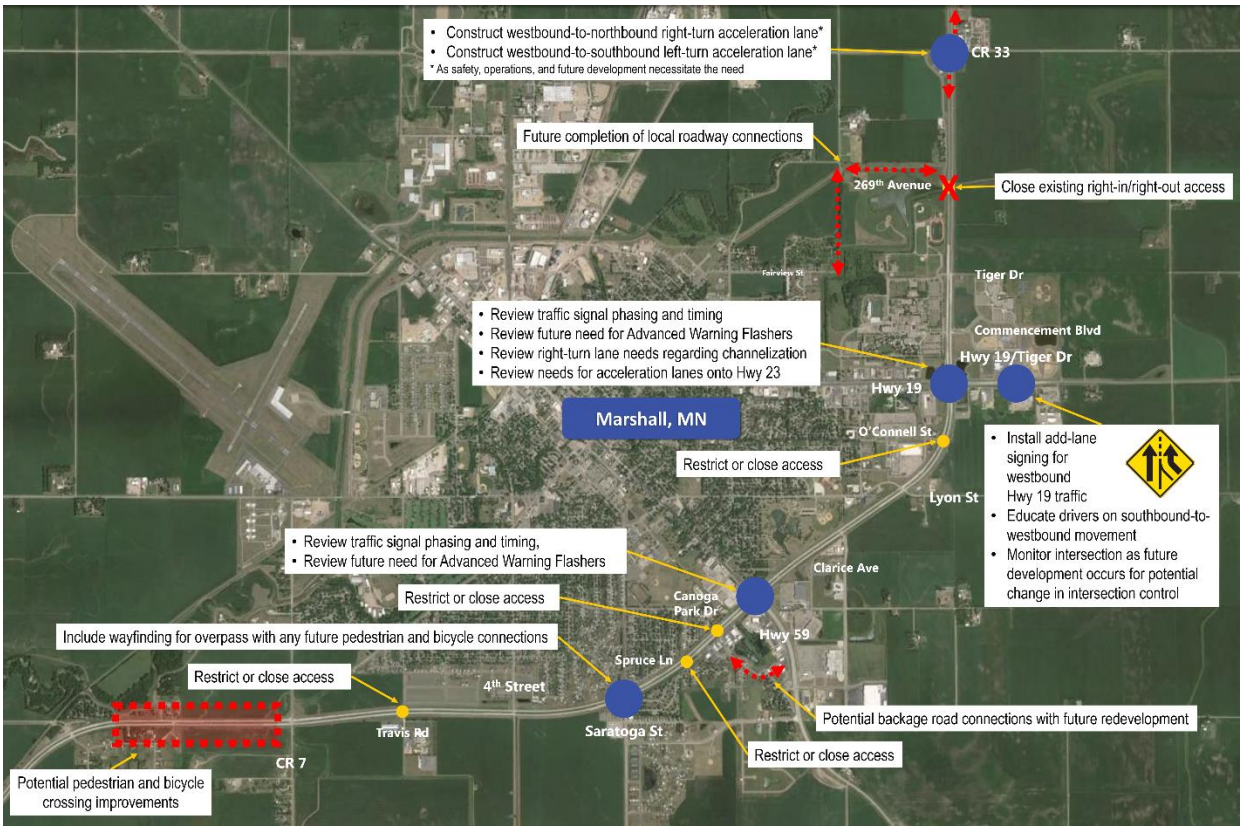
- Conduct education campaign regarding speeding and distracted driving

Education Campaign

EVALUATION:

- Evaluate changes in travel speeds following any improvements
- Evaluate for local frontage/backage road connections with future development
- Evaluate potential removal of advanced warning flashers at traffic signals

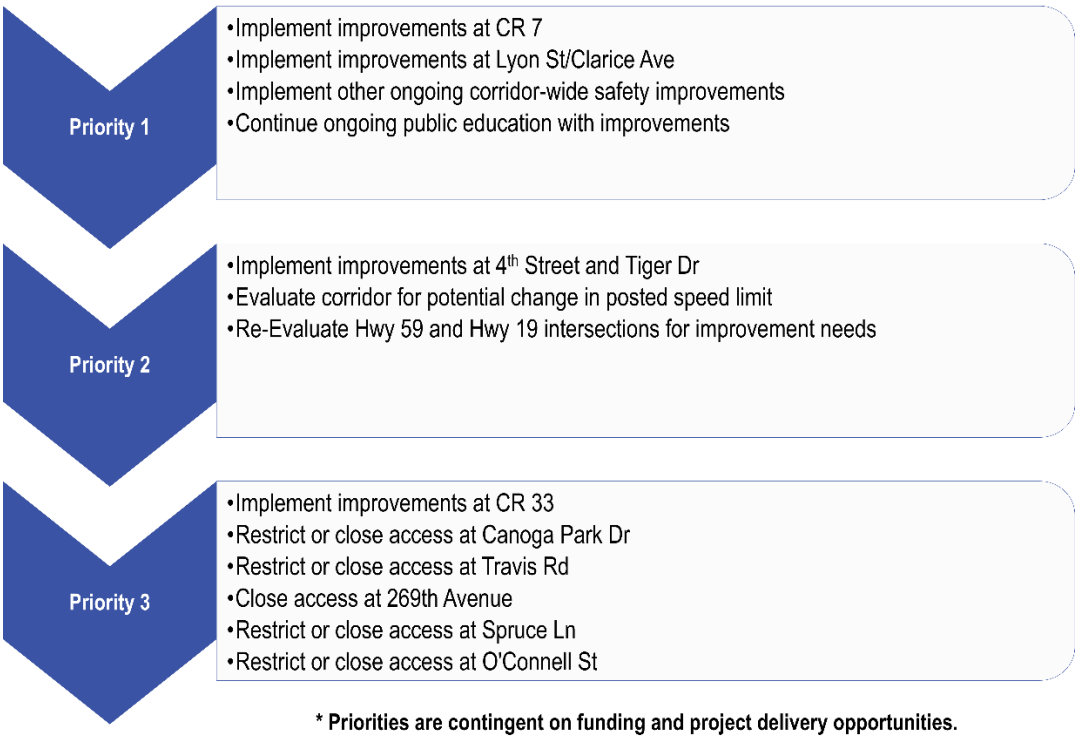
The image below demonstrates other opportunities to restrict or eliminate access, improve signal timing or phasing at the traffic signals, improve pedestrian and bicycle accommodations long-term, and opportunities to provide other local connections that will minimize the need for some of the existing access points along Highway 23.



Many of these strategies were identified to minimize access to Highway 23. Even though these areas may not be a safety issue now, they have the same characteristics as locations that do have current safety concerns, so there is a potential in the future for safety issues to arise.

Implementation Plan

The process to identify priorities for Highway 23 included both the aforementioned detailed technical review of the corridor as well as input from the public and stakeholder engagement process. It is important to note that the findings from both of these were consistent. With improving the safety of Highway 23 as the goal for the assessment and improving intersection safety as the number one concern from the community, the following priorities were identified:



*** Priorities are contingent on funding and project delivery opportunities.**

Initial highway improvement priorities include implementing improvements at County Road 7 and implementing improvements at Lyon St and Clarice Ave. Next, the priorities include implementing improvements at 4th Street and Tiger Drive, which will allow for further evaluation of the corridor for a potential change in posted speed limit. Continuing to keep the community involved is a high priority as implementation plans move forward.

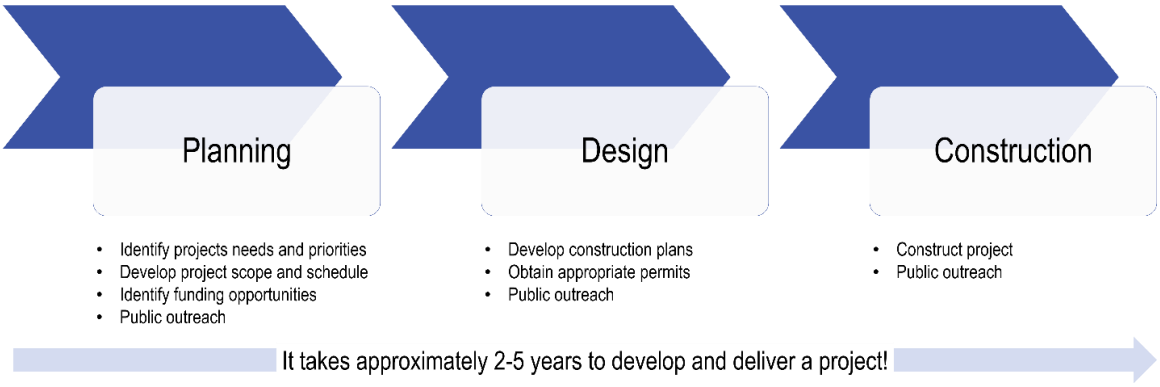
Addressing the above priorities will then allow us to re-evaluate the Highway 59 and Highway 19 intersections to determine if the overall safety has been improved, or to see if our recommendations need to be modified. The remaining locations along Highway 23 are considered lower priority locations based on the information available. These locations will continue to be monitored in the future to determine if and when improvements need to be implemented.

It is important to note that the priorities recommended can certainly change as funding opportunities become available. In other words, some priorities could be delayed or accelerated based on a number of factors.

The other ongoing corridor-wide safety improvements described above can be implemented as funding becomes available. These improvements are typically lower-cost solutions.

Next Steps

With this assessment complete, the assessment partners can begin pursuing funding opportunities to begin addressing the priorities for the Highway 23 corridor. This assessment is the initial step of the first phase of the project development and delivery process, as illustrated in the graphic below.



This assessment will allow the assessment partners to develop detailed project scope and schedule. The last two phases, design and construction, can take place once funding has been identified and secured. There are ongoing corridor-wide safety improvements that can be implemented as soon as funding becomes available, but implementing major infrastructure projects takes time. It typically takes approximately 2 to 5 years to complete this process of developing and delivering a project.

MnDOT and its partners, the City of Marshall, Lyon County, and the Marshall Area Transportation Group, are committed to working together to implement the recommendations identified in this safety assessment. Depending on the project being initiated, the appropriate agency will take the lead on pursuing funding and delivering the project. Public and stakeholder engagement, as well as education on improvements, will continue in the future as improvements are designed and implemented.